Dated :
26-4-2022

M.L. Syal's Helix Institute
S.C.O. 343-345, Top Floor, Sector 34-A, Chandigarh. Ph : 0172-2623155

MM : 720

XII cum Competition Course for Medical
Test - 1

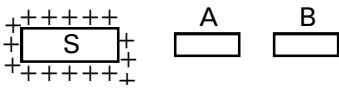**Time : 3 hrs.**

PHYSICS	:	ELECTROSTATICS I
CHEMISTRY	:	SOLUTIONS
ZOOLOGY	:	SEXUAL REPRODUCTION-I MALE REPRODUCTION SYSTEM, FEMALE REPRODUCTIVE SYSTEM-I (UPTO UTERUS)
BOTANY	:	SEXUAL REPRODUCTION IN FLOWERING PLANTS-I

PHYSICS : SECTION-A

All questions are compulsory in section A

1. Let 2×10^{15} electrons be added to a neutral body. Then charge on the body will become
   (1) 160 μC
   (2) −160 μC
   (3) 320 μC
   (4) −320 μC

2. Two small conducting spheres of equal radius have charges $+10 \, \mu$C and $-20 \, \mu$C respectively and placed at a distance R from each other experience force F_1. If they are brought in contact and separated to the same distance, they experience force F_2. The ratio of F_1 to F_2 is
   (1) 1 : 8
   (2) −8 : 1
   (3) 1 : 2
   (4) −2 : 1

3. Two conducting bodies with charges $+5$ C and -3C are brought in contact. Which of the following can not be the possible charges on them finally?
   (1) 1 C, 1C
   (2) 1.5C, 0.5C
   (3) 2C, 1C
   (4) 1.75C, 0.25C

4. A small electric dipole is placed at origin with its dipole moment directed along positive x-axis.
   Direction of electric field at $\left(2, 2\sqrt{2}\right)$ is along
   (1) 30° with x-axis
   (2) +ve z-axis
   (3) 60° with y-axis
   (4) +ve y-axis

5. A glass rod rubbed with silk is used to charge a gold leaf electroscope having vacuum inside the jar and the leaves are observed to diverge. The electroscope thus charged is exposed to X-rays for a short period. Then the leaves will
   (1) not be affected
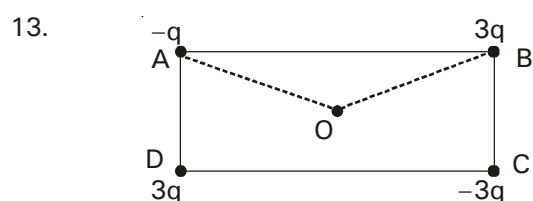   (2) diverge further
   (3) collapse
   (4) melt

6.
   A large charged body 'S' has positive charge on it. Two uncharged small metal plates A and B are placed near the body as shown. Which of the following is ture?
   (1) S attracts A
   (2) S attracts B
   (3) A attracts B
   (4) All of these

7. When a body is connected to earth, electrons from the earth flow into the body. This means the body was most likely
   (1) uncharged
   (2) positively charged
   (3) negatively charged
   (4) an insulator

8. A pendulum bob of mass 'm' has a charge '$-q_0$'. The pendulum is suspended in a place with a uniform electric field of magnitude 'E_0' directed vertically upwards. The tension in the string of the pendulum is
   (1) mg
   (2) $mg + q_0 E_0$
   (3) $mg - q_0 E_0$
   (4) zero

9. When the distance between the charged particles is halved, force between them becomes
   (1) One-fourth   (2) Half
   (3) Double   (4) Four times

10. A pendulum has a length 1m and a bob with mass 100gram and charge $100\,\mu C$. It is suspended in a uniform horizontal electric field of magnitude $2\sqrt{2} \times 10^4$ N/C. Its time period of small oscillations about equilibrium position is

   (1) $\dfrac{2\pi}{\sqrt{30}}$ s   (2) $\dfrac{2\pi}{\sqrt{15}}$ s

   (3) $\dfrac{2\pi}{3}$ s   (4) $\dfrac{2\pi}{\sqrt{10}}$ s

11. The ratio of acceleration of electron to that of proton due to the electrical force of their mutual attraction when they are $1\,\text{Å}$ apart is
   ($m_P = 1.67 \times 10^{-27}$ kg, $m_E = 9.11 \times 10^{-31}$ kg).
   (1) 180   (2) 1834
   (3) 912   (4) 1

12. An electron is placed in an electric field of intensity E near the surface of earth. If net force experienced by the electron is zero, then E is
   (1) 5.57×10^{-11} N/C   (2) 4.47×10^{-11} N/C
   (3) 10^{-11} N/C   (4) 10 N/C

13.

```
-q                    3q
A •------------------• B
     \           /
        •
        O
D •------------------• C
3q                   -3q
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   In the above arrangement of four charges placed at four corners of a rectangle, the charge '–q' is shifted from point A to point B without moving any other charge. Magnitude of change in electric field at point O is (take $q = 100\ \mu C$, AO = 10m and $\angle AOB = 120^0$)

   (1) $6\sqrt{6} \times 10^3$ N/C   (2) $2\sqrt{6} \times 10^3$ N/C

   (3) $9\sqrt{3} \times 10^3$ N/C   (4) None of these

14. What is the ratio of magnitude of q_1 to that of q_2?
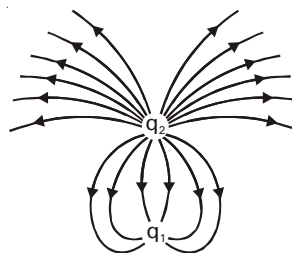
   (1) 1 : 3   (2) 3 : 1
   (3) 1 : 1   (4) 1 : 2

15. The force on a point charge situated on the axis of a short dipole is F. If the charge is shifted along the axis at double the distance, the electric force acting will be

   (1) 4F   (2) $\dfrac{F}{2}$

   (3) $\dfrac{F}{4}$ (4) $\dfrac{F}{8}$

16. Which of the following is not true for electric lines of force
   (1) They start from and terminate on a charge
   (2) Their seperation is directly proportional to field strength
   (3) They cannot cross each other
   (4) They may be straight or curved

17. Which of the following statements is true?
   (1) Electric field of a dipole varies inversely with square of distance from the charge.
   (2) Torque acting on a dipole of moment $\vec{P}$ in an electric field $\vec{E}$ is $\vec{E} \times \vec{P}$.
   (3) If an electric dipole is kept in non-uniform electric field, it may experience both force and torque.
   (4) Path traced by a positive test charge when released in an electric field is a field line.

18. A electric dipole with dipole moment 5×10^{-5} Cm is aligned at $53°$ with the direction of a uniform electric field of magnitude 10^4 NC^{-1}. Calculate the magnitude of torque acting on the dipole.
   (1) 0.2 Nm   (2) 0.4 Nm
   (3) 0.5 Nm   (4) 1 Nm

19.
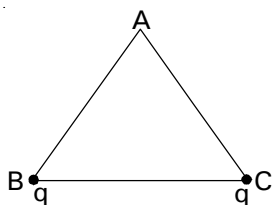
Two charges each of magnitude 'q' are placed at two corners of an equilateral triangle and let the electric field at A be E. Then the new electric field at A, if one of the two charges is removed, will be

(1) E

(2) $\sqrt{3}$ E

(3) $\dfrac{E}{\sqrt{3}}$

(4) $\dfrac{E}{3}$

20. Potential energy of an electric dipole in uniform electric field is zero, when angle between dipole moment and electric field is
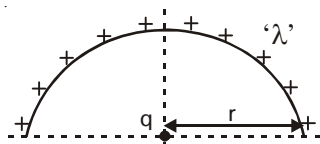(1) 180°
(2) 90°
(3) 0°
(4) 45°

21. In the region around an electric dipole electric field is
(1) uniform
(2) zero
(3) non-uniform
(4) radial

22. The work required to rotate a molecule with a dipole moment 'p' in uniform electric field E by 90° can not be
(1) zero
(2) $-$ pE
(3) pE
(4) 2pE

23. What is force exerted by charge q on semi-circular ring? ['l' is the linear charge density]

(1) $\dfrac{\lambda\,q}{2\,\pi\,\varepsilon_0\,r}$

(2) $\dfrac{\lambda\,q}{2\,\pi\,\varepsilon_0\,r^2}$

(3) $\dfrac{\lambda\,q}{4\,\pi\,\varepsilon_0\,r}$

(4) $\dfrac{\lambda\,q}{4\,\pi\,\varepsilon_0\,r^2}$

24. A body is charged by rubbing with another body. What is charge acquired by it, if its mass decreases by 240 nanogram?
(1) 4.2 C
(2) $-$4.2 C
(3) $-$42 C
(4) 42 C

25. Two equal and opposite charges of magnitude $5\,\mu$C are placed 10 cm apart to make a dipole. Its dipole moment is
(1) 2.5×10^{-7} Nm
(2) 5×10^{-7} Nm
(3) 5×10^{-5} Nm
(4) zero

26. Two identical simple pendulums are suspended from same point. The bobs (of equal mass and specific gravity ρ) are given equal amounts of charge and the strings in equilibrium make an angle 60^0 with each other. Now the whole apparatus is submerged in a liquid with finite dielectric constant K and specific gravity σ. It is found that the strings now make an angle 180^0 with each other. Then
(1) $\rho = \sigma$
(2) $K = 3$
(3) Either (1) or (2)
(4) Neither (1) nor (2)

27. Three positive charges of equal value 'q' are placed at the vertices of an equilateral triangle. Resulting lines of force should be sketched as

(1)
(2)

(3)
(4)
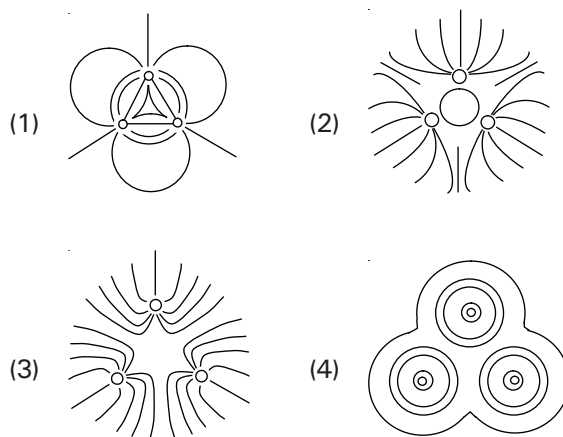
28. A simple pendulum of mass 'm' and charge 'q' is hanging from roof of a car moving on a circular track of radius 'r' with constant speed 'v' and string makes angle θ with vertical. Magnitude of horizontal electric field required so that string makes same angle θ on other side of vertical is

(1) $\dfrac{mv^2}{qr}$ (2) $\dfrac{2mv^2}{qr}$

(3) $\dfrac{4mv^2}{qr}$ (4) $\dfrac{3mv^2}{qr}$

29. As we move away from the centre of a uniformly charged ring on its axis, the strength of electric field
(1) increases
(2) decreases
(3) first decreases then increases
(4) first increases then decreases

30. An electric dipole of moment 10C-m is lying in a uniform electric field of strength 100 N/C in stable equilibrium position. It is rotated by an angle θ with respect to field and work done is W_1. It is further rotated so that it becomes perpendicular to field and additional work done is W_2. If $W_1 = W_2$, then $W_2 =$
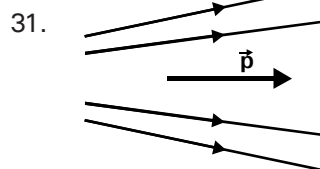(1) 866 J   (2) 600 J
(3) 500 J   (4) 1000J

31.

Figure shows electric field lines in which an electric dipole $\vec{p}$ is placed as shown. The dipole will
(1) not experience any force
(2) experience a force towards right
(3) experience a force towards left
(4) experience a force upwards

32. Direction of net electric field at a point O is roughly along the direction (point O is at equal distances from either dipole)
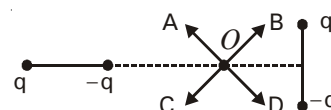
(1) OA   (2) OB
(3) OC   (4) OD

33. **Assertion**: Two similarly charged objects always repel each other.
   Reason: Force between them is directly proportional to product of magnitude of charge on each.
(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Assertion is false

34. A 10 gram ball having charge $-1\,\mu C$ when released 1 m above the ground is seen to accelerate horizontally towards east at $1\,m/s^2$. Taking $\hat{i}$ along east and $\hat{j}$ vertically upward, uniform electric field in the region is

(1) $(10^4\,\hat{i} + 10^5\,\hat{j})$N/C (2) $(-10^4\,\hat{i} - 10^5\,\hat{j})$N/C

(3) $-10^4\,\hat{i}$ N/C   (4) $(10^4\,\hat{i} - 10^5\,\hat{j})$N/C

35. Figure shows some of the electric field lines corresponding to an electric field, which suggests
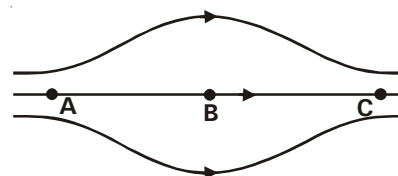
(1) $E_A > E_B > E_C$ (2) $E_A = E_B = E_C$
(3) $E_A = E_C > E_B$ (4) $E_A = E_C < E_B$

PHYSICS : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

36. Four particles, each having a charge q, are placed on the vertices of a regular pentagon. The distance of each corner from the centre is 'r'. The electric field at the centre of the pentagon is

    (1) $\dfrac{1}{4\pi\varepsilon_0}\dfrac{q}{r^2}$ (2) $\dfrac{1}{4\pi\varepsilon_0}\dfrac{q}{r}$

    (3) Zero   (4) $\dfrac{1}{4\pi\varepsilon_0}\dfrac{3q}{r^2}$

37. Four charges are arranged at the corners of a square ABCD, as shown in the adjoining figure. The force on a charge $+Q$ kept at centre O is
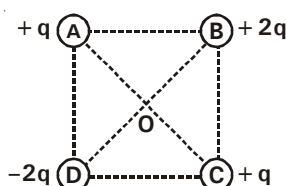
    (1) Zero
    (2) Along the diagonal AC
    (3) Along the diagonal BD
    (4) Perpendicular to side AB

38. Electric charges q, 2q, $-3q$ are placed at the corners of an equilateral triangle ABC of side L. The magnitude of electric dipole moment of the system is

    (1) $\sqrt{6}\,qL$ (2) $\sqrt{7}\,qL$

    (3) $\sqrt{3}\,qL$ (4) $2\sqrt{2}\,qL$

39. Four charges equal to $-Q$ are placed at the four corners of a square and a charge q is at its centre. If system is in equilibrium value of q is

    (1) $-0.25Q\,(1+2\sqrt{2})$ (2) $0.25Q\,(1+2\sqrt{2})$

    (3) $-0.5Q\,(1+2\sqrt{2})$ (4) $0.5Q\,(1+2\sqrt{2})$

40. Two point charge $-q$ and $+q/4$ are situated at the origin and at the point (12, 0, 0) respectively. The point on the x-axis where the electric field vanishes is $x =$

    (1) 8   (2) 18
    (3) 16   (4) 24

41. A point charge $q = 50\,\mu C$ is located in the x-y plane at a point (2, 3). What is the electric field at the point (8, -5) if all distances are in meters?

    (1) 1200 V/m   (2) 4×10^{-2} V/m
    (3) 900 V/m   (4) 4500 V/m

42. Electric field of intensity 500 N/C is acting along positive z-direction. A point charge $-4\,\mu C$ is taken from a point (1m, 3m, 4m) to a point (-1m, 2m, 1m). Work done by electric field is

    (1) 6 mJ   (2) 3 mJ
    (3) -6 mJ   (4) -3 mJ

43. ABC is a right angled triangle in which AB = 10 cm and BC = 20 cm and ĐABC = $\pi/2$. Three charges $+100$, $+200$ and -100 e.s.u. are placed respectively on A, B and C. The force acting on the charge at B is

    (1) 206 dynes   (2) 138 dynes
    (3) 268 dynes   (4) 183 dynes

44. Two particles, each having a mass of 1 kg and charge $5\times10^{-6}C$, stay in limiting equilibrium on a horizontal table with a separation of 20 cm between them. If the coefficient of friction between each particle and the table is same, then coefficient of friction is

    (1) 0.38   (2) 0.62
    (3) 0.56   (4) 0.43

45. Two charges q_1 and q_2 are placed in vacuum at a distance d and the force acting between them is F. If a medium of dielectric constant 4 is introduced around them, the net force now will be

    (1) 4F   (2) F

    (3) $\dfrac{F}{2}$ (4) $\dfrac{F}{4}$

46. Two negative charges, each $-q$, are fixed at points $(0, a)$ and $(0, -a)$ on the Y-axis. A negative charge $(-Q)$ is released from rest somewhere on X-axis. Then this charge will definitely
 (1) execute SHM about the origin
 (2) move to the origin and remain at rest
 (3) move to infinity
 (4) execute oscillatory motion about the origin

47. Two point charges $+3\,\mu C$ and $+8\,\mu C$ repel each other with a force of 40 N. If a charge of $-5\,\mu C$ is added to each of them, then the force between them will become
 (1) -10 N (2) $+10$ N
 (3) $+20$ N (4) -20 N

48. Electric field is zero in the zone of

 I   q   II $-3\,q$ III

 (1) I (2) II
 (3) III (4) none of these

49. A given point on the extension of an ideal electric dipole has electric field E. If the dipole is suddenly turned by $90°$, electric field at the same point will be
 (1) E (2) 0.5 E
 (3) 2E (4) Zero

50. Two point charges Q and $-3Q$ are placed at some distance apart. If the electric field at the location of Q is E then at the locality of $-3Q$, it is
 (1) $-E$ (2) $E/3$
 (3) $-3E$ (4) $-E/3$

CHEMISTRY : SECTION-A

All questions are compulsory in section A

51. Vapour pressure of a given liquid will decrease if
 (1) surface area of liquid is decreased
 (2) the volume of the vapours is increased
 (3) the volume of liquid in the container is decreased
 (4) the temperature is decreased

52. Which of the following statement is correct for the two solutions at $27°C$ given below ?
 Solution A = 6g urea in 100 ml solution
 Solution B = 6g CH_3COOH 100 ml solution
 (1) A and B are isotonic solutions
 (2) A and B are isotonic but not equimolar solutions
 (3) A and B are equimolar but not isotonic solutions
 (4) A has more osmotic pressure than B

53. Which of these will form minimum boiling a zeotrope?
 (1) $HCl + H_2O$ (2) $CHCl_3 + $ acetone
 (3) $HNO_3 + H_2O$ (4) $C_2H_5OH + H_2O$

54. Sea water is found to contain NaCl and $MgCl_2$. If NaCl is 80 % ionised and $MgCl_2$ is 50% ionised, then
 (1) $i_{NaCl} > i_{MgCl_2}$ (2) $n_{NaCl} > n_{MgCl_2}$
 (3) $i_{NaCl} < i_{MgCl_2}$ (4) $i_{NaCl} = i_{MgCl_2}$

55. Identify the mismatch
 (1) Rast method – Camphor
 (2) Antifreeze – Ethylene glycol
 (3) 0.91 % (w/v) NaCl – Isotonic with blood
 (4) 68% HNO_3 (by mass) – Minimum boiling azeotropes

56. The molarity of a solution containing 10 g of NaOH in 500 mL solution is
 (1) 0.5 M (2) 0.2 m
 (3) 0.4 M (4) 0.125 M

57. For aqueous NaCl solution, its freezing point depression was numerically equal to twice the molal depression constant. The relative lowering of vapour pressure of the solution is
 (1) 0.117 (2) 0.034
 (3) 0.0585 (4) 0.068

58. Boiling point elevation constant is
    (1) also known as ebullioscopic or molal elevation constant
    (2) expressed as k kg mol^{-1}
    (3) a constant quantity for a particular solvent
    (4) all of these

59. Which of the following colligative properties can provide molar mass of proteins (or polymers or colloids) with greater precision?
    (1) Relative lowering of vapour pressure
    (2) Elevation of boiling point
    (3) Depression in freezing point
    (4) Osmotic pressure

60. At a given temperature, total vapour pressure, in torr, of a mixture of volatile components A and B is given by
    $$P_{Total} = 130 - 70X_B$$
    Hence, vapour pressure of pure A and B respectively (in torr) are
    (1) 130, 70   (2) 130, 100
    (3) 130, 60   (4) 70, 60

61. On adding ammonia to $CuSO_4$ solution the following following reaction occurs
    $$CuSO_4 + 4NH_3 \rightarrow [Cu(NH_3)_4]SO_4$$
    Which one is correct? (Assuming complete ionization of both reactant and product)
    (1) B.pt of solution is raised
    (2) F. pt of solution is raised
    (3) V.P of solution is raised
    (4) No change in colligative properties

62. To avoid bends, as well as, the toxic effects of high concentrations of nitrogen in the blood, the cylinders used by scuba divers are filled with air diluted with
    (1) helium   (2) nitrogen
    (3) oxygen   (4) carbon dioxide

63. The vapour pressure at a given temperature of an ideal solution containing 0.2 mol of a non-volatile solute and 0.8 mol of solvent is 60 mm of Hg. The vapour pressure of the pure solvent at the same temperature will be
    (1) 120 mm of Hg   (2) 150 mm of Hg
    (3) 60 mm of Hg   (4) 75 mm of Hg

64. A compound MX_2 has observed and normal molar masses 65.6 and 164 respectively. The apparent degree of dissociation of MX_2 is
    (1) 75%   (2) 85%
    (3) 65%   (4) 25%

65. The mole fraction of solute in one molal aqueous solution is
    (1) 0.009   (2) 0.018
    (3) 0.027   (4) 0.036

66. The material used for making SPM for carrying out reverse OSMOSIS is
    (1) cellulose acetate   (2) calcium phosphate
    (3) copper ferrocyanide (4) iron silicate

67. A solution is defined as a
    (1) homogeneous mixture of two or more substances
    (2) heterogeneous mixture of two or more substances
    (3) homogeneous mixture of liquid & solid components only
    (4) homogeneous mixture consisting water as one of the components

68. If two aqueous solutions of a non-volatile, non-electrolyte solute having concentrations C_1 and C_2 are separated by a semipermeable membrane and $C_1 > C_2$, then which of the following is the correct statement ?
    a   Net flow of solvent is from solution of C_1 concentration to C_2 concentration
    b. Net flow of solvent is from solution C_2 concentration solution to C_1 concentration solution
    c. Osmotic pressure is $(C_1 - C_2)RT$
    d. The osmotic pressure is $C_1 RT$
    (1) a, b & d   (2) both a & c
    (3) b & c   (4) both b & d

69. Osmotic pressure is 0.0821 atm at temperature of 300K. Find concentration in mole/litre
    (1) 0.033   (2) 0.066
    (3) 0.33×10^{-2} (4) 3

70. The molality of a 15% (w/w) solution of H_2SO_4 is approximately
    (1) 1.2   (2) 1.04
    (3) 1.81   (4) 2.68

71. The ebullioscopic constant for water is $0.513°C$ kg mol^{-1}. The aqueous solution of sugar containing 0.1 mole of it in 200 g of water will boil under a pressure of one atm at
(1) $100.513°C$ (2) $100.0513°C$
(3) $100.256°C$ (4) $101.025°C$

72. 2 mol each of liquids A and B are dissolved to form an ideal solution. The mole fraction of B in the vapour phase is ($P_A^0 = 120$ torr, $P_B^0 = 80$ torr)

(1) $\dfrac{1}{4}$ (2) $\dfrac{1}{2}$

(3) $\dfrac{3}{5}$ (4) $\dfrac{2}{5}$

73. Match the options in column I with choices given in column II.

Column-I	Column-II
A. $2M CuSO_4$ aqueous solution	p. elevation in boiling point
B. Hexane & heptane	q. Isotonic with 3M sucrose solution
C. $1M K_2SO_4$ aqueous solution	r. cryoscopic constant
D. Nature of solvent	s. ideal solution

(1) A—q; B—r; C—p; D—s
(2) A—p; B—p,q; C—p,r; D—s
(3) A—p; B—s; C—p,q; D—r
(4) A—q; B—p,s; C—q; D—r

74. K_H values for gases A, B, C & D are 0.7, 1.5, 20 and 30 bar respectively. Which of the following is the correct graph?
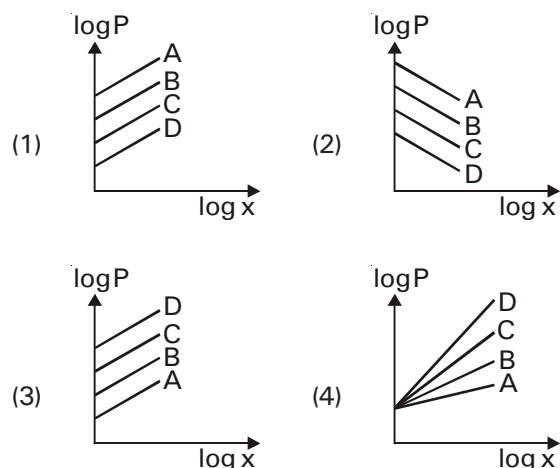
75. **Assertion**: The freezing point of water is depressed by the addition of glucose.
Reason: Entropy of solution is less than entropy of pure solvent.
(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Assertion is false

76. Molarity of H_2SO_4 is 0.8 and its density is 1.06 g/cm^3. Molality of the solution is
(1) 0.815   (2) 1.6
(3) 0.04   (4) 2.8

77. The vapour pressure of pure liquid C and D are 500 mm of Hg and 250mm Hg respectively. If x_C and x_D are mole fraction in liquid phase and y_C and y_D in vapour phase, the correct relation is

(1) $x_C + x_D > y_C + y_D$ (2) $\dfrac{x_C}{x_D} > \dfrac{y_C}{y_D}$

(3) $\dfrac{x_C}{x_D} < \dfrac{y_C}{y_D}$ (4) $\dfrac{x_C}{x_D} = \dfrac{y_C}{y_D}$

78. Expression $P = P_1 = x_1 P^0_1$ (P is total vapour pressure) holds good for binary solution containing
(1) $CHCl_3$ & CH_2Cl_2 (2) NaCl & H_2O
(3) MeOH & H_2O (4) EtOH & CH_3COCH_3

79. The depression in freezing point of 0.01 m aqueous solution of urea, NaCl, and Na_2SO_4 is in ratio
(1) 1:1:1   (2) 1:2:4
(3) 1:2:3   (4) 2:2:3

80. The incorrect statement w.r.t. a solution of benzene (A) and toluene (B) is
(1) the intermolecular attractions A.... A, B.... B and A... B are equal
(2) $\Delta H_{mix} = 0$, $\Delta V_{mix} = 0$
(3) $\Delta G_{mix} = 0$
(4) $\Delta S_{mix} > 0$

81. Boiling point of the solution containing a nonelectrolyte is plotted in the graph as shown

Boiling point (°C) vs molality
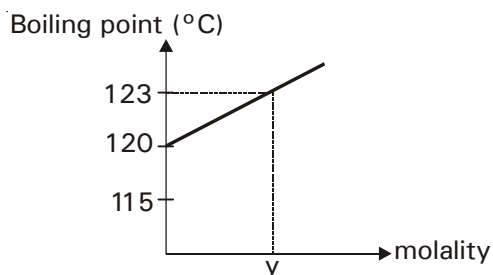
If the slope of the graph is 0.3, then molality of the solution at point y is
   (1) 10 m   (2) 1 m
   (3) 0. 1 m   (4) 0.2 m

82. Which of the following aq. solution has the highest value of K_f?
   (1) 0.01 m NaCl
   (2) 0.10 m urea
   (3) 0.10 m $MgCl_2$
   (4) All have the same value

83. Solute A is ternary electrolyte and solute B is non electrolyte. If 0.1 M solution of solute B produces an osmotic pressure of 2P, then 0.05 M solution of A at the same temperature will produce an osmotic pressure equal to
   (1) P   (2) 1.5 P
   (3) 2P   (4) 3P

84. Camphor in nitrogen gas is an example of
   (1) gas in gas solution
   (2) solid in gas solution
   (3) liquid in gas solution
   (4) this solution is not possible

85. Total vapour pressure of mixture of 1 mole of volatile component A $(P_A^\circ = 100\,mmHg)$ and 3 moles of volatile component B $(P_B^\circ = 60\,mmHg)$ is 75 mm. Identify the incorrect statement
   (1) There is positive deviation from Raoult's law
   (2) Boiling point of each component is lowered
   (3) Force of attraction between A and B is weaker than between A — A or between B — B
   (4) The components can be completely seperated by fractional distillation.

CHEMISTRY : SECTION-B

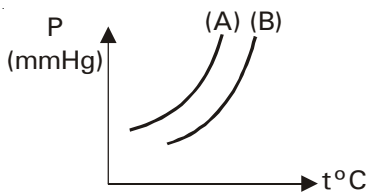**This section has 15 questions, attempt any 10 questions of them.**

86. Concentration of pollutant in ppm (w/w), that has been measured at 450 mg per 150 kg of sample is
   (1) 3 ppm   (2) 6 ppm
   (3) 3000 ppm   (4) 330 ppm

87. Colligative properties have many practical uses, some of them may be :
   I : Melting of snow by salt
   II : Desalination of sea water
   III : Determination of molar mass
   IV : Determination of melting point and boiling point of solvent
   Actual practical uses are
   (1) I, II   (2) III, IV
   (3) I, II, III   (4) II, III, IV

88. The molal freezing point constant for water is 1.86°C/m. Therefore, freezing point of 0.1 m NaCl solution in water is expected to be
   (1) −1.86°C   (2) −0.372°C
   (3) −0.186°C   (4) 0.372°C

89.
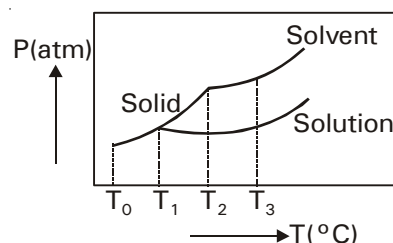
What is the normal freezing point of the solution represented by the above phase diagram?
   (1) T_1 (2) T_2
   (3) T_3 (4) T_0

90. The vapour pressure of an aqueous solution of sucrose at 373 K is found to be 722 mm Hg. The mole fraction of solute at the same temperature will be
   (1) 0.05   (2) 2.9
   (3) 0.74   (4) none of these

91. Which solution will show the maximum vapour pressure at 300 K?
    (1) 1 M $C_{12}H_{22}O_{11}$
    (2) 1 M $AlCl_3$ (50% dissociated)
    (3) 1 M NaCl (90% dissociated)
    (4) 1 M $CaCl_2$ (70% dissociated)

92. A 5 molar solution of H_2SO_4 is diluted from 1 litre to a volume of 10 litre, the normality of the solution will be
    (1) 1 N
    (2) 0.1 N
    (3) 5 N
    (4) 0.5 N

93. 2 moles of Na_2CO_3 were added to one litre of 4 M aqueous solution of $CaCl_2$. Then which of the following is correct?
    (1) boiling point of solution increases
    (2) boiling point of solution decreases
    (3) boiling point of solution remains same
    (4) boiling point of solution firstly increases and then decreases

94. Which of the following is characteristic of H_2O & CH_3CH_2OH mixture?
    (1) $\Delta H_{Sol} > O$ $\quad$ $\Delta S_{Sol} = O$
    (2) $\Delta H_{Sol} > O$ $\quad$ $\Delta S_{Sol} > O$
    (3) $\Delta H_{Sol} < O$ $\quad$ $\Delta V_{Sol} > O$
    (4) $\Delta H_{Sol} > O$ $\quad$ $\Delta V_{Sol} < O$

95. Red blood cells are placed into pure water. Which of the following statements is true?
    (1) water molecules flow out of the red blood cells, causing them to collapse
    (2) water flows into the red blood cells, causing them to swell and burst
    (3) the osmotic pressure of the cell contents increases, causing the cells to burst
    (4) the osmotic pressure inside the cells equals the osmotic pressure outside

96. A 5% solution of cane sugar (MW = 342) is isotonic with 1% solution of non electrolyte substance X. The molecular weight of X is
    (1) 171.2
    (2) 68.4
    (3) 34.2
    (4) 136.2

97. Henry law constants for four gases are given below at 293 K. Which one is most soluble in water at this temperature?
    (1) $A(K_H = 34.86 \, k \, bar)$
    (2) $B(K_H = 69.16 \, k \, bar)$
    (3) $C(K_H = 144.97 \, k \, bar)$
    (4) $D(K_H = 88.84 \, k \, bar)$

98. Analyse the following graph,

Which curve is for the solvent and what happens to the vapour pressure when the non-volatile solute is dissolved in the solvent?
    (1) curve(A) is the solvent and vapour pressure decreases
    (2) curve(A) is the solvent and vapour pressure increases
    (3) curve(B) is the solvent and vapour pressure decreases
    (4) curve(B) is the solvent and vapour pressure increases

99. $\dfrac{M}{10}$ solution of potassium ferrocyanide ($K_4[Fe(CN)_6]$) is 40% dissociated at 18°C. What will be its osmotic pressure ?
    (1) 5.23 atm
    (2) 6.24 atm
    (3) 3.38 atm
    (4) 8.75 atm

100. It is more convenient to obtain the molecular weight of an unknown solute by measuring the freezing point depression than by measuring the boiling point elevation because
    (1) Freezing point depression is a colligative property where as boiling point elevation is not
    (2) freezing point depression is larger than boiling point elevation for the same solution
    (3) freezing point depression is smaller than boiling point elevation for the same solution
    (4) freezing point depression depends more on the amount of the solvent than boiling point elevation

ZOOLOGY : SECTION-A

All questions are compulsory in section A

101. How many of the following statements are correct ?
    a. Female sex accessory ducts are oviducts, uterus & vagina
    b. Glandular layer that lines the uterine cavity is endometrium
    c. Uterine fundus is upper dome like part of uterus
    d. Steroidal ovarian hormones work through membrane bound receptors
    e. Female primary sex organs are sites of gametogenesis and also assist in transport of gametes
    (1) Two (2) Three
    (3) Five (4) Four

102. Match the column & choose the correct option
    a. Infundibulum   (i) Inverted pear shaped
    b. Ampulla of oviduct   (ii) Finger like processes
    c. Fimbriae   (iii) Site of fertilization
    d. Uterus   (iv) Funnel shaped
    (1) a–ii; b–iii; c–iv; d–i
    (2) a–iii; b–ii; c–i; d–iv
    (3) a–iv; b–iii; c–ii; d–i
    (4) a–iii; b–iv; c–ii; d–i

103. How many of the following are components of seminal plasma ?
    a. Calcium   b. Sperms
    c. Pentose sugar   d. Enzymes
    e. Mucus
    (1) Four (2) Three
    (3) Two (4) Five

104. **Statement A :** The process of deposition of semen in the female reproductive tract is called insemination
    Statement B : Special tissue of penis helps in erection of penis to facilitate insemination
    (1) Both statements A & B are correct
    (2) Both statements A & B are incorrect
    (3) Only statement A is correct
    (4) Only statement B is correct

105. Blockage of ejaculatory duct is not likely to affect transport of
    (1) fructose from seminal vesicles
    (2) testosterone from testis
    (3) sperms from seminiferous tubules
    (4) none of these

106. Identify the correct match
    (1) Epididymis – posterior surface of testis
    (2) Vas deferens – exclusively abdominal
    (3) Sertoli cells – intertubular space
    (4) Leydig cells – within seminiferous tubules

107. What is common to ovaries & testes ?
    a. Produce steroid hormones
    b. Have cells that undergo meiosis
    c. Are extra-abdominal
    d. Tunica albuginea covers each
    (1) a, b, c & d (2) b, c & d
    (3) a, c & d (4) a, b, d

108. On disecting a human body, which of the following observation will be true for a female body ?
    a. Ovary is ventral to rectum
    b. Ovary is ventral to urinary bladder
    c. Infundibulum is close to ovary
    d. Seminal vesicle is dorsal to urinary bladder
    (1) b, c & d (2) a, b & d
    (3) a & c (4) a, c & d

109. Which part of the female reproductive tract forms part of birth canal ?
    (1) Isthmus (2) Infundibulum
    (3) Cervix (4) Ampulla

110. Which of the following undergoes cyclic changes in uterine wall during menstrual cycle ?
    (1) Mesometrium (2) Myometrium
    (3) Endometrium (4) Perimetrium

111. If A is testes, B is scrotum and C is epididymis then identify the correct statement
    (1) A contains B and C
    (2) B contains A and C
    (3) C contains A and B
    (4) B contains A but not C

112. For the following diagram, what is correct ?
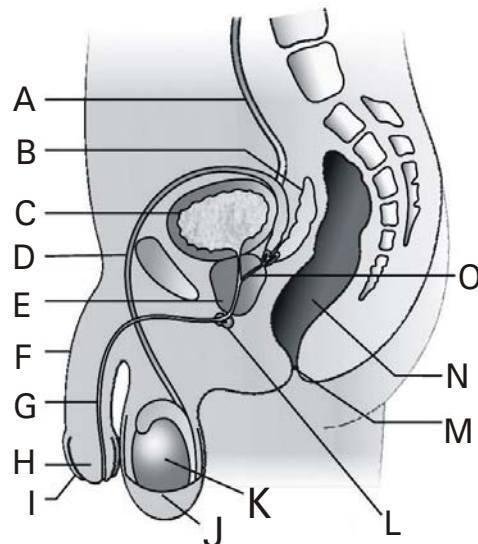
    (1) B & L are paired accesory glands
    (2) Sperms are transported by A
    (3) D carries fructose and calcium
    (4) I is enlarged part of penis

113. Which of the following is found inside Graafian follicle?
    (1) Cortex
    (2) Medulla
    (3) Corpus luteum
    (4) Membrane granulosa

114. Cowper's glands secretes a substance to
    a. nourish sperms
    b. neutralize acidity
    c. kill pathogens
    d. lubricate female vagina to facilitate copulation
    (1) a & b are correct   (2) b & d are correct
    (3) a & c are correct   (4) a, b & c are correct

115. Fallopian tubes are lined by
    (1) ciliated epithelium
    (2) transitional epithelium
    (3) squamous epithelium
    (4) keratinised epithelium

116. Both corpus luteum and macula lutea are
    (1) a source of hormones
    (2) found in human males
    (3) characterized by a yellow colour
    (4) contributory in maintaining pregnancy

117. Ejaculatory duct is formed by the union of
    (1) vas deferens and prostatic urethra
    (2) vas deferens and duct from seminal vesicle
    (3) penile urethra and membranous urethra
    (4) vas deferens and membranous urethra

118. Major part of semen is the secretion of
    (1) Prostate gland   (2) Bulbourethral gland
    (3) Seminal vesicles   (4) Bartholin's gland

119. Identify the correct chronological sequence of appearance of the following structures in mammalian ovary
    (1) Graafian follicle - corpus luteum - corpus albicans
    (2) Graafian follicle - corpus albicans - corpus luteum
    (3) Corpus luteum - corpus albicans - graafian follicle
    (4) Corpus albicans - corpus luteum - graafian follicle

120. If uterus is for pregnancy then oviduct is for
    'X'
    Identify 'X' and mark the site of oviduct where it occurs
    (1) Infundibulum   (2) Isthmus
    (3) Ampulla   (4) Fimbriae

121. Out of the given structures present in scrotum which are found inner to tunica albuginea in human testis
    a. immunologically competent cells
    b. male germ cells
    c. tunica vaginalis
    d. rete testis
    e. epididymis
    (1) a, b & c   (2) a, b, c & d
    (3) a, b & d   (4) b, c, d & e

122. Hysterectomy is surgical removal of
    (1) uterus   (2) prostate gland
    (3) vas deferens   (4) mammary glands

123. Spot the odd one out from the following structures with reference to the male reproductive system
    (1) Rete testis   (2) Epididymis
    (3) Vasa efferentia   (4) Isthmus

124. Testicular hormones called androgens are synthesised by
    (1) spermatogonia   (2) leydig cells
    (3) sertoli cells   (4) male germ cells

125. The male sex accessory duct that ascends to the abdomen & loops over the urinary bladder is
    (1) vas efferens   (2) epididymis
    (3) vas deferens   (4) urethra

126. The number of sperms in the ejaculate **per mL** is about
    (1) 300-400 million   (2) 200-300 million
    (3) 300-600 million   (4) 70-100 million

127. Which of the following is INCORRECT?
    (1) Most mammals are viviparous.
    (2) The process of reproduction is necessary for the maintenance of species.
    (3) Corpus luteum is not visible along with graafian follicle in ovary
    (4) In scrotum the temperature is $2-2.5°F$ lower than body temperature to support androgen production

128. When both ovaries are removed from a female, which hormone decreases in blood?
    (1) Oxytocin   (2) Prolactin
    (3) Estrogen   (4) GnRH

129. Which of the following peptide/proteins are produced by the testes ?
    a. Testosterone
    b. Inhibin
    c. Estrogen
    d. Androgen binding protein
    e. Androgens
    (1) a, b and d   (2) a, b, d and e
    (3) b and d   (4) a, c and e

130. Intratesticular genital duct system includes
    (1) seminiferous tubules, vasa efferentia
    (2) vasa efferentia, epididymis
    (3) epididymis, vas deferens
    (4) rete testis and vasa efferentia

131. The correct sequence through which the ovum passes as it is released by ovary is
    (1) infundibulum-ampulla-isthmus
    (2) infundibulum-isthmus-ampulla
    (3) uterus-isthmus-ampulla
    (4) infundibulum-uterus-isthmus
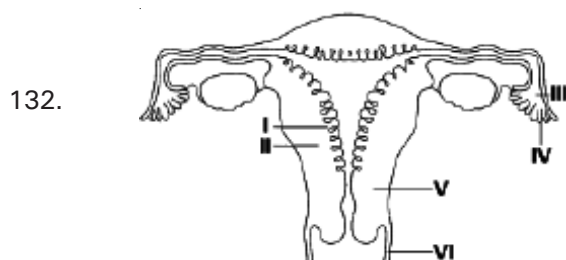
132.

Given is the sectional view of female reproductive system. From the following options identify which are correctly matched
    (1) I - Endometrium, V - Cervical canal
        III - Infundibulum, VI - Vagina
    (2) II - Myometrium, IV - Fimbriae
        III - Infundibulum, V - Cervix
    (3) II - Endometrium, III - Infundibulum
        VI - Cervical canal, I - Perimetrium
    (4) III - Infundibulum, IV - Ostia
        V - Cervix, VI - Cervical canal

133. Paired abdominal structures in the female reproductive system are
    a. ovary   b. oviduct
    c. uterus   d. mammary glands
    (1) a, b & d   (2) a & b
    (3) c & d   (4) a & d

134. **Assertion** : Sexual reproduction provides opportunities for variations in offsprings.

    Reason : It involves crossing over during gamete formation.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

135. An incorrect statement is
    (1) Ability of sperm to become motile is acquired in the epididymis
    (2) In adult males, each testis is oval in shape
    (3) Reproductive events continue in old men
    (4) Erectile tissue in penis contains one ventrally placed corpora cavernosa and two dorsally placed corpus spongiosum

ZOOLOGY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

136. Fill in the blanks
    Each testis is covered by a dense covering & is divided into _____ compartments called _____. Each compartment has highly coiled _____ in which sperms are produced. These coiled structures are lined by two types of cells called _____ & _____.
    (1) 750, seminiferous tubules, testicular lobules germ cells, Leydig cells
    (2) 750, seminiferous tubules, testicular lobules germ cells, sertoli cells
    (3) 250, testicular lobules, seminiferous tubules, germ cells, sertoli cells
    (4) 750, testicular lobules, seminiferous tubules, Leydig cells, sertoli cells

137. How many of the following are hormones released from gonads located abdominally?
    Testosterone, Estrogen, Progesterone, ABP, FSH, LH
    (1) 4   (2) 3
    (3) 5   (4) 2

138. The correct sequence for the conduction of sperms from seminiferous tubules to vas deferens is
    (1) Vasa efferentia $\rightarrow$ rete testes $\rightarrow$ epididymis
    (2) Rete testes $\rightarrow$ vasa efferentia $\rightarrow$ epididymis
    (3) Epididymis $\rightarrow$ rete testes $\rightarrow$ vasa efferentia
    (4) Rete testes $\rightarrow$ epididymis $\rightarrow$ vasa efferentia

139. Prostate gland is a
    (1) digestive gland
    (2) sperm producing gland
    (3) hormone producing gland of the ovary
    (4) accessory gland of male

140. For normal fertility, in a single ejaculate at least 60 percent sperms must have normal shape & size and at least _____ % of them must show vigrous motility
    (1) 30   (2) 20
    (3) 10   (4) 40

141. Sterility in males may be due to
    (1) impotence
    (2) failure of testis to descend
    (3) azoospermia
    (4) any of these

142. Which of the following does not pass through inguinal canal?
    (1) Spermatic cord   (2) Vas deferens
    (3) Blood vessels   (4) Ejaculatory duct

143. Which among the following is/are characters of sexual reproduction in humans ?
    (1) Fusion of male & female gametes
    (2) Meiotic divisions for gametogenesis
    (3) Offsprings are genetically identical to parents.
    (4) Both (1) and (2)

144. What is the correct difference between Vasa efferentia and Vasa deferentia?

Vasa efferentia	Vasa deferentia
(1) Arise from epididymis	– arise from testes
(2) Thick, coiled in scrotum but straight in abdomen	– Fine and convoluted
(3) Carry sperms from rete testes to epididymis	– carry sperms from cauda epididymis to ejaculatory ducts
(4) Their number is 12 to 20 per testis	– Their number is 2 per testis

145. Which of these is not a secondary sex character of human males?
    (1) Muscular body
    (2) Hairy & coarse skin
    (3) Low pitched voice
    (4) Broad pelvis

146. The length and width of each testis is about _____ and _____ respectively.
    (1) 4–5 cm & 3–4 cm
    (2) 3–4 cm & 2–3 cm
    (3) 4–5 cm & 2–3 cm
    (4) 3–4 cm & 1–2 cm

147. If a transverse section is cut through the glans penis part, it will show the presence of
    (a) Corpora cavernosa
    (b) Corpus spongiosum
    (c) Urethra
    (1) (a) & (b) only
    (2) (b) & (c) only
    (3) (a) & (c) only
    (4) (a), (b) & (c)

148. After ovulation, many follicular cells in the collapsed follicle on surface of ovary change into
    (1) granulosa cells that secrete progesterone
    (2) granulosa cells that secrete estrogen
    (3) luteal cells that secrete estrogen
    (4) luteal cells that secrete progesterone

149. The shared terminal duct of the reproductive and urinary system in the human male is
    (1) urethra
    (2) ureter
    (3) vas deferens
    (4) vasa efferentia

150. How many of the following cells are likely to be rich in lipid synthesising enzymes?
    Luteal cells, Sertoli cells, Anterior pituitary cells, Granulosa cells, Leydig cells, cells of adrenal cortex.
    (1) 2
    (2) 3
    (3) 4
    (4) 6

BOTANY : SECTION-A

All questions are compulsory in section A

151. A typical anther is
    (1) Bilobed and Bisporangiate
    (2) Tetragonal and Tetrasporangiate
    (3) Monothecous and Monosporangiate
    (4) Single lobed and bisporangiate

152. Which one of the following is not a function of tapetum ?
    (1) Production of compatibility proteins
    (2) Production of ubisch granules
    (3) Release of pollen grains
    (4) Secretion of pollenkitt in entomophillous pollens

153. Callase enzyme that dissolves callose layer separating four pollens is secreted by
    (1) Endothecium
    (2) Epidermis
    (3) Middle layers
    (4) Tapetum

154. Presence of lateral hooks, terminal filiform apparatus, chalazal vacuole are the features of
    (1) egg
    (2) central cell
    (3) synergids
    (4) antipodal

155. In *Hibiscus*, each microporangium has 1000 PMC. What would be total number of pollen grains produced in one anther?
    (1) 16000
    (2) 800
    (3) 8000
    (4) 2000

156. Egg apparatus in angiosperms is made up of
    (1) egg cells & two synergids at chalazal end
    (2) three antipodals & an egg cell at micropylar end
    (3) antipodals & two synergids at chalazal end
    (4) two synergids & an egg cell at micropylar end

157. The diagram given below shows megasporogenesis and megagametogenesis in an angiosperm named *Polygonum*
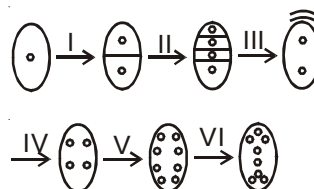

    Free nuclear division takes place at
    (1) step I
    (2) step II
    (3) steps II and III
    (4) steps III to V

158. Which of the following is not a pre-fertilisation event in flowering plant?
    (1) Transfer of pollen grains
    (2) Formation of embryo sac
    (3) Formation of endosperm
    (4) Formation of pollen tube

159. What will be the ploidy of the cells of nucellus, MMC, the functional megaspore and female gametophyte?
    (1) 2n, 2n, n, 2n
    (2) n, n, 2n, n
    (3) 2n, 2n, n, n
    (4) n, n, 2n, 2n

160. Oily endosperm is found in
    (1) Coconut
    (2) Aleurone layer
    (3) Cereal
    (4) Orchid

161. Transfer of male gametes with the help of pollen tube is called as
    (1) porogamy
    (2) mesogamy
    (3) siphonogamy
    (4) zooidogamy

162. Which one forms the pollen tube?
    (1) Prothallial cell
    (2) Vegetative cell
    (3) Generative cell
    (4) Stalk cell

163. In angiosperm, megasporangium is equivalent to
    (1) ovule   (2) embryo sac
    (3) ovary   (4) egg apparatus

164. Arrangement of nuclei in normal dicot embryosac is
    (1) 3 + 3 + 2   (2) 2 + 4 + 2
    (3) 3 + 2 + 3   (4) 2 + 3 + 3

165. Which of the following statements is/are correct?
    a. Micropyle represent the basal part of ovule
    b. Ovule has one or two protective envelopes called integuments.
    c. Ovule arises from style
    d. The body of the ovule fuses with funicle in the region called hilum
    (1) a, b, c   (2) b, c, d
    (3) b, d   (4) a, b, c, d

166. Examine the figures a, b and c given below and select the right option out of 1-4 in which all a, b & c are identified correctly

    a.

    b.   c.
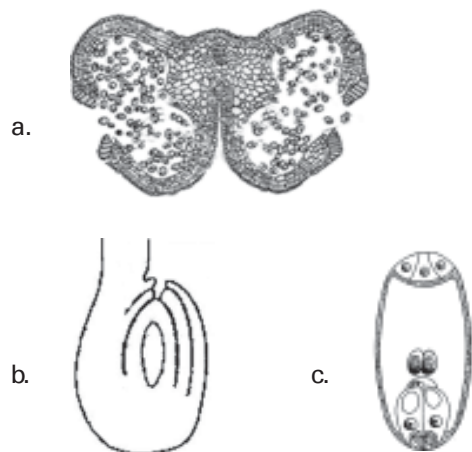
	a	b	c
(1)	Young anther	Orthotropus ovule	Mature embryo sac
(2)	Dehisced anther	Anatropus ovule	Mature embryo sac
(3)	Young anther	Anatropus ovule	Mature embryo sac
(4)	Dehisced anther	Orthotropus ovule	Developing embryo sac

167. Select the incorrect statement w.r.t. pollen grain.
    (1) 25 − 50 μm in diameter
    (2) prominent two layered wall
    (3) hard inner exine
    (4) rich in starch and unsaturated fats

168. In members of which of the following pollen grains remain viable for months?
    (1) Poaceae   (2) Rosaceae
    (3) Ranunculaceae   (4) Brassicaceae

169. Meiosis of megaspore mother cell generally produces
    (1) isobilateral tetrad   (2) linear tetrad
    (3) decussate tetrad   (4) tetrahedral tetrad

170. Which of the following pair is mismatched?
    (1) Pollen grain−male gametophyte
    (2) *Parthenium* −pollen allergy
    (3) Embryo sac −generative cell
    (4) Microsporangium−pollen sac

171. Pollen is stored in pollen banks for crop breeding programmes at a temperature of
    (1) −100°C   (2) −10 to 20°C
    (3) −196°C   (4) −15°C

172. A pistil of *Papaver* is
    (1) Multicarpellary syncarpous
    (2) Multicarpellary apocarpous
    (3) Bicarpellary syncarpous
    (4) Pentacarpellary syncarpous

173. The number of ovules inside ovary can be many in
    (1) Mango and Papaya
    (2) Paddy and wheat
    (3) Orchids and Paddy
    (4) Watermelon and orchids

174. A typical angiospermic embryo sac, at maturity is
    (1) 8—celled, 8— nucleated
    (2) 7— nucleated ,8— celled
    (3) 7— celled , 7—nucleated
    (4) 8 —nucleated, 7—celled

175. Find the incorrect statement
    (1) Asymmetric spindle is formed during generative cell formation
    (2) Generative cell undergoes meiosis during male gamete formation
    (3) Vegetative cell is large with irregular nucleus
    (4) Generative cell floats freely in the cytoplasm of vegetative cell

176. Find the correct statement regarding male gametophyte
    (1) In 60% of dicots, pollens are released at 2-cell stage
    (2) In 40% of monocots, pollens are released at 2-cell stage
    (3) In 40% of angiosperms, pollens are released at 2-cell stage
    (4) In 60% of angiosperms, pollens are released at 2-cell stage

177. Sporopollenin
    a. is one of the most resistant organic material
    b. can withstand high temperature
    c. form the exothecium of anther
    d. can be degraded by callase enzyme
    (1) b & c   (2) c & d
   (3) a & b   (4) a, b & c

178. The process of formation of microspores from microspore mother cell is called
    (1) megasporogenesis
    (2) megametogenesis
    (3) microsporogenesis
    (4) microgametogenesis

179. A hexaploid female plant is pollinated with a tetraploid plant. The ploidy level of endosperm will be
    (1) Tetraploid   (2) Hexaploid
    (3) Octaploid   (4) Septaploid

180. White kernel of coconut represent which type of endosperm ?
    (1) Nuclear endosperm (2) Cellular endosperm
    (3) Helobial endosperm (4) Both (1) and (3)

181. Double fertilisation means the fusion of
    (1) two polar nuclei
    (2) one male gamete with egg and second with synergid
    (3) egg with two polar nuclei
    (4) one male gamete with egg and other with secondary nucleus

182. **Assertion**: Fillform apparatus guides the pollen tube into the synergids.
    Reason: It is a special cellular thickening at micropylar tip and secrete chemotropic stimulus..
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

183. How many meiotic divisions are required to produce 50 rice grains?
    (1) 63   (2) 50
    (3) 100   (4) 25

184. Transmitting tissue is a characteristic feature of
    (1) Monosporangiate anther
    (2) Solid style
    (3) Filament
    (4) Amphitropous ovule

185. Select the incorrect statement w.r.t pollen–pistil interaction
    (1) It is a dynamic process
    (2) It involves all the events from dehiscence of anther till pollen deposition on stigma
    (3) It is a chemically mediated process
    (4) Acceptance or rejection of pollen by pistil is the result of continuous dialogue between them.

BOTANY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

186. The inner most layer/wall of microsporangium, which provide nourishment to developing pollen grain is
    (1) Tapetum having uninucleate cells
    (2) Endothecium having multinucleate cells
    (3) Endothecium with fibrous thickening
    (4) Tapetum with more than one nucleus per cell

187. If root cell of a plant has 46 chromosomes, how many chromosomes wil be present in synergid, antipodal, nucellus and funicle ?
    (1) 23, 23, 46, 46
    (2) 46, 23, 46, 69
    (3) 23, 23, 46, 69
    (4) 46, 23, 46, 46

188. How many meiotic divisions are required to produce 1200 functional pollen grains in *Cyperus* plant ?
    (1) 400   (2) 600
    (3) 1200   (4) 300

189. Pollen grains are well-preserved as fossils due to presence of
    (1) Pectocellulosic wall
    (2) Pollen kit over pollen
    (3) Sporopollenin
    (4) Callose over pollen surface

190. How many of the following statements are correct?
    a. Tetrahedral tetrad is most common type of microspore tetrad in monocots
    b. P. Maheshwari is the father of plant embryology in India.
    c. Aril is the collar like outgrowth of integument, found in Litchi
    d. Caruncle is found in castor
    e. Obturator guides the path of pollen tube inside ovary
    (1) Two   (2) Three
    (3) One   (4) Four

191. Monosporic development of female gametophyte means, it is
    (1) single celled
    (2) formed from a single megaspore
    (3) diploid
    (4) formed from single microspore

192. Formation of male gametophyte involves
    (1) 1 meiosis + 2 mitosis
    (2) 2 meiosis + 1 mitosis
    (3) 1 meiosis + 3 mitosis
    (4) 2 meiosis + 2 mitosis

193. Translator apparatus is composed of
    (1) 2 pollinia, 2 caudicles, 2 corpusculum
    (2) 2 pollinia, 1 caudicle, 1 corpusculum
    (3) 1 pollinia, 2 caudicle, 2 corpusculum
    (4) 2 pollinia, 2 caudicles, 1 corpusculum

194. Find the option with the correct identification of diagrams (w.r.t. type of endosperm)

(a)　　　(b)　　　(c)
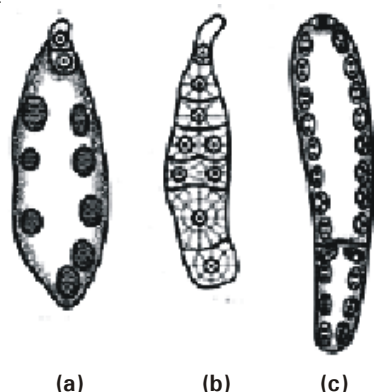
(1) a-nuclear, b-helobial
(2) a-helobial, b-cellular
(3) c-helobial, b-cellular
(4) b-cellular, c-nuclear

195. The pollen tube most commonly enters the ovule through the
(1) Funicle　　　　(2) Micropyle
(3) Integument　　(4) Chalaza

196. **Assertion**: Flower is the seat of sexual reproduction.
Reason: Gynoecium is the male reproductive part of the flower.
(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Assertion is false

197. How many female nuclei participate during double fertilisation ?
(1) 2　　　　　(2) 3
(3) 6　　　　　(4) 7

198. Select the correct statement/s
a. Hormonal and structural changes lead to the differentiation and further development of the floral primordium
b. During fertilization pollen tube enters into the persistent synergid
c. Germ pore is the prominent aperture in the pollen where sporopollenin is absent.
d. Movement of pollen tube is chemotactic along gradient of Ca-B-inositol complex
(1) a and c　　　　(2) a, c and d
(3) c and d　　　　(4) a, b, c and d

199. Ovules during megasporogenesis differentiate a single megaspore mother cell in the
(1) micropylar region
(2) chalazal region
(3) integuments
(4) middle of nucellus

200. First cell of male gametophytic generation in angiosperms is
(1) male gamate　　(2) PMC
(3) microspore　　(4) pollen grain

Dated :
26-4-2022

M.L. Syal's Helix Institute
S.C.O. 343-345, Top Floor, Sector 34-A, Chandigarh. Ph : 0172-2623155

XII cum Competition Course for Medical – Test - 1

1. (4)	51. (4)	101. (2)	151. (2)
2. (2)	52. (3)	102. (3)	152. (3)
3. (3)	53. (4)	103. (2)	153. (4)
4. (4)	54. (3)	104. (1)	154. (3)
5. (2)	55. (4)	105. (2)	155. (3)
6. (4)	56. (1)	106. (1)	156. (4)
7. (2)	57. (2)	107. (4)	157. (4)
8. (2)	58. (4)	108. (3)	158. (3)
9. (4)	59. (4)	109. (3)	159. (3)
10. (1)	60. (3)	110. (3)	160. (1)
11. (2)	61. (4)	111. (2)	161. (3)
12. (1)	62. (1)	112. (1)	162. (2)
13. (3)	63. (4)	113. (4)	163. (1)
14. (1)	64. (1)	114. (2)	164. (3)
15. (4)	65. (2)	115. (1)	165. (3)
16. (2)	66. (1)	116. (3)	166. (2)
17. (3)	67. (1)	117. (2)	167. (3)
18. (2)	68. (3)	118. (3)	168. (2)
19. (3)	69. (3)	119. (1)	169. (2)
20. (2)	70. (3)	120. (3)	170. (3)
21. (3)	71. (3)	121. (3)	171. (3)
22. (4)	72. (4)	122. (1)	172. (1)
23. (1)	73. (3)	123. (4)	173. (4)
24. (4)	74. (3)	124. (2)	174. (4)
25. (2)	75. (3)	125. (3)	175. (2)
26. (1)	76. (1)	126. (4)	176. (4)
27. (3)	77. (3)	127. (4)	**177. (3)g**
28. (2)	78. (2)	128. (3)	178. (3)
29. (4)	79. (3)	129. (3)	179. (3)
30. (3)	80. (3)	130. (4)	180. (2)
31. (3)	81. (1)	131. (1)	181. (4)
32. (3)	82. (4)	132. (2)	182. (1)
33. (4)	83. (4)	133. (2)	183. (1)
34. (2)	84. (2)	134. (1)	184. (2)
35. (3)	85. (4)	135. (4)	185. (2)
36. (1)	86. (1)	136. (3)	186. (4)
37. (3)	87. (3)	137. (4)	187. (1)
38. (2)	88. (2)	138. (2)	188. (3)
39. (2)	89. (1)	139. (4)	189. (3)
40. (4)	90. (1)	140. (4)	190. (2)
41. (4)	91. (1)	141. (4)	191. (2)
42. (1)	92. (1)	142. (4)	192. (1)
43. (1)	93. (1)	143. (4)	193. (4)
44. (3)	94. (2)	144. (3)	194. (3)
45. (4)	95. (2)	145. (4)	195. (2)
46. (3)	96. (2)	146. (3)	196. (3)
47. (1)	97. (1)	147. (2)	197. (2)
48. (1)	98. (1)	148. (4)	198. (1)
49. (2)	99. (2)	149. (1)	199. (1)
50. (2)	100. (2)	150. (3)	200. (3)

Dated :
13-05-2022

M.L. Syal's Helix Institute
S.C.O. 343-345, Top Floor, Sector 34-A, Chandigarh. Ph : 0172-2623155

XII cum Competition Course for Medical
Test - 2
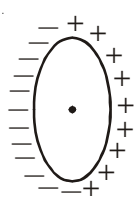
MM : 720

Time : 3 hrs.

PHYSICS	: ELECTRIC POTENTIAL, GAUSS LAW
CHEMISTRY	: SOLID STATE, CHEMISTRY IN EVERYDAY LIFE
ZOOLOGY	: HUMAN REPRODUCTION-II (UPTO IMPLANTATION)
BOTANY	: SEXUAL REPRODUCTION IN FLOWERING PLANTS, REPRODUCTION IN ORGANISMS

PHYSICS : SECTION-A

All questions are compulsory in section A

1. Four equal charges Q are placed at four corners of a square of each side 'a'. Work done in removing a charge (–Q) from its centre to infinity is

    (1) 0

    (2) $\dfrac{\sqrt{2}Q^2}{4\pi\varepsilon_0 a}$

    (3) $\dfrac{\sqrt{2}\,Q^2}{\pi\varepsilon_0 a}$

    (4) $\dfrac{Q^2}{2\pi\varepsilon_0 a}$

2. An alpha particle is accelerated through a potential difference of 10^6 volt. Change in its kinetic energy will be

    (1) 1 MeV   (2) 2 MeV

    (3) 4 MeV   (4) 8 MeV

3. A short dipole has a dipole moment equal to 16 μC m. Electric potential on the line making 60^0 with dipole moment at a distance of 2 m from the centre of this dipole is

    (1) 1.8×10^4 V   (2) 3.6×10^4 V

    (3) 7.2×10^4 V   (4) 14.4×10^4 V

4. A charge of 4C is given a displacement of 60 cm and work done in this process is 20 J. Potential difference between two points is

    (1) 0.2 V   (2) 3 V

    (3) 1 V   (4) 5 V

5. The distance between the two charges 5μC and –6μC is 11 cm. On the straight line passing through these two charges, potential will be zero at a distance of

    (1) 55 cm from 5μC   (2) 4 cm from 5μC

    (3) 66 cm from 5μC   (4) 6 cm from 5μC

6.

    A ring of radius R is having two charges –q and 2q distributed on its two half parts. The electric potential at a point on its axis at a distance $2\sqrt{2}$ R from its centre is

    (1) $\dfrac{3kq}{R}$ (2) $\dfrac{kq}{3R}$

    (3) $\dfrac{kq}{R}$ (4) $\dfrac{kq}{\sqrt{3}R}$

7. Two charge +q and –q are situated at a certain distance. At the point exactly midway between them

    (1) electric field and potential both are zero

    (2) electric field is zero but potential is not zero

    (3) electric field is not zero but potential is zero

    (4) neither electric field nor potential is zero

8. The variation of potential with distance R from a fixed point is as shown in the figure. The electric field at R = 5m is
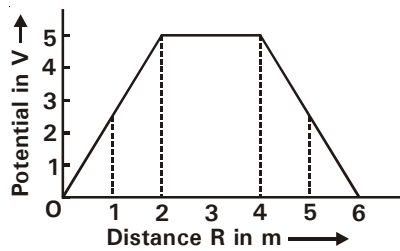
(1) 2.5 volt/m   (2) −2.5 volt/m
(3) 2/5 volt/m   (4) −2/5 volt/m

9. A Gaussian surface contains no net charge. Which of the following is true for a point inside it?
   (1) Electric field must be zero
   (2) Potential must be zero
   (3) Both electric field and potential must be zero
   (4) None of these

10. The electric potential V is given as a function of distance x (metre) by $V = (2x^2 + 12x - 10)$ volt. Value of electric field at x = 2 is
   (1) 16 V/m   (2) 32 V/m
   (3) −32 V/m   (4) −20 V/m

11. The potential at a point due to an electric dipole will be maximum and minimum when the angles between the axis of the dipole and the line joining the point to the dipole are respectively
   (1) 90° and 180°   (2) 0° and 90°
   (3) 90° and 0°   (4) 0° and 180°

12. Which of the following graphs represents variation between electric field and distance for an infinitely long uniformly charged wire?
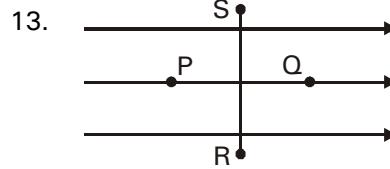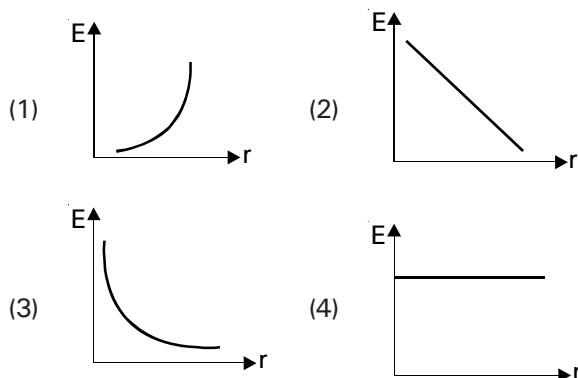
13.

Two points lying on an equipotential surface are
   (1) P and Q   (2) R & Q
   (3) S and R   (4) P & S

14. A cube of side L is placed in a uniform field E, where $E = E\,\hat{i}$. Net electric flux through cube is
   (1) Zero   (2) L^2E
   (3) $4L^2E$ (4) $6L^2E$

15. Inward and outward electric flux for a closed surface in units of N-m^2/C are respectively 5×10^3 and 2×10^3. Then total charge inside surface is [where ε_0 = permittivity constant]
   (1) -3×10^3 C   (2) $-7 \times 10^3\ \varepsilon_0$ C
   (3) $-3 \times 10^3\ \varepsilon_0$ C   (4) zero

16. A closed Gaussian surface encloses no net charge. Then
   (1) electric field must be zero everywhere on the surface
   (2) electric field must be zero everywhere inside the surface
   (3) electric flux through the surface must be zero
   (4) both (1) & (3)

17. Electric flux for Gaussian surface B in free space is about

   (given $q_1 = -10\,\mu C$, $q_2 = 60\,\mu C$, $q_3 = 32\,\mu C$)
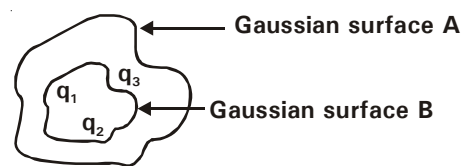
   (1) 10^6 Nm^2 C^{-1} (2) 5.6×10^6 Nm^2 C^{-1}
   (3) 6.3×10^6 Nm^2 C^{-1} (4) 4.8×10^6 Nm^2 C^{-1}

18.
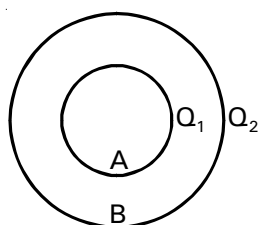
Figure shows two concentric conducting shells A and B carrying charges Q_1 and Q_2 respectively. The charge on outer surface of shell B is

(1) Q_2 (2) $Q_1 + Q_2$

(3) $Q_2 - Q_1$ (4) zero

19. 8 dipoles, in which each charge has magnitude 'e', are placed inside a cube. The total flux through the cube is

(1) $\dfrac{8e}{\varepsilon_0}$ (2) $\dfrac{16e}{\varepsilon_0}$

(3) $\dfrac{e}{\varepsilon_0}$ (4) zero

20. Electric field due to uniformly charged insulating sphere of radius R is shown by the curve
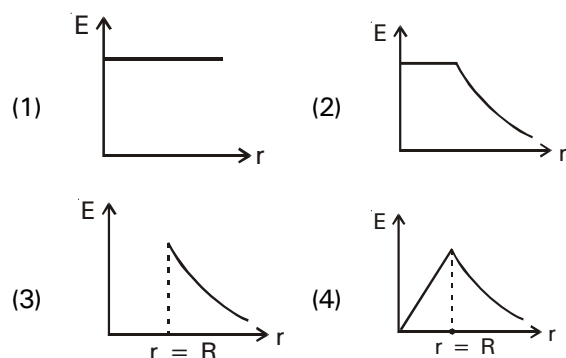
21. Two charges $+1\,\mu C$ each are placed in x-y plane at points (0, 2) and (0, −2) respectively. Two more charges $-2\,\mu C$ each are placed at points (0, 4) and (0, −4) respectively. Electric field is zero on x- axis at (ignore infinity points)

(1) one point only   (2) two points

(3) three points   (4) no points

22. A cylinder cut along its axis as shown is placed in a uniform electric field E. The flux linked with curved surface of the cylinder is
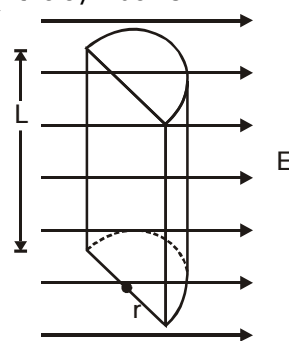
(1) $-$ LrE   (2) 2 LrE

(3) Zero   (4) πrLE

23. In the system of two concentric hollow metal spheres, the inner sphere is given a charge q_1 and the outer sphere is grounded. Then

(1) induced charge on the inner surface of outer shell is $-q_1$.

(2) induced charge on the outer surface of outer shell is zero.

(3) both (1) and (2)

(4) neither (1) nor (2)

24. A particle P of mass 100 gm and charge $+1\,\mu C$ approaches particle Q of mass 200 gm and charge $+2\,\mu C$ head on from a large distance with a speed of 100 m/s. Q was free but at rest initially. At the instant when speed of P is 80 m/s, distance between them is about

(1) 0.09 mm   (2) 0.13 mm

(3) 0.11 mm   (4) 0.07 mm

25. Electric potential due to a uniformly charged spherical shell of radius R is shown by the curve
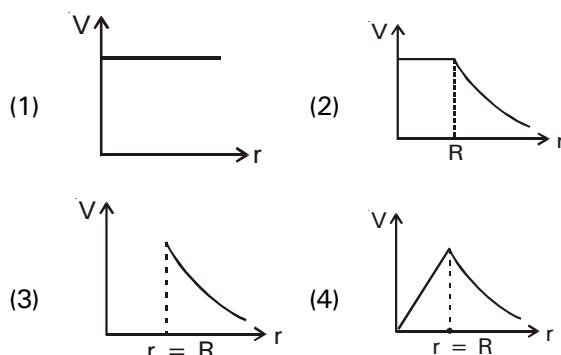
26. A metal sphere M of radius R and a metal sphere N of radius 2R have surface charge densities $-\sigma$ and σ respectively. They are brought in contact and separated. What is the new surface charge densities σ_1 and σ_2 on spheres M and N respectively?

(1) $\sigma_1 = \dfrac{\sigma}{3}, \sigma_2 = \dfrac{\sigma}{6}$

(2) $\sigma_1 = \dfrac{3\sigma}{4}, \sigma_2 = \dfrac{3\sigma}{8}$

(3) $\sigma_1 = \sigma, \sigma_2 = \dfrac{\sigma}{2}$

(4) none of these

27.

In the above arrangement, the potential is zero at

a. a single point on the line passing through A and B

b. two different points on the line passing through A and B

c. infinite number of points in the plane passing through A and B

(1) both a & c   (2) a only

(3) b only   (4) both b & c

28.
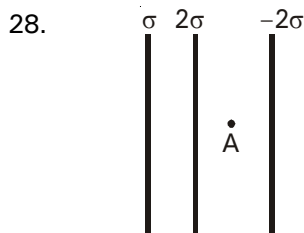
Three very large uniformly charged sheets are placed as shown in figure. The electric field at point A is

(1) $\dfrac{5\sigma}{\varepsilon_0}$ towards right   (2) $\dfrac{3\sigma}{2\varepsilon_0}$ towards right

(3) $\dfrac{5\sigma}{2\varepsilon_0}$ towards right   (4) $\dfrac{3\sigma}{2\varepsilon_0}$ towards left

29.
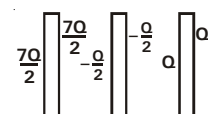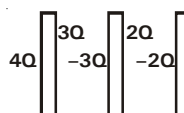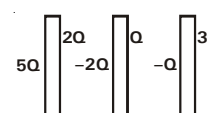
The conductor shown is given some charge. Electric field on the surface of the conductor is

(1) more at A   (2) more at B

(3) same at A and B   (4) zero at A

30. A charged particle is released in a gravity free region with electric field. Its kinetic energy is found to increase linearly with square of time elapsed. Then

(1) Electric field in the region is non uniform

(2) Electric potential energy of the particle varies inversely with square of time elapsed

(3) both (1) and (2)

(4) neither (1) nor (2)

31. Three conducting plate having charges $7Q$, $-Q$ and $2Q$ are placed facing as shown. The charge distribution on each face will become as
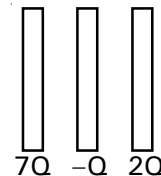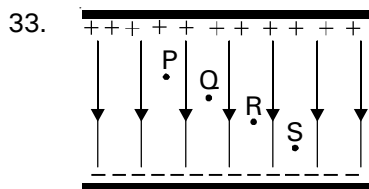

(1)   (2)

(3)   (4)

32. Two points A and B are located at points (1,2,3) and (4, −2, 3) respectively where distances are in metre. Potential difference between these points $V_A - V_B = 10$ V. Uniform electric field in the region is 2 V/m. X- component of electric field in the region is

(1) 2 V/m   (2) 1 V/m

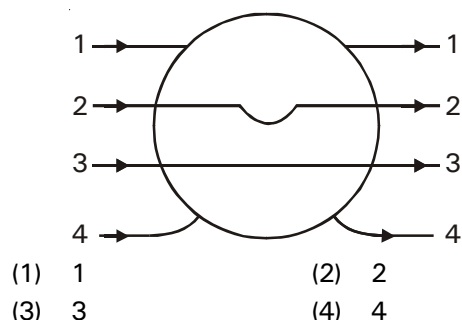(3) 1.2 V/m   (4) 1.6 V/m

33.

The figure shows the electric field lines between two large parallel plates. Four points P, Q, R and S are marked in this figure. At which point is the electric potential the largest?

(1) P (2) Q
(3) R (4) S

34. A metallic solid sphere is placed in a uniform electric field. The lines of force follow the path

(1) 1 (2) 2
(3) 3 (4) 4

35. **Assertion**: Electric potential on the axis of a ring is independent of whether ring is uniformly charged or non-uniformly charged.

Reason: Electric potential is a scalar.

(1) Both Assertion and Reason are true and the reason is correct explanation of assertion.
(2) Both Assertion and Reason are true but reason is not correct explanation of assertion.
(3) Assertion is true but Reason is false.
(4) Assertion is false.

PHYSICS : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

36. Equipotential surfaces in a region are equidistant planes parallel to y-z plane. Field in region is
(1) uniform, perpendicular to x-axis
(2) uniform, perpendicular to y-axis
(3) non-uniform, parallel to y-axis
(4) uniform, parallel to x-axis

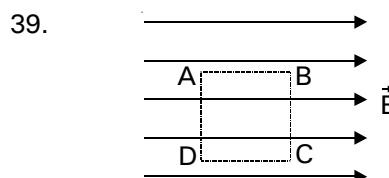37. A charge $q = +1\,\mu C$ is held at O as shown in figure. Potential difference $V_A - V_B =$

(b)
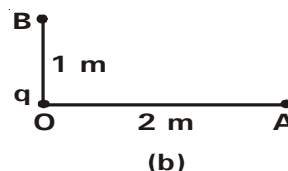
(1) Zero (2) 3600 V
(3) −4500 V (4) −7200 V

38.
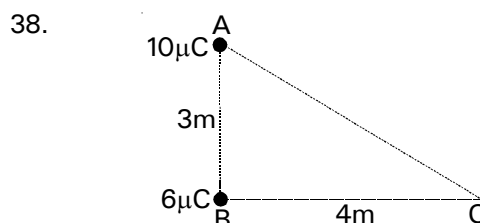
In the figure shown, charge at B is fixed. Work done in shifting $10\,\mu C$ charge from position A to position C is
(1) 0.045 joules (2) −0.045 joules
(3) 0.054 joules (4) −0.054 joules

39.

A proton is slowly shifted along the closed path ABCDA in a uniform electric field as shown. If W represents the work done by electrostatic force in moving the proton, which of the following is FALSE?
(1) W_{AB} is positive
(2) W_{CD} is negative
(3) $W_{AB} + W_{BC} + W_{CD} + W_{DA} = 0$
(4) W_{AB} is negative and W_{BC} is zero

40. S_1 and S_2 are two equipotential surfaces on which the potentials are not equal. Which of the following is incorrect?
(1) S_1 and S_2 cannot intersect
(2) S_1 and S_2 both cannot be plane surfaces.
(3) in the region between S_1 and S_2, the field is maximum where they are closest to each other
(4) A line of force from S_1 to S_2 must be perpendicular to both

41. Ratio of potential at the centre to that at the surface of a solid sphere with uniform volume distribution of charge is
    (1) 1 : 1   (2) 3 : 2
    (3) 2 : 1   (4) 1 : 2

42. Two plates are 2 cm apart, a potential difference of 10 volt is applied between them, the electric field between the plates is
    (1) 20 N/C   (2) 500 N/C
    (3) 5 N/C   (4) 250 N/C

43. Two spheres A and B of radius 2 cm and 6 cm are given charges of 100 μC and 60 μC respectively. If they are connected by a fine wire, the amount of charge flowing from one to other is
    (1) 30 μC from A to B   (2) 40 μC from A to B
    (3) 60 μC from A to B   (4) 30 μC from B to A

44. At what distance from a point charge the electric field is 300 V/m and potential is 2400 V?
    (1) 6 m   (2) 8 m
    (3) 12 m   (4) 72 m

45. Point charge q moves from point P to point S along the path PQRS (figure) in a uniform electric field E pointing parallel to the positive direction of the x-axis. The coordinates of the points P, Q, R an S are (a, b, 0), (2a, 0, 0), (a, −b, 0) and (0, 0, 0) respectively. The work done by the field in the above process is given by expression
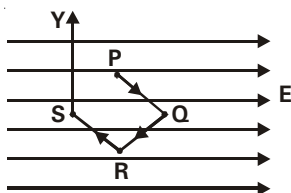
    (1) qEa   (2) −qEa
    (3) qEa$\sqrt{2}$ (4) qE$\sqrt{[(2a)^2 + b^2]}$

46. A solid conducting sphere having a charge Q is surrounded by an uncharged concentric conducting spherical shell. The potential defference between the surface of solid sphere and shell is V. The shell is now given a charge $+2Q$. The new potential difference between the same surfaces will be
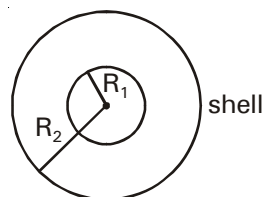
    (1) V   (2) 2 V
    (3) −V   (4) Zero

47. Three particles, each having a charge of 20 μC are placed at the corners of an equilateral triangle of side 4cm. The electrostatic potential energy of the system is
    (1) Zero   (2) 270 J
    (3) 135 J   (4) 90 J

48. Electric field in a region is $\vec{E} = (8\hat{i} + 4\hat{j} + 3\hat{k})$ NC^{-1}. For two points A(3,1,2) and B(1,−2,3), where distances are in metres, potential difference $V_A - V_B =$
    (1) 24 V   (2) −25 V
    (3) 18 V   (4) −35 V

49. Two spheres of radii R_1 and R_2 are charged uniformly to the same potential. The ratio of charges on the spheres is
    (1) $\sqrt{R_1} : \sqrt{R_2}$ (2) $R_1 : R_2$
    (3) $R_1^2 : R_2^2$ (4) $R_1^3 : R_2^3$

50. An electric charge q is placed at the centre of a cube of side 'a'. The electric flux on one of its faces will be
    (1) $\dfrac{q}{6\varepsilon_0}$ (2) $\dfrac{q}{\varepsilon_0 a^2}$
    (3) $\dfrac{q}{4\pi\varepsilon_0 a^2}$ (4) $\dfrac{q}{\varepsilon_0}$

CHEMISTRY : SECTION-A

51. The packing fraction of the element that crystallizes in simple cubic arrangement is

(1) $\dfrac{\pi}{4}$ (2) $\dfrac{\pi}{6}$

(3) $\dfrac{\pi}{3}$ (4) $\dfrac{\pi}{2}$

52. If Z is the number of atoms per unit cell that represents the packing with 74% efficiency, the number of octahedral voids in the unit cell is equal to

(1) Z (2) 2Z

(3) N_0 (4) $2N_0$

53. A match box exhibits
    (1) cubic geometry
    (2) monoclinic geometry
    (3) orthorhombic geometry
    (4) tetragonal geometry

54. Which is a false statement w.r.t. detergents?
    (1) Unbranched chains are more prone to attack by bacteria and are easily biodegradable
    (2) ABS detergents are slowly degraded than LAS detergents
    (3) Sodium salts of long chain alkyl hydrogen sulphate can act as detergents
    (4) Detergents are always ionic compounds

55. The most unsymmetrical crystal system is
    (1) hexagonal (2) tetragonal
    (3) triclinic (4) monoclinic

56. Yellow colour in NaCl is due to
    (1) crystalline nature
    (2) metal deficiency defect
    (3) metal excess defect
    (4) dipole-dipole interactions

57. Distance between tetrahedral and octahedral void in fcc lattice will be (both are present on body diagonal axis)

(1) $\dfrac{\sqrt{3}\,a}{4}$ (2) $\sqrt{3}\,a$

(3) $\dfrac{\sqrt{3}\,a}{2}$ (4) $\dfrac{\sqrt{3}\,a}{3}$

58. AB has ZnS structure where radius of B^- is x $\overset{o}{A}$ and radius of A^+ is y $\overset{o}{A}$. The value of (x + y) is (if a is the unit cell edge)

(1) $\dfrac{\sqrt{3}}{2}\,a$ (2) $\dfrac{\sqrt{3}}{4}\,a$

(3) $\sqrt{3}\,a$ (4) $\dfrac{a}{4}$

59. Consider two unit cells
    Unit cell A : NaCl structure
    Unit cell B : CsCl structure
    In each unit cell, all atoms from one of the faces are removed. The ratio of number of Cl^- ions in A to that of B now would be
    (1) 7 (2) 2
    (3) 4 (4) 6

60. In cubic close packing, each corner atom/sphere of a cube is surrounded by 'x' number of tetrahedral voids and y number of octahedral voids. Then the value of x : y is
    (1) 2 : 1 (2) 1 : 2
    (3) 4 : 3 (4) 3 : 4

61. The edge length of face centred unit cubic cell is 508 pm. The radius of an atom is.
    (1) 180 pm (2) 398 pm
    (3) 144 pm (4) 252 pm

62. Identify the incorrect statement
    (1) an octahedral void at the edge centre is formed by six spheres, out of which 2 are at the face centres and 4 are at corners
    (2) Each body diagonal of a face centred cubic unit cell contains two tetrahedral voids
    (3) A cubical void is formed at the centre of simple cubic unit cell
    (4) Trigonal void is a planar void

63. In the structure of diamond the number carbon atoms present in a unit cell are
    (1) 4 (2) 16
    (3) 8 (4) 6

64. In diamond unit cell, there are 8 carbon atoms at the corner 6 carbon atoms at face centre and 4 carbon atoms in the interior. The length of diamond unit cell was measured as 0.4 nm. The density of diamond is
    (1) $0.250 \text{ g} / cm^3$ (2) $2.50 \text{ g} / cm^3$
    (3) $2.50 \text{ kg} / cm^3$ (4) $2.50 \text{ g} / m^3$

65. To form a n-type semiconductor, the element doped to Si is
(1) P
(2) Sn
(3) Ge
(4) C

66. In two dimensional square close packing, the co-ordination number is
(1) 2
(2) 4
(3) 6
(4) 8

67. At curie temperature
(1) Diamagnetic solid changes to paramagnetic
(2) Ferromagnetic solid changes to paramagnetic
(3) Antiferromagnetic solid changes to paramagnetic
(4) Ferrimagnetic solid changes to paramagnetic

68. Match the Crystal system in column-I with their corresponding axial distances in column-II.

Column-I		Column-II
i.	Cubic	p. $a \neq b \neq c$
ii.	Tetragonal	q. $a = b \neq c$
iii.	Orthorhombic	r. $a = b = c$

(1) i-q ; ii-r ; iii-p
(2) i-r ; ii-q ; iii-p
(3) i-q ; ii-p ; iii-r
(4) i-p ; ii-q ; iii-r

69. Which of the following point defects are not shown by AgBr(s) crystals?
(A) Schottky defect
(B) Frenkel defect
(C) Stoichiometric defect
(D) Metal deficiency defect
(1) (A) and (B)
(2) only (C)
(3) only (D)
(4) (B) and (D)

70. The correct order of packing efficiency is
(1) bcc > fcc > sc
(2) sc > fcc > bcc
(3) fcc > bcc > sc
(4) fcc > sc > bcc

71. In a solid, O^{2-} forms ccp arrangement atoms X occupies body center & atoms Y at alternate face. Formula is
(1) XYO_4
(2) XYO_2
(3) XY_2O_4
(4) XYO

72. Glycerol is added to soap. It functions
(1) as a filler
(2) to increase leathering
(3) to prevent rapid drying
(4) to make soap granules.

73. In CsCl structure, Cs^+ ion are present at
(1) corner of cube
(2) body center of cube
(3) corner of each face of cube
(4) edge center of cube

74. The radius of cation (A^+) in AB solid (having ideal NaCl structure) is
(1) $\left(\dfrac{\sqrt{2}-1}{2\sqrt{2}}\right) a$
(2) $\left(\dfrac{1}{2\sqrt{2}}\right) a$
(3) $\left(\dfrac{2\sqrt{2}}{\sqrt{2}-1}\right) a$
(4) $\left(\dfrac{1}{2\sqrt{2}} - \dfrac{1}{2}\right) a$

75. Which of the following statement regarding electrical conductivity is/are true?
(1) The electrical conductivity of semiconductors increase with rise in temperature
(2) Conductivity of germanium crystals increase on doping with gallium.
(3) Metals becomes super conductor at very low temperature
(4) All are correct

76. In an atomic bcc, what fraction of edge is covered by atoms ?
(1) 0.32
(2) 0.866
(3) 0.134
(4) 0.268

77. Which one of the following pairs is/are correctly matched?
(1) Dettol — Chloroxylenol
(2) Tranquiliser — Aspirin
(3) Antibiotic — Brufen
(4) Anaesthetic — Penicillin

78. The vacant space in body centred cubic lattice b.c.c. unit cell is about
(1) 32%
(2) 10%
(3) 23%
(4) 46%

79. The ratio of number of total lattice sites in NaCl unit cell to that of CsCl unit cell is
(1) 3
(2) 4
(3) 6
(4) 8

80. Chemical substances which kill micro organisms but are harmful to human tissues are called
(1) antiseptics
(2) disinfectant
(3) antipyretic
(4) antihistamines

81. The ratio of body diagonal to face diagonal in cube is
(1) 2
(2) 1.22
(3) 1.5
(4) 3

82. On applying high temperature to a 12 coordinate cubic lattice of X ; it changes to a lattice in which each X atom touches 4X atoms in the upper layer and 4X atoms in the lower layer but does not touch any X atom in its layer . The ratio of density of lattice before and after applying high temperature is

(1) $4 : (\sqrt{2})^3$
(2) $(\sqrt{2})^3 : (\sqrt{3})^3$
(3) $2(\sqrt{2})^3 : (\sqrt{3})^3$
(4) $4(\sqrt{2})^3 : (\sqrt{3})^3$

83. Cetyltrimethyl ammonium bromide is a popular
    (1) anionic detergent
    (2) cationic detergent
    (3) non-ionic detergent
    (4) antioxidant

84. **Assertion**: In 3–D close packing, ABAB .... arrangement can have coordination number 8 or coordination number 12.
    Reason: In 3–D close packing ABAB....... arrangement corresponds to body centered cube only.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

85. A compound formed by elements A and B form cubic structure in which 'A' atoms are at the corners of a cube and 'B' atoms are at the face centre. The formula of the compound is
    (1) AB_3
    (2) AB_2
    (3) A_3B
    (4) AB

CHEMISTRY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

86. In a solid X atom are at corners and Y atoms are at the face centre of the cube. If $a = 5\,\text{Å}$, the density of solid is [Atwt. of X = 60, Y = 90)
    (1) 4.4 g/cc
    (2) 2 g/cc
    (3) 1.33 g/cc
    (4) 0.32 g/cc

87. Nearest neighbours of Cesium ion in CsCl structure is
    (1) 6
    (2) 8
    (3) 12
    (4) 4

88. How much portion of an atom located at corner of the face-centred cubic unit cell is part of its neighbouring unit cell?

    (1) $\dfrac{1}{6}$
    (2) $\dfrac{1}{2}$
    (3) $\dfrac{1}{4}$
    (4) $\dfrac{1}{8}$

89. In XY_3, Y^- ions have ccp arrangement and X^{3+} ions are present in octahderal voids. The fraction of total number of voids occupied is
    (1) 1/3
    (2) 1/9
    (3) 1/6
    (4) 1/12

90. Function of aspirin is
    a. to prevent heart attack
    b. to prevent blood clotting
    c. to bring body temperature down
    d. to releave body pain
    (1) a, c & d
    (2) b, c & d
    (3) a, b & d
    (4) a, b, c & d

91. A solid has ZnS type structure. If the radius of anion is 100 pm, what is the maximum radius of cation
    (1) 68.3 pm
    (2) 120.7 pm
    (3) 41.4 pm
    (4) 100 pm

92. Cations are present in the interstitial sites in
    (1) Frenkel defect
    (2) Schottky defect
    (3) Vacancy defect
    (4) Metal deficiency defect

93. Missing of one cation and one anion from the crystal lattice is called
    (1) ionic defect
    (2) crystal defect
    (3) Schottky defect
    (4) Frenkel defect

94. In a compound of a A^+ and B^+, radius of cation A^+ is 50 pm and that of anion B^+ is 100 pm, then the volume of the unit cell of AB is
    (1) 1×10^{-24} cm³
    (2) 3.37×10^{-24} cm³
    (3) 27×10^{-24} cm³
    (4) 3×10^{-24} cm³

95. Which of the following is a property of molecular solid?
    (1) Hardness and rigidity
    (2) High melting points
    (3) Volatile nature
    (4) Good conductors of electricity

96. Which of the following chemicals can be added for sweetening of food items at cooking temperature and does not provide calories?
    (1) Sucrose
    (2) Glucose
    (3) Aspartame
    (4) Sucralose

97. A crystalline solid is made up of X, Y, Z elements. Atoms of X forms fcc packing, atoms of Y occupy octahedral voids while atoms of Z occupies all the tetrahedral voids. If all the atoms along one body diagonal are removed then formula of solid will be
   (1) $X_5Y_4Z_8$ (2) $X_8Y_4Z_5$
   (3) X_2YZ_2 (4) XYZ_2

98. Compound which is added to soap to impart antiseptic properties is
   (1) sodium laurylsulphate
   (2) sodium dodecylbenzenesulphonate
   (3) rosin
   (4) bithional

99. If NaCl is doped with 10^{-3} mol% of $AlCl_3$, the concentration of cation vacancies is
   (1) 6.02×10^{18} (2) 6.02×10^{16}
   (3) 0.12×10^{20} (4) 3.01×10^{18}

100. The value of refractive index of graphite
   (1) is same in different directions
   (2) is different in different directions
   (3) can not be measured
   (4) is always zero

ZOOLOGY : SECTION-A

All questions are compulsory in section A

101. Cervical plug is formed during pregnancy under the influence of
   (1) estrogen   (2) progesterone
   (3) GnRH   (4) FSH

102. Which of the following layer prevents the implantation of the blastocyst at an abnormal site by not exposing the sticky and phagocytic cells of trophoblast?
   (1) Chorion   (2) Zona pellucida
   (3) Corona radiata   (4) All of these

103. Which of the following is not related to spermiogenesis ?
   (1) Formation of axial filament form distal centriole
   (2) Formation of mitochondrial spiral
   (3) Conversion of spermatogonia into sperm
   (4) Formation of acrosome from golgi apparatus

104. The glandular tissue of each breast is divided into _____ mammary lobes containing cluster of cells called _____.
   (1) 10−12, lactiferous duct
   (2) 5−7, lactiferous duct
   (3) 15−20, alveoli
   (4) 10−12, alveoli

105. Birth canal in female is formed by
   (1) vagina only
   (2) cervical canal only
   (3) both cervical canal and vagina
   (4) none of these

106. Identify the parts of the structure a, b & c and the structure 'd' respectively
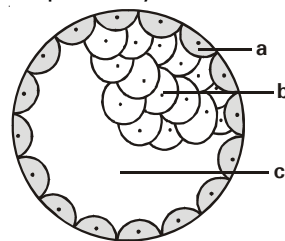
   Structure _____ d
   (1) Inner cell mass, Blastocoel, Trophoblast, Blastocyst
   (2) Trophoblast, Inner cell mass, Blastocoel, Blastocyst
   (3) Blastocyst, Inner cell mass, Blastocoel, Trophoblast
   (4) Blastocoel, Blastocyst, Trophoblast, Inner cell mass

107. After fertilization, cleavage of zygote occurs in
   (1) uterus   (2) isthmus
   (3) ovary   (4) infundibulum

108. Follicular atresia occurs in ovary
   a. Before birth
   b. After birth till sexual maturity
   c. During woman's reproductive life time
   (1) a only   (2) b and c
   (3) c only   (4) a, b and c

109. Primary oocyte and secondary oocyte are suspended at which of the following stages of meiosis, respectively?
   (1) metaphase and diplotene stage
   (2) diplotene and metaphase I
   (3) diplotene and metaphase II
   (4) metapahse II and diplotene

110. Arrange the following events in correct sequence
    a. Formation of blastocyst
    b. Fertilization and formation of zygote
    c. Formation of 2–, 4–, 8– celled stage
    d. Attachment of trophoblast cells with endometrium
    e. Morula decends into uterus
    f. Uterine cells divide rapidly and covers blastocyst
    (1) b → c → e → a → d → f
    (2) b → c → a → e → d → f
    (3) b → e → c → a → f → d
    (4) b → c → e → d → f → a

111. In an adult human female the DNA content of a primary oocyte is
    a. same as that of a somatic cell
    b. double the amount of DNA in a spermatid
    c. double the amount of DNA in 2nd polar body
    d. equal to amount of DNA in a zygote
    (1) a, b, c & d   (2) a & b
    (3) only c   (4) none of these

112. Which of the following activity occurring in a regularly menstruating female is incorrectly matched to its underlying cause?
    (1) failure of menstruation – fertilization
    (2) follicular growth in ovaries – increased FSH
    (3) release of oxytocin – milk let down
    (4) involution of corpus luteum – reduced LH

113. **Assertion :** The estrogen stimulated proliferated endometrium is maintained by progesterone.
    Reason : Progesterone prepares the endometrium for implantation of Morula.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

114. Stimulus for the completion of meiosis II of secondary oocyte is
    (1) entry of sperm into the cytoplasm of the ovum
    (2) only presence of sperm near to ovum
    (3) just contact of sperm and ovum
    (4) none of the above

115. How many cleavages are completed in a 16-celled stage of human morula?
    (1) sixteen   (2) fifteen
    (3) eight   (4) four

116. Which of the following statement is incorrect w.r.t. menstrual cycle ?
    (1) Rapid secretion of LH leading to its maximum level in the middle of cycle induces rupture of graafian follicle
    (2) Luteal phase is followed by ovulatory phase
    (3) Menstrual flow results due to breakdown of endometerial lining of uterus & its blood vessels
    (4) Endometrium of uterus regenerates during follicular phase

117. Which of these are not seen in a secondary follicle?
    a. antrum
    b. theca
    c. liquor folliculi
    d. membrana granulosa
    e. differentiated theca
    (1) a, b and c   (2) b, d and e
    (3) a, c and e   (4) d and e

118. If a female took a drug that inhibited release of LH, the consequence would be
    (1) failure of ovulation
    (2) failure of implantation
    (3) failure of meiosis I of oocyte
    (4) failure of fertilisation

119. The path of milk flow in mammary glands is
    (1) alveoli → mammary tubules → mammary ducts → ampulla → lactiferous duct
    (2) alveoli → lactiferous duct → mammary ducts → ampulla → mammary tubules
    (3) ampulla → mammary tubules → mammary ducts → alveoli → lactiferous duct
    (4) alveoli → mammary ducts → lactiferous duct → mammary tubules → ampulla

120. What would be the number of gametes produced respectively from 20 primary oocytes, 10 secondary spermatocytes, 5 spermatids and 5 secondary oocytes?
    (1) 40, 20, 5 & 10   (2) 20, 10, 5 & 5
    (3) 20, 20, 5 & 5   (4) 40, 20, 10 & 5

121. Which of the following prevent polyspermy?
    (1) Acrosomal reaction (2) Cortical reaction
    (3) Sperm lysins   (4) Capacitation

122. Which of the following is correct pertaining to mammary glands?
    a. Ejection of milk occurs under influence of oxytocin
    b. Lie over pectoralis major muscles
    c. Structure varies with sex and physiology
    (1) a, b and c   (2) b and c
   (3) a and c   (4) a and b

123.

Blood vessels
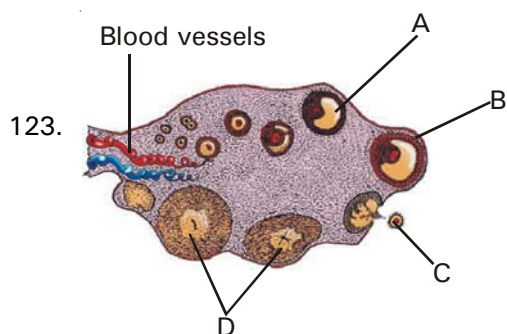
Which of the following is a correct match w.r.t. A, B, C and D in the above diagram?
(1) A–Tertiary follicle having 2° oocyte stage arrested at diplotene of prophase-I
(2) B–Graafian follicle having 2° oocyte which is arrested at metaphase-II
(3) C–Ovum with outer most covering corona radiata, the cells of which are glued by hyaluronidase
(4) D–Corpus luteum a temporary endocrine gland formed only during pregnancy

124. In the given representation of 28 days menstrual cycle (with phases X,Y and Z), the events given as A,B and C match with which given phases of menstrual cycle ?
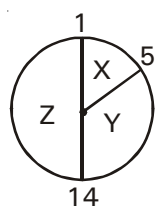
A. cervical mucus becomes thin
B. uterine glands become more secretory
C. level of gonadotropins increase gradually
(1) A–X, B–Y, C–Z   (2) A–Y, B–Z, C–Y
(3) A–Y, B–Z, C–X   (4) A–Y, B–X, C–Z

125. Correct chronological sequence of source of synthesis of hormones acting on mammary glands directly for their development and lactation is
(1) ovary-anterior lobe of pituitary-hypothalamus
(2) anterior lobe of pituitary - hypothalamus - ovary
(3) ovary- hypothalamus - anterior lobe of pituitary
(4) hypothalams - anterior lobe of pituitary - ovary

126. Which of the following is not correct w.r.t. the menopause?
(1) There are no ovarian follicles
(2) Female experiences hot flushes
(3) Increased urinary excretion of gonadotrophins
(4) Increased circulating levels of ovarian hormones

127.
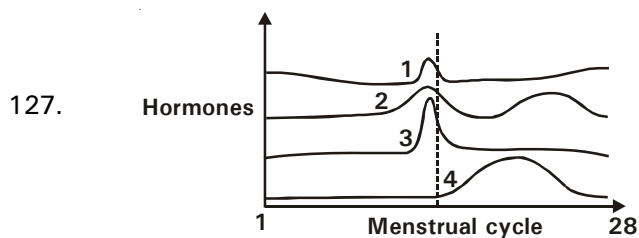
In the diagram shown above, 1, 2, 3 and 4 are respectively.
(1) Estrogen, LH, FSH, Estrogen
(2) Progesterone, Estrogen, FSH, LH
(3) FSH, Estrogen, LH, Progesterone
(4) LH, FSH, Progesterone, Estrogen

128. Select the correct option describing gonadotropin activity in a normal pregnant female
(1) High level of FSH and LH stimulates the thickening of endometrium
(2) High level of FSH and LH facilitate implantation of the embryo
(3) High level of hCG stimulates the synthesis of estrogen and progesterone
(4) High level of hCG stimulates the thickening of endometrium

129. The main function of mammalian corpus luteum is to produce
(1) estrogen only
(2) progesterone
(3) human chorionic gonadotropin
(4) relaxin only

130. Which of the following is an incorrect match ?
(1) Labia majora – Fleshy folds of tissue which extend from mons pubis & surround vaginal opening
(2) Hymen – A membrane which partially covers vaginal opening
(3) Mons pubis – Cushion of fatty tissue covered by skin and pubic hair
(4) Labia minora – Paired folds of tissue above labia majora

131. Choose the correct difference between sperm & ova in humans ?

	Character	Sperm	Ova
(1)	Shape	Oval	Knobbed thread
(2)	Motility	Flagellar movement	Non motile
(3)	Size	Large	Small
(4)	Ploidy	Diploid	Haploid

132. At the end of first meiotic division, male germ cell differentiates into
    (1) secondary spermatocyte
    (2) primary spermatocyte
    (3) spermatogonium
    (4) spermatid

133. How many of the following structures have 2n, 2c condition in female body ?
    Primary oocyte, Secondary oocyte, Ovum, Secondary spermatocyte, Follicular cell, Somatic cell, 1st polar body, Spermatogonium
    (1) Five   (2) Six
    (3) Two   (4) Three

134. Which of the following are correct statements?
    a. Size of Graafian follicle is same as secondary oocyte
    b. Secondary oocyte and morula are of same size
    c. Luteal cells of corpus luteum are rich in SER
    d. Mammary glands of female undergo differentiation during pregnancy
    (1) a, b & c   (2) a & b
    (3) b, c & d   (4) a & d

135. **Statement A** : Spermatogenesis starts at the age of puberty due to significant increase in the level of GnRH from anterior lobe of pituitary
    Statement B: LH acts on leydig cells & stimulates synthesis & secretion of androgens
    (1) Both statements A & B are correct
    (2) Both statements A & B are incorrect
    (3) Only statement A is correct
    (4) Only statement B is correct

ZOOLOGY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

136. Which one of the following statement about morula in humans is correct?
    (1) It has almost equal quantity of cytoplasm as an uncleaved zygote but much more DNA
    (2) It has far less cytoplasm as well as less DNA than in an uncleaved zygote
    (3) It has more or less equal quantity of cytoplasm and DNA as in uncleaved zygote
    (4) It has more cytoplasm and more DNA than an uncleaved zygote

137. Match the terms in column I correctly with those in column II
Column I	Column II
a. Menstrual phase	p. Corpus luteum
b. Luteal phase	q. Mature ovarian follicle
c. Proliferative phase	r. Regressing corpus luteum
    (1) a – p, b – q, c – r   (2) a – q, b – p, c – r
    (3) a – r, b – p, c – q   (4) a – r, b – q, c – p

138. Extrusion of 2nd polar body from egg nucleus occurs
    (1) after entry of sperm before completion of fertilization
    (2) after completion of fertilization
    (3) before entry of sperm
    (4) without any relation to sperm entry

139. Read the statements and choose the correct options
    a. Clitoris lies at the upper junction of two labia minora
    b. Hymen is a reliable indicator of virginity or sexual experience
    (1) both a, b are correct
    (2) a is correct, b is incorrect
    (3) both a, b are incorrect
    (4) a is incorrect, b is correct

140. How many of the following statements are correct?
    a. Basal body temperature can be raised by progesterone
    b. After menopause gonadotrophins increase and estrogen decrease
    c. Progesterone is produced by stroma of ovary
    d. Progesterone acts on uterus
    e. Testosterone promotes anabolism and erythropoiesis
   (1) Two   (2) Three
    (4) One   (4) Four

141. Given below are the events in human reproduction
    a. Insemination   b. Gametogenesis
    c. Fertilisation   d. Parturition
    e. Gestation   f. Implantation
   Their correct sequential order is
    (1) a → b → c → d → e → f
    (2) b → a → c → f → d → e
    (3) b → f → a → f → c → d
    (4) b → a → c → f → e → d

142. Study the diagram given below and identify the phases in which endometrial glands become secretory and endometrium is sloughed off respectively.
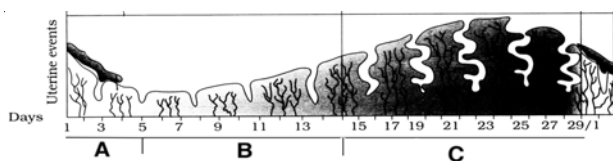
(1) Phase B and phase C
(2) Phase A and phase B
(3) Phase C and phase A
(4) Phase A and phase C

143. Phase of menstrual cycle when progesterone level is maximum
(1) Menstrual   (2) Luteal
(3) Proliferative   (4) Follicular

144. Which of the following statement is incorrect?
(1) Capacitation occurs in female reproductive tract
(2) Granulosa cells secrete inhibin that inhibits the release of LH
(3) Morula is a solid ball consisting of 8-16 cells
(4) Menstrual blood is without clots

145. Set of endocrine cells in gonads which secrete steroid hormones is
(1) Granulosa cells, Sertoli cells, Luteal cells
(2) Follicular cells, immunocompetent cells, Germ cells
(3) Follicular cells, Luteal cells, Leydig cells
(4) Interstitial cells, Granulosa cells, sertoli cells

146. Complete the following
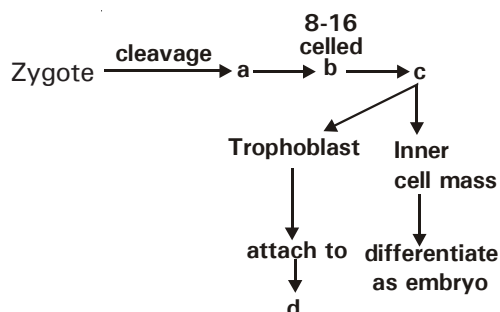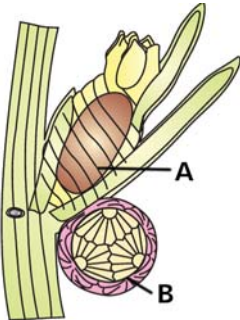
(1) Blastocyst, Blastomeres, Gastrula, Perimetrium
(2) Blastocyst, Morula, Gastrula, Endometrium
(3) Blastomeres, Morula, Blastocyst, Endometrium
(4) Blastomeres, Morula, Blastocyst, Perimetrium

147. The female external genitalia includes
A. Mons pubis   B. Hymen
C. Penis   D. Clitoris
E. Spermatic cord
(1) A, B & C   (2) A, B & D
(3) B, C & D   (4) B & C

148. During a woman's lifetime she produces about
(1) 400-500 eggs   (2) 4000 egs
(3) 365-800 eggs   (4) 40 eggs

149. Where can you find primary oocyte, secondary oocyte and blastula
(1) Ovary, ovary, fallopian tube
(2) Fallopian tube, fallopian tube, uterus
(3) Ovary, fallopian tube, uterus
(4) Uterus, ovary, uterus

150. During the formation of zygote different components are contributed by sperm and ovum. Which of the following statements about their contribution are true?
a. Sperm contributes half the cytoplasm
b. Both sperm and egg contribute haploid nucleus
c. Most of the cytoplasm is contributed by ovum
d. Both sperm and egg contribute centrioles
(1) a, b, c & d   (2) b & c
(3) a, c & d   (4) a & b

BOTANY : SECTION-A

All questions are compulsory in section A

151. Cotyledons become large and curved in
(1) *Cuscuta*
(2) *Capsella bursa pastoris*
(3) Onion
(4) Beans

152. Which of the following statement is incorrect w.r.t. pollination?
(1) In Papaya dioecious condition prevents both autogamy and getionogamy
(2) In *Oxalis* and *Commelina* presence of chasmogamous flowers ensures assured seed set even in the absence of pollinators
(3) Genetically, geitonogamy is similar to autogamy
(4) Continued self pollination result in inbreeding depression

153. Epibasal tier in dicot embryo give rise to all the structures except
(1) Plumule   (2) Epicotyl
(3) Hypocotyl   (4) Cotyledons

154. Seed offers several advantages except
(1) Seed formation is more dependable because pollination and fertilization are dependent on water
(2) Seed have sufficient food reserve for nourishment of young seedlings
(3) Seed coat provides protection to the young embryo
(4) Being product of sexual reproduction, seed generates new genetic combination

155. Pick the correct match
(1) *Strobilanthus*   – annual
(2) Menstrual cycle   – non primate female mammals
(3) Heterothallism   – Dioecious
(4) Gamete transfer   – Post fertilization event

156. Occurrence of more than one embryo in a seed is referred to as
    (1) Amphimixis   (2) Polyembryony
    (3) Parthenogenesis (4) Polyspermy

157. Identify the incorrect statement
    (1) In angiosperms, seeds have better adaptive strategies for dispersal to new habitats
    (2) Dehydration and dormancy of mature seeds are crucial for storage of seeds
    (3) 0.1%solution of triphenyl tetrazolium chloride can be used to test the viability of seed
    (4) Apomixis is a form of sexual reproduction which mimics asexual reproduction

158. Which of the following statements is incorrect ?
    (1) Sexual reproduction is present in all vertebrates
    (2) Reproduction in organisms depend on their habitats and internal physiology
    (3) The typical dicot embryo development is called onagrad type
    (4) Beet and bell pepper have perispermic seed

159. Choose the correct pair of statements
    a. Emasculation is required in case of unisexual flowers
    b. Bagging is done to prevent the contamination of stigma with unwanted pollen
    c. Orchid fruit contain only a few tiny seeds
    d. Fruits formed as a result of fertilisation could be a false fruit
    (1) a & b   (2) c & d
    (3) a & c   (4) b & d

160. There are some angiosperms which shows pollination by external agencies
    Grevillea, *Butea*, *Callistemon*, *Agave*, *Adansonia*, *Kigelia*, *Bauhinia, Rafflesia, Yucca*.
    How many plants shows pollination by birds?
    (1) 6   (2) 5
    (3) 3   (4) 4

161. Which one group of plants is propagated through underground stems?
    (1) *Bryophyllum* and *Kalanchoe*
    (2) Pistia, *Eichornia*
    (3) Ginger, Potato, Onion, *Colocasia*
    (4) Sweet Potato, Guava

162. Pericarp is not fleshy in
    (1) Guava   (2) Orange
    (3) Mango   (4) Mustard

163. Which of the following is incorrectly matched
    (1) Dichogamy – Stigma becomes receptive before anthers
    (2) Dioecy – Bisexuality
    (3) Herkogamy – Physical barrier between stigma and anther
    (4) Self incompatibility – Pistil and anther of same flower are incompatible

164. Which of the following plants show clear cut vegetative, reproductive and senescent phases?
    (1) Wheat   (2) Mango
    (3) Lemon   (4) Eucalyptus

165. Large number of organisms are produced in
    (1) Fishes and amphibians
    (2) Humans and reptiles
    (3) Birds and mammals
    (4) Algae and birds

166. Presence of male and female flowers on same plant prevents
    (1) autogamy but not geitonogamy
    (2) allogamy but not autogamy
    (3) both autogamy and geitonogamy
    (4) both autogamy and allogamy

167. Parthenogenesis is
    (1) development of embryo from the zygote
    (2) development of embryo from nucellus
    (3) development of embryo from unfertilised female gamete
    (4) development of fruit without fertilisation in banana

168.

    Select the incorrect option w.r.t. to above diagram
    (1) *Chara* plant   (2) Monoecious
    (3) A is antheridium   (4) B is antheridium

169. Cleistogamous flower are
    (1) male flowers which never open
    (2) unisexual flowers which never open
    (3) bisexual flowers which never open
    (4) open bisexual flowers which perform self pollination in bud condition

170. Two fusing gametes are morphologically or physiologically different from each other in
    (1) *Cladophora*   (2) Yeast
    (3) *Fucus*   (4) All of these

171. What will be the chromosome number in column-III w.r.t. column-I

	Column-I	Column-II	Column-III
a.	House fly	Meiocytes	---
b.	Human	Gametes	---
c.	Dog	Meiocytes	---
d.	Maize	Gametes	---
e.	Fruit fly	Meiocytes	---
f.	*Ophioglossum*	Gametes	---

    The numbers in the blank space respectively are
    (1) 21, 23, 36, 630, 4, 19
    (2) 12, 23, 78, 10, 8, 630
    (3) 12, 46, 19, 78, 8, 630
    (4) 21, 12, 78, 38, 8, 630

172. Which of the following is incorrect w.r.t. life span
    (1) is time period from birth to natural death of organism
    (2) is correlated with size of organism
    (3) is 3-4 months in Rice plant
    (4) may range from few days to few thousands years

173. Most vital / critical event of sexual reproduction is
    (1) Gametogenesis   (2) Gamete transfer
    (3) Fertilization   (4) Zygote- formation

174. Which of the following is the correct sequence of stages in embryo development seen in Onagrad type of embryo?
    (1) Zygote–proembryo–globular–octant embryo
    (2) Proembryo–globular–heart shaped–mature embryo
    (3) Zygote- globular–octant–mature embryo
    (4) Octant–zygote–heart shaped–mature embryo

175. **Assertion :** Non-albuminous seeds have no residual endosperm.
    Reason : It is completely consumed during embryo development.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

176. In which of the following plant, gamete transfer takes place through water ?
    (1) Bryophyte only
    (2) Algae and gymnosperm
    (3) Pteridophyte and gymnosperm
    (4) Bryophyte and pteridophyte

177. If the chromosome number in a stock is 2n = 24 and that in a scion is 2n = 28, then what will be the chromosome number in the egg, microspore mother cell and zygote respectively?
    (1) 26, 52, 52   (2) 12, 24, 24
    (3) 14, 28, 28   (4) 12, 52, 52

178. Wind pollinated flowers are
    (1) small, bright coloured, producing large number of pollen grain
    (2) small, producing large number of pollen grain
    (3) large producing abundant nectar and pollen
    (4) small producing abundant nectar and pollen

179. How many of the following seeds are endospermic in nature?
    (i) Coconut   (ii) Castor
    (iii) Pea   (iv) Wheat
    (v) Maize   (vi) Groundnut
    (1) 3   (2) 4
    (3) 5   (4) 6

180. During favourable period *Amoeba* divides by multiple fission and releases many pseudopodiospores. This phenomenon is
    (1) Encystation   (2) Sporulation
    (3) Binary fission (4) Budding

181. The dicot embryo in *Capsella* has
    (1) single celled suspensor
    (2) multicellular suspensor with haustoria
    (3) single shield like scutellum
    (4) protective coleoptile over plumule

182. Identify the following diagram and label its parts

    (1) A-Scutellum, B-Epiblast, C-Coleorhiza, D-Radicle, E-Coleoptile
    (2) A-Scutellum, B-Coleorhiza, C-Epiblast, D-Radicle, E-Coleoptile
    (3) A-Epiblast, B-Scutellum, C-Coleoptile, D-Radicle, E-Coleorhiza
    (4) A-Coleoptile, B-Radicle, C-Coleorhiza, D-Epiblast, E-Scutellum

183. Asexual reproduction is
    (1) uncommon among single celled organism
    (2) produces morphologically but genetically dissimilar individuals
    (3) shown by members of the kingdom fungi and algae
    (4) by production of budding and gemmules in plants

184. Which of the following set of plants in monoecious in nature?
    (1) Sweat potato, *Marchantia* , *Chara*
    (2) Maize , Castor , Cucumber
    (3) Papaya , Date palm , Mulberry
    (4) Coconut , Pea, Tomato
185. Apomictic embryos in citrus arise from
    (1) paternal sporophytic tissue in ovule
    (2) antipodal cell
    (3) maternal sporophytic tissue in ovule
    (4) diploid egg

BOTANY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

186. Arrange the following seeds in order of their decreasing viability period and choose the correct option
    (1) *Phoenix, Oxalis,* Lotus, *Lupinus*
    (2) *Oxalis,* Lotus*, Phoenix, Lupinus*
    (3) *Lupinus*, *Phoenix*, Lotus, *Oxalis*,
    (4) *Oxalis*, *Lupinus*, *Phoenix*, Lotus
187. In the embryos of a typical dicot and grass plant, two homologous structures are
    (1) coleoptile and plumule
    (2) coleoptile and coleorhiza
    (3) cotyledon and scutellum
    (4) hypocotyl and radicle
188. In sugarcane, the lower ends of cuttings are often dipped in IBA prior to sowing to promote
    (1) rooting
    (2) increase in number of shoot buds
    (3) sprouting of shoot bud
    (4) none of these
189. Pick the correct match
    (1) Gemmules–Endogenous buds–archaeocytes
    (2) Zoospores–Quadriflagellate–*Ectocarpus*
    (3) *Dalbergia*–Vegetative propagation–Leaves
    (4) Mint–Vegetative propagation–bulb
190. Branched conidiophore and conidia present in chain is a feature of
    (1) *Aspergillus* & *Phytophthora*
    (2) *Aspergillus* & *Penicillium*
    (3) *Penicillium*
    (4) *Aspergillus*
191. Which of the following is mismatch pair?
    (1) *Mussaenda* – Coloured bracts
    (2) *Zostera* – Ribbon like pollen grain
    (3) *Vallisneria* – Dioecious
    (4) *Commelina*– Cleistogamous flower
192. Besides vegetative propagation, how hybrid seeds can be used year after year without segregation of hybrid characters?
    a. by making these hybrids into apomicts
    b. conservation of the seed
    c. by artificial hybridisation with desired pollen
    d. by making these plants self pollinated
    (1) a, b, d only   (2) b, c, d only
    (3) b, c only   (4) a only

193. Water hyacinth is
    (1) one of the most fast growing weed in sea water and standing water
    (2) an aquatic herb
    (3) a floating plant that drains oxygen from water
    (4) both (2) and (3)
194. Asexual reproduction differs from sexual reproduction in
    (1) being biparental
    (2) introducing variation
    (3) playing role in evolution
    (4) involving only mitotic division
195. Which type of pollination brings genetically different types of pollen grain to the stigma?
    (1) Cleistogamy   (2) Xenogamy
    (3) Autogamy   (4) Geitonogamy
196. Select the incorrect statement
    (1) Sexual reproduction is elaborate, complex and slow process
    (2) Annual & biennial plants show clear cut phases of life
    (3) Juvenile phase is of variable duration in different organisms
    (4) In animals, the juvenile phase is not followed by morphological & physiological changes prior to active reproductive behaviour
197. Which of the following structure is basis of our agricultural?
    (1) Flower   (2) seed
    (3) stem   (4) leaves
198. Select the incorrect statment regarding the given diagram.

    (1) Albuminous seed   (2) A monocot seed
    (3) Member of liliaceae (4) Exalbuminous seed
199. Which of the following is a post - fertilization event?
    (1) Gametogenesis   (2) Gamete transfer
    (3) Syngamy   (4) Embryogenesis
200. Identify the agency of pollination on basis of characters given
    a. Large amount of nectar
    b. Flowers are large but dull colored or white
    c. Flowers have a strong odour.
    (1) Bird   (2) Bat
    (3) Insect   (4) Wind

Dated :
13-5-2022

M.L. Syal's Helix Institute

S.C.O. 343-345, Top Floor, Sector 34-A, Chandigarh. Ph : 0172-2623155

XII cum Competition Course for Medical – Test -2

No.	Ans	No.	Ans	No.	Ans	No.	Ans
1.	(3)	51.	(2)	101.	(2)	151.	(2)
2.	(2)	52.	(1)	102.	(2)	152.	(2)
3.	(1)	53.	(3)	103.	(3)	153.	(3)
4.	(4)	54.	(4)	104.	(3)	154.	(1)
5.	(1)	55.	(3)	105.	(3)	155.	(3)
6.	(2)	56.	(3)	106.	(2)	156.	(2)
7.	(3)	57.	(1)	107.	(2)	157.	(4)
8.	(1)	58.	(2)	108.	(4)	158.	(4)
9.	(4)	59.	(4)	109.	(3)	159.	(4)
10.	(4)	60.	(3)	110.	(1)	160.	(4)
11.	(4)	61.	(1)	111.	(4)	161.	(3)
12.	(3)	62.	(1)	112.	(3)	162.	(4)
13.	(3)	63.	(3)	113.	(3)	163.	(2)
14.	(1)	64.	(2)	114.	(1)	164.	(1)
15.	(3)	65.	(1)	115.	(4)	165.	(1)
16.	(3)	66.	(2)	116.	(2)	166.	(1)
17.	(2)	67.	(2)	117.	(3)	167.	(3)
18.	(2)	68.	(2)	118.	(1)	168.	(3)
19.	(4)	69.	(3)	119.	(1)	169.	(3)
20.	(4)	70.	(3)	120.	(3)	170.	(3)
21.	(3)	71.	(1)	121.	(2)	171.	(2)
22.	(2)	72.	(3)	122.	(1)	172.	(2)
23.	(3)	73.	(2)	123.	(2)	173.	(3)
24.	(3)	74.	(1)	124.	(2)	174.	(2)
25.	(2)	75.	(4)	125.	(1)	175.	(1)
26.	(3)	76.	(2)	126.	(4)	176.	(4)
27.	(4)	77.	(1)	127.	(3)	177.	(3)
28.	(3)	78.	(1)	128.	(3)	178.	(2)
29.	(2)	79.	(1)	129.	(2)	179.	(2)
30.	(4)	80.	(2)	130.	(4)	180.	(2)
31.	(3)	81.	(2)	131.	(2)	181.	(2)
32.	(3)	82.	(3)	132.	(1)	182.	(2)
33.	(1)	83.	(2)	133.	(3)	183.	(3)
34.	(4)	84.	(3)	134.	(2)	184.	(2)
35.	**(2)**	85.	(1)	135.	(4)	185.	(3)
36.	(4)	86.	(1)	136.	(1)	186.	(3)
37.	(3)	87.	(2)	137.	(3)	187.	(3)
38.	(2)	88.	(4)	138.	(1)	188.	(1)
39.	(4)	89.	(2)	139.	(2)	189.	(1)
40.	(2)	90.	(4)	140.	(4)	190.	(3)
41.	(2)	91.	(3)	141.	(4)	191.	(1)
42.	(2)	92.	(1)	142.	(3)	192.	(4)
43.	(3)	93.	(3)	143.	(2)	193.	(4)
44.	(2)	94.	(3)	144.	(2)	194.	(4)
45.	(2)	95.	(3)	145.	(3)	195.	(2)
46.	(1)	96.	(4)	146.	(3)	196.	(4)
47.	(2)	97.	(1)	147.	(2)	197.	(2)
48.	(2)	98.	(4)	148.	(1)	198.	(4)
49.	(2)	99.	(3)	149.	(3)	199.	(4)
50.	(1)	100.	(2)	150.	(2)	200.	(2)

Dated :
27-05-2022

M.L. Syal's Helix Institute
S.C.O. 343-345, Top Floor, Sector 34-A, Chandigarh. Ph : 0172-2623155

MM : 720   **XII cum Competition Course for Medical**   **Time : 3 hrs.**
Test - 3

Physics	**: Electrostatics-III (Capacitance)**
Chemistry	**: Chemical kinetics**
Zoology	**: Human reproduction-III, Reproductive health**
Botany	**: Mendelian inheritance**

PHYSICS : SECTION-A

All questions are compulsory in section A

1. An isolated parallel plate capacitor of capacitance C has charges q and −q on its plates. If one of the plates is moved to double the distance between them, then work done by external force is

   (1) $\dfrac{q^2}{C}$ (2) $\dfrac{q^2}{2C}$

   (3) $\dfrac{q^2}{4C}$ (4) $\dfrac{2q^2}{C}$

2. If one of the plates of a $10\,\mu F$ capacitor charged to 50 V is earthed, the heat produced is
   (1) 12.5 mJ   (2) 25 mJ
   (3) 6.25 mJ   (4) zero

3.
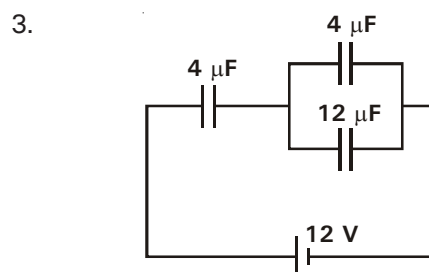
   In the circuit shown in the figure, the potential difference across the 12 μF capacitor is
   (1) 2.4 volts   (2) 9.6 volts
   (3) 3.6 volts   (4) 8.4 volts

4.
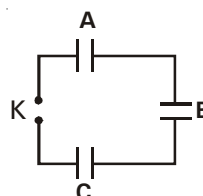
   In the above circuit, key K is open . Capacitor A of 20 µF has a charge 140 µC . Capacitors B and C of 10 µF and 40 µF capacity respectively are uncharged. When key K is closed, final potential difference on capacitor A will be
   (1) 10 V   (2) 5 V
   (3) 2 V   (4) 3. 5 V

5. Match physical quantities in column-I with their dimensions in column-II

	column-I		column-II
a.	Potential	p.	$[M^{-1}L^{-2}T^4A^2]$
b.	Capacitance	q.	$[M^1L^2T^{-3}A^{-1}]$
c.	Polarisation	r.	$[L^{-2}AT]$

   (1) a-p, b-q, c-r   (2) a-p, b-r, c-q
   (3) a-q, b-r, c-p   (4) a-q, b-p, c-r

6. A parallel plate capacitor has capacitance C. When it is one-half filled with a dielectric of dielectric constant K = 4, then percentage increase in its capacitance is
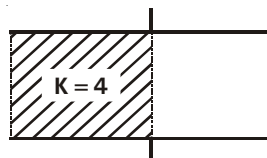
   (1) 200%   (2) 150%
   (3) 100%   (4) 50%

7. Which of the following is incorrect about polarisation?
   (1) In a non-polar molecule, the centres of positive and negative charges coincide
   (2) Non-polar molecule has no permanent dipole moment
   (3) In a polar molecule centres of positive and negative charges are always separated
   (4) Polar molecule has no permanent dipole moment

8. A parallel plate condenser is connected with the terminals of a battery. The distance between the plates is 6 mm. If a glass plate (dielectric constant K = 9) of 4.5 mm is introduced between them, then the capacity will become
   (1) 2 times   (2) same
   (3) 3 times   (4) 4 times

9.
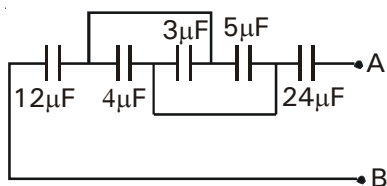
   The capacities and connection of five capacitors are shown in the above figure. Then the equivalent capacity between A and B will be
   (1) 13.6 μF   (2) 6.4 μF
   (3) 4.8 μF   (4) 9.6 μF

10. An uncharged capacitor of capacity C is charged using a battery of emf E. If heat produced in the circuit during the time capacitor charges from zero to 0.5CE is H_1 and during the time capacitor charges from 0.5CE to CE is H_2, then $H_1 : H_2 =$
    (1) 1 : 1   (2) 1 : 2
    (3) 3 : 1   (4) 2 : 1

11.
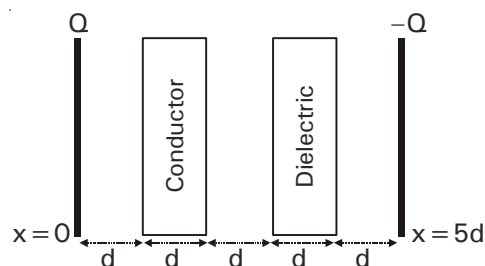
   For the above arrangement, potential versus distance graph will look like

   (1)   (2)
   (3)   (4)
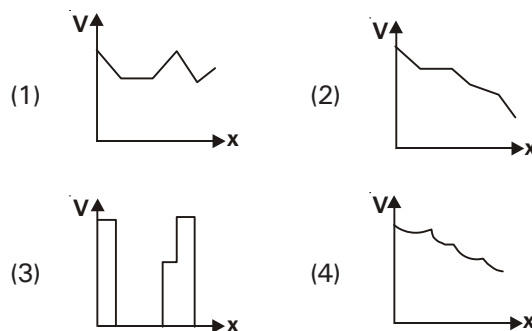
12. If a slab of material of dielectric constant K, having the same area as the plates of a parallel-plate capacitor and a thickness 0.5 d (where d is separation of the plates), is inserted between the plates, the capacitance increases by a factor of
    (1) $\dfrac{K}{K+1}$ (2) $\dfrac{2K}{K+1}$
    (3) $\dfrac{4K}{K+2}$ (4) $\dfrac{2K}{K+2}$

13.
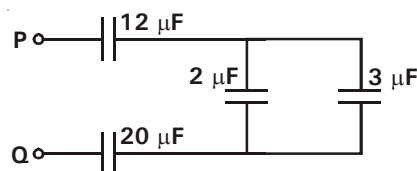
   In the circuit diagram shown in the figure, the resultant capacitance between P and Q is
   (1) 47 μF   (2) 3 μF
   (3) 60 μF   (4) 10 μF

14. n small drops of same size are charged to V volts each. If they coalesce to form a signal large drop, then its potential will be
    (1) V/n
    (2) Vn
    (3) $Vn^{1/3}$
    (4) $Vn^{2/3}$

15.

ABC
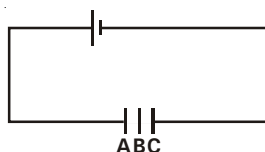
Area of each of three fixed conducting plates A, B and C is A_0, distance between A and B and that between B and C is 'd' each. EMF of battery is E. Then
    (1) energy stored in the system of capacitors is

$$0.25 \left(\frac{\varepsilon_0 A_0}{d} \right) E^2$$

    (2) energy stored in the system of capacitors if plate B is earthed will be $\left(\dfrac{\varepsilon_0 A_0}{d} \right) E^2$

    (3) both (1) and (2)
    (4) neither (1) nor (2)

16. One plate of parallel plate capacitor is smaller than other, then charge on smaller plate will be
    (1) less than other
    (2) more than other
    (3) equal to other
    (4) zero

17. Which of the following statements is false?
    (1) Three identical capacitors are combined differently. For same voltage to each combination, one that stores greatest energy is three in parallel.
    (2) The capacity of a given conductor remains same even if charge is varied on it.
    (3) The unit of relative permittivity is Farad/m
    (4) A capacitor is so configured that it confines the field lines within a small region.

18.
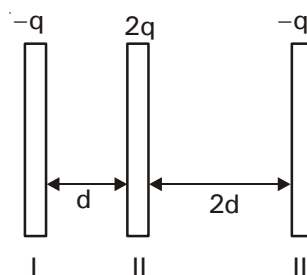
Three conducting plates of same area are given charges and fixed parallel to each other as shown. Let capacitor formed be by plate I and plate II be C_1 and that formed by plate II and plate III be C_2. Then
    (1) Energy stored in C_2 is more than that in C_1
    (2) If plates I and III are connected by a conducting wire, energy stored in C_1 will be more than that in C_2
    (3) Both (1) and (2)
    (4) Neither (1) nor (2)

19. In a spherical condenser radius of the outer sphere is R. The difference in the radii of outer and inner sphere is x. Its capacity is proportional to
    (1) $\dfrac{xR}{(R-x)}$
    (2) $\dfrac{x(R-x)}{r}$
    (3) $\dfrac{R(R-x)}{x}$
    (4) $\dfrac{R}{x}$

20. Four plates each of area A and separation d are arranged as shown. What is the magnitude of electric field between the plate 2 and 3?
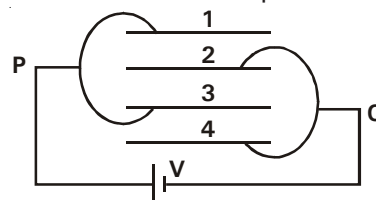
    (1) $\dfrac{4V}{d}$
    (2) $\dfrac{V}{2d}$
    (3) $\dfrac{V}{d}$
    (4) $\dfrac{2V}{d}$

21.
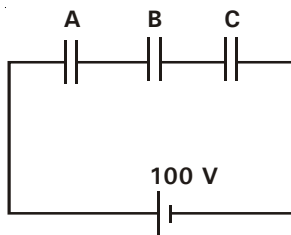
In the circuit shown, capacitor A of capacitor $10\,\mu F$ develops a potential difference of 20V. Given that capacity of capacitor C is twice that of capacitor B, capacity of B is

(1) $7.5\,\mu F$ (2) $3.75\,\mu F$

(3) $4.5\,\mu F$ (4) $3.25\,\mu F$

22. Charge on a capacitor is doubled. What happens to its capacity?

(1) It is doubled (2) It is halved

(3) Remains same (4) It is quadrupled

23.
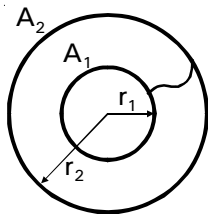
Two spherical conductors A_1 and A_2 of radii r_1 and r_2 are placed concentrically in air the two are connected by a copper wire as shown in figure. Then equivalent capacitance of system is

(1) $4\pi\varepsilon_0\dfrac{r_1 r_2}{r_2 - r_1}$ (2) $4\pi\varepsilon_0(r_1 + r_2)$

(3) $4\pi\varepsilon_0 r_2$ (4) $4\pi\varepsilon_0 r_1$

24. When the distance between the plates of a parallel plate capacitor is decreased to one-third, then the capacity is

(1) increased by 300%

(2) increased by 200%

(3) increased by 100%

(4) decreased by 33%

25.
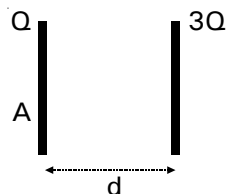
The force between the plates of the parallel plate capacitor shown above is

(1) $\dfrac{3Q^2}{2A\varepsilon_0}$ (2) $\dfrac{Q^2}{2A\varepsilon_0}$

(3) $\dfrac{Q^2}{A\varepsilon_0}$ (4) $\dfrac{Q^2}{3A\varepsilon_0}$

26. Which statement is correct w.r.t. van de Graaff generator?

a. It is used to accelerate electrons, protons and ions to high energies needed for experiments.

b. It is capable of building up fields close to the breakdown field of air

c. It can build up high voltage differences of as much as 600 million volts

(1) both a & b (2) both b & c

(3) a, b & c (4) both a & c

27. Which of the following statements is false?

(1) Radial and non-uniform electric field exists between the shells of spherical capacitor.

(2) A capacitor stores charge in electrostatic field between plates.

(3) Spherical conductor is equivalent to a spherical capacitor with it's outer sphere of infinite radius.

(4) A spherical capacitor behaves as a parallel plate capacitor if it's spherical surfaces have large radii and are close to each other.

28. The equivalent capacitance of three capacitors shown in figure is
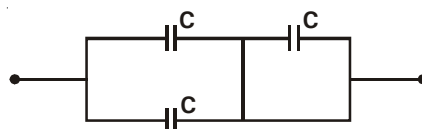
(1) $2C$ (2) $3C$

(3) $\dfrac{C}{2}$ (4) $\dfrac{2C}{3}$

29.
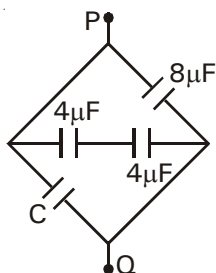
Four capacitors are connected as shown in diagram. When a battery of 12 V is connected between P and Q, the charge stored is found to be $168\,\mu C$. The value of C is

(1) $2\,\mu F$ (2) $8\,\mu F$

(3) $4\,\mu F$ (4) $16\,\mu F$

30. The capacity of parallel plate condenser depends on
   (1) The type of metal used
   (2) The thickness of plates
   (3) The potential applied across the plates
   (4) The separation between the plates

31. A capacitor of $1\,\mu F$ is charged to a potential of 50V. It is now connected to an uncharged capacitor of $4\,\mu F$. The common potential will be
   (1) 10 V   (2) 50 V
   (3) 25 V   (4) 100 V

32.
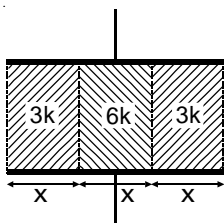
A parallel plate capacitor (capacitance C) has dielectric medium filled in it as shown. The new capacitance is

(1) 4 kC   (2) $\dfrac{2}{5}kC$

(3) 10 kC   (4) $\dfrac{kC}{10}$

33. On increasing the distance between the plates of a charged and isolated parallel plate condenser the electric intensity between the plates will
   (1) decrease   (2) increase
   (3) remain unchanged   (4) become zero

34. A thin metal plate P is inserted between the plates of a parallel plate capacitor of capacitance C in such a way that its edges touch the two plates forming Z shape as shown in figure. The capacitance now becomes
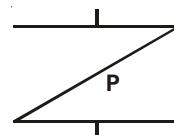
(1) $\dfrac{C}{2}$ (2) 2C

(3) zero   (4) infinity

35. The capacitance of a spherical condenser is $1\,\mu F$. If the spacing between the two spheres is 1 mm, the radius of the outer sphere is
   (1) 3 m   (2) 6 m
   (3) 3 cm   (4) 30 cm

PHYSICS : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

36. A $400\,\mu F$ capacitor is charged at a steady rate of $50\,\mu C/s$. The potential difference across the capacitor will be 10 V after an interval of
   (1) 80 s   (2) 40 s
   (3) 100 s   (4) 60 s

37. Two capacitors $C_1 = 1\,\mu F$ and $C_2 = 4\,\mu F$ are charged to a potential difference of 100 volts and 200 volts respectively. The charged capacitors are now connected to each other with terminals of opposite sign connected together. Then which of the statements is false?
   (1) Final charge on C_1 will be $140\,\mu C$
   (2) Final charge on C_2 will be $560\,\mu C$
   (3) Common potential difference will be 140 volts
   (4) None of these

5   3PCZB/HMC-8/Helix-2022

38. A 10 μF capacitor and a 20 μF capacitor are connected in series across a 200 V supply line. The charged capacitors are then disconnected from the line and reconnected with their positive plates together and negative plates together and no external voltage is applied. What is the potential difference across each capacitor

(1) $\dfrac{400}{9}$ V
(2) $\dfrac{800}{9}$ V
(3) 400 V
(4) 200 V

39.
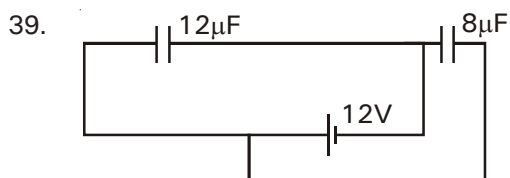
The charge supplied by the battery in the arrangement shown above is
(1) 144 μC
(2) 96 μC
(3) 240 μC
(4) 33.6 μC

40. Minimum number of capacitors of 2 μF capacitance each required to obtain a capacitor of 5 μF will be
(1) three
(2) four
(3) five
(4) six

41. A parallel plate condenser is immersed in an oil of dielectric constant 2. The field between the plates
(1) is doubled
(2) is halved
(3) becomes $\sqrt{2}$ times
(4) becomes $\dfrac{1}{\sqrt{2}}$ times

42. 4 identical capacitors are connected in series with a 10 V battery as shown. The point N is earthed. The potentials of points A and B are
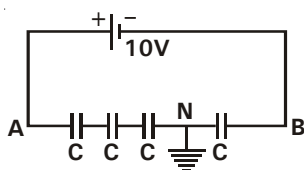
(1) 10 V, 0 V
(2) 7.5 V, −2.5 V
(3) 5 V, −5 V
(4) 7.5 V, 2.5 V

43. Two identical capacitors are connected in parallel across potential difference V. After they are fully charged, positive of first capacitor is connected to negative of second & negative of 1st is conn-ected to positive of other. Loss of energy will be

(1) $\dfrac{1}{2}CV^2$
(2) CV^2
(3) $\dfrac{1}{4}CV^2$
(4) Zero

44.
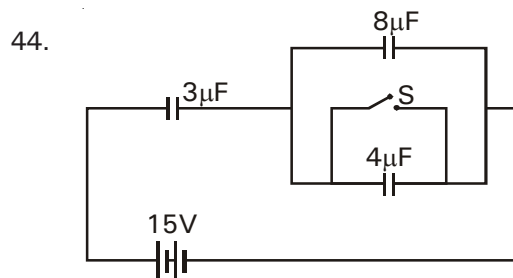
Consider the circuit shown in figure. After switch(S) is closed, the amount of charge that flows through the battery is
(1) 8 μC
(2) 15 μC
(3) 12 μC
(4) 9 μC

45.
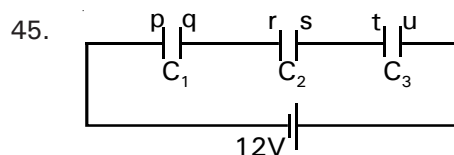
Three capacitors of capacitance 20 μF, 40 μF and 40 μF respectively are connected to a battery as shown. The charge accumulated on different plates will satisfy
(1) $q_p + q_r + q_s = -120\,\mu$C
(2) $q_p + q_r + q_u = 240\,\mu$C
(3) $q_p + q_r + q_u = -240\,\mu$C
(4) $q_r + q_s + q_u = -60\,\mu$C

46. The capacity of a condenser is 4×10^{-6} farad and its potential is 100 volts. The energy released on discharging it fully will be
(1) 0.02 J
(2) 0.04 J
(3) 0.025 J
(4) 0.05 J

47. The effective capacitance of the combination is
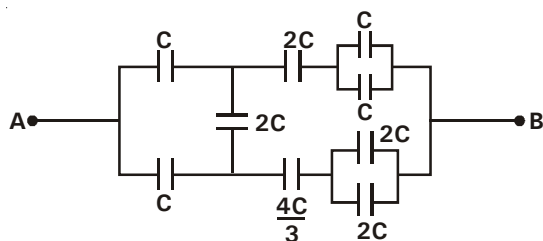
  (1) 2C (2) C/2
  (3) C   (4) 3C/4

48. The plates of a parallel-plate capacitor are maintained at constant voltage by a battery as they are pulled apart. The strength of the electric field between the plates during this process
  (1) increases
  (2) decreases
  (3) remains constant
  (4) becomes zero

49. The electric field at which the dielectric of a condenser fails is called
  (1) dielectric constant
  (2) dielectric strength
  (3) dielectric resistance
  (4) relative permitivity

50. Four metallic plates each with a surface area A of one side are placed at a distance 'd' from each other. The plates are connected as shown in the Figure. Then the capacitance of the system between 'a' and 'b' is
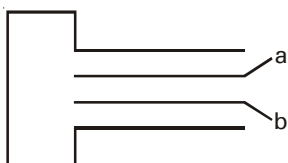
  (1) $\dfrac{3\varepsilon_0 A}{d}$ (2) $\dfrac{2\varepsilon_0 A}{d}$

  (3) $\dfrac{2\varepsilon_0 A}{3d}$ (4) $\dfrac{3\varepsilon_0 A}{2d}$

CHEMISTRY : SECTION-A

All questions are compulsory in section A

51. For the reaction $2A + B \rightarrow 3C + D$ which of the following does not express the reaction rate ?

  (1) $-\dfrac{d[C]}{3dt}$ (2) $-\dfrac{d[B]}{dt}$

  (3) $\dfrac{d[D]}{dt}$ (4) $-\dfrac{d[A]}{2dt}$

52.
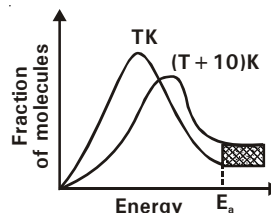
The shaded area shows
  (1) Energy of activation
  (2) Fraction of additional molecules which react at $(T+10)K$
  (3) Total fraction of molecules which react at $(T+10)$ K
  (4) Total kinetic energy possessed by molecules
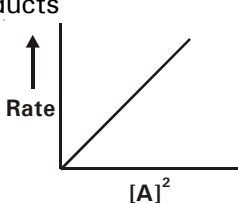
53. Which of the following statement is true?
  (1) Catalyst increases the rate by increasing activation energy
  (2) Rate of reaction remains independent with concentration of reactant for zero order reaction
  (3) With the increase in temperature, rate constant mainly increases due to increase in collision frequency
  (4) With the increase in temperature, rate constant increases because E_a decreases with increase in temperature

54. If the value of rate constant of a reaction is 2×10^{-3} sec^{-1} then reaction will be
  (1) 1st order (2) zero order
  (3) 2nd order (4) 3rd order

55. 75% of a first order reaction was completed in 32 min. When will 90% of the reaction complete?
  (1) 52.8 min (2) 46.2 min
  (3) 49.5 min (4) 48 min

56. Which of the following factor does not affect the rate of a non gaseous reaction?
    (1) Pressure   (2) Temperature
    (3) Concentration (4) Catalyst

57. Which of the following rate equations show zero order?
    (1) $k[A]^{3/2}[B]^{-1}[C]^{1/2}$ (2) $k[A]^2[B]$
    (3) $k[A]^{1/2}[B]^{1/2}[C]^{-1}$ (4) $k[A]^\circ[B]^2$

58. For the first order reaction, if rate constant is $10^{-2}\,sec^{-1}$ then average life for the given reaction is
    (1) 69.3 sec   (2) 100 sec
    (3) 138.6 sec   (4) 200 sec

59. The time required for completion of zero order reaction is
    (1) $\dfrac{[A_0]}{k}$ (2) $\dfrac{[A_0]}{2k}$
    (3) $\dfrac{0.693}{k}$ (4) infinite

60. For the following first order reaction
    $$SO_2Cl_2(g) \rightarrow SO_2(g) + Cl_2(g).$$
    Initial pressure was 0.5 atm and total pressure after 100 seconds was 0.8 atm. The rate constant is
    (1) $2 \times 10^3\,sec^{-1}$ (2) $9 \times 10^{-3}\,sec^{-1}$
    (3) $10^{-5}\,sec^{-1}$ (4) $5 \times 10^{-2}\,sec^{-1}$

61. The role of a catalyst is to change
    (1) gibbs energy of reaction
    (2) enthalpy of reaction
    (3) activation energy of reaction
    (4) equilibrium constant

62. Which among the following represents the fastest reaction?
    (1) Rxn-I : $k = 10^4$ (2) Rxn-II : $k = 10^3$
    (3) Rxn-III : $k = 10^{-2}$ (4) Rxn-IV : $k = 1$

63. In the following consecutive reactions.

    A $\xrightarrow{k = 2 \times 10^{-4}\,min^{-1}}$ B $\xrightarrow{k = 6 \times 10^{-6}\,min^{-1}}$ C
    D $\xleftarrow{k = 3 \times 10^{-3}\,min^{-1}}$

    Which of the following steps is the rate determining step?
    (1) A $\rightarrow$ B   (2) B $\rightarrow$ C
    (3) C $\rightarrow$ D   (4) A $\rightarrow$ D

64. For a first order reaction, if half life of the reaction gets doubled due to change in temperature, then the factor by which rate constant is affected ?
    (1) 2   (2) $\dfrac{1}{2}$
    (3) 3   (4) $\dfrac{1}{3}$

65. The half life for radioactive decay of ^{14}C is 5730 years. An archaeological artifact containing wood had only 25% of the ^{14}C found in a living tree. The approximate age of the sample is
    (1) 5730 years   (2) 3730 years
    (3) 11460 years   (4) 2845 years

66. For a chemical reaction $A \rightarrow P$; the rate constant(k) is found to fit the following equation :
    $$\log K(min^{-1}) = 20 - \frac{6600}{T}$$
    Choose the correct statements for the reaction
    a. the reaction follow first order kinetics
    b. activation energy of reaction is nearly 55 kJ
    c. half-life of reaction at 300 K is 69.30 min
    d. the lower limit of half-life is 6.93×10^{-21} min
    (1) a & b   (2) a, c & d
    (3) a, b & c   (4) a, b, c & d

67. Consider the following information regarding a first order reaction
    graph I $\rightarrow$ $\ln k$ vs $\dfrac{1}{T}$
    graph II $\rightarrow$ $\log k$ vs $\dfrac{1}{T}$
    where k is velocity constant and T is the temperature. Identify the incorrect statement(s)
    a. Slopes of both graphs are equal
    b. Intercept of both graphs are equal
    c. Slope of graph I is positive
    d. Intercept of graph II is logarithm of Boltzmann factor
    (1) c & d only   (2) b & d only
    (3) a, b & c   (4) a, b, c & d

68. Which of the following is/are correct for decomposition of N_2O_5 (g)?
   a. Half life period is independent of initial concentration
   b. Changing the units of concentration does not change the value of rate constant
   c. Half life period × Rate constant = 0.693
   d. Average life period is independent of initial concentration
   (1) both a & b
   (2) both b & c
   (3) a, c & d
   (4) a, b, c & d

69. The following graph is observed for a reaction

   $2A \rightarrow$ products

   The slope of the given graph is
   (1) k(1st order)
   (2) k(zero order)
   (3) k (2nd order)
   (4) k(3rd order)

70. $X \rightarrow$ products (1st order)

   $Y \rightarrow$ products (1st order)

   Initial concentration of X is 8M and that of Y is 1M . If both reactions start at the same time and in 't' minutes the final concentration of X becomes half of final concentration of Y ($t_{1/2}$ of X and Y respectively are 2 minutes and 4 minutes), then 't' is
   (1) 16
   (2) 15
   (3) 8
   (4) 32

71. At room temperature the reaction between NO and O_2 to give NO_2 is fast, while that between CO and O_2 to give CO_2 is slow. It is due to
   (1) CO is smaller in size than that of NO
   (2) CO is poisonous
   (3) The activation energy for the reaction $2NO + O_2 \rightarrow 2NO_2$ is less than that of the reaction $2CO + O_2 \rightarrow 2CO_2$
   (4) All of above

72. The rate constant for the reaction, $2N_2O_5 \rightarrow 4NO_2 + O_2$ is 3×10^{-5} sec^{-1}. If the rate is 2.40×10^{-5} mol litre^{-1} sec^{-1}, then the concentration of N_2O_5 (in mol litre^{-1}) is
   (1) 1.4
   (2) 1.2
   (3) 0.04
   (4) 0.8

73. What is true regarding the following reaction?

   $2H_2O_2 \xrightarrow{I^-} 2H_2O + O_2$
   (1) It is an elementary reaction
   (2) Molecularity of the reaction is 1
   (3) Rate of the reaction depends on concentration of I^-
   (4) Both (1) &(3)

74. The number of radioactive nuclei left is maximum after
   (1) t_{av}
   (2) $t_{3/4}$
   (3) $t_{1/2}$
   (4) $t_{1/8}$

75. Select the rate law that corresponds to data shown for reaction : $A + B \rightarrow$ Products

Exp.	[A]	[B]	initial rate
1	0.012	0.035	0.1
2	0.024	0.070	0.8
3	0.024	0.035	0.1
4	0.012	0.070	0.8

   (1) rate = k $[B]^3$
   (2) rate = k $[B]^4$
   (3) rate = k $[A][B]^3$
   (4) rate = k $[A]^2[B]^2$

76. If a reaction has pre-exponential factor equal to 10^{20} then the hypothetical value of rate constant at temperature equal to ∞ is
   (1) 10^{-20}
   (2) 10
   (3) 20
   (4) 10^{20}

77. Which of the following will burn most rapidly?
   (1) Liquid alcohol
   (2) Vaporized alcohol
   (3) Solid alcohol
   (4) All burn at the same rate

78. The half-life periods of decomposition of PH_3 for different initial pressures are given below

p(torr.)	707	79	37.5
$t_{1/2}$(min.)	84	84	84

The order of the reaction is
(1) 1
(2) zero
(3) 1/2
(4) 2

79. $2NO + Br_2 \rightarrow 2NOBr$ follows the mechanism given below.

I. $NO + Br_2 \rightleftharpoons NOBr_2$ (fast)

II. $NOBr_2 + NO \rightarrow 2NOBr$ (slow)

If concentrations of both NO and Br_2 are doubled, then the rate of reaction would become
(1) 4 times
(2) 2 times
(3) 8 times
(4) 6 times

80. In a first order reaction the value of $a/(a-x)$ was found to be 8 after 10 minute. The rate constant is
(1) $(2.303 \times 3\log 2)/10$
(2) $(2.303 \times 2\log 3)/10$
(3) $10 \times 2.303 \times 2\log 3$
(4) $10 \times 2.303 \times 2 \times 3\log 2$

81. Chemical reaction $2O_3 \rightarrow 3O_2$ proceeds as follows:

$O_3 \rightleftharpoons O_2 + O$(fast)

$O + O_3 \rightarrow 2O_2$(slow). Rate law expression is
(1) $r = k[O_3]^2$
(2) $r = k[O_3]^2[O_2]^{-1}$
(3) $r = k[O_3][O_2]$
(4) unpredictable

82. Order of a reaction
(1) is an experimental quantity
(2) is applicable to elementary as well as complex reactions
(3) is given by the slowest step for complex reactions
(4) all of these

83. Mark the correct statement about given graph
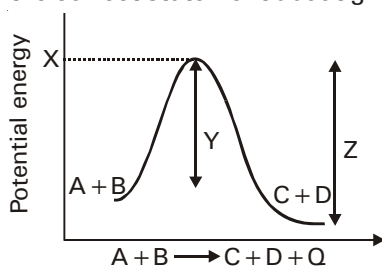
(1) X is threshold energy
(2) Y and Z are energy of activation for forward and backward reaction respectively
(3) Q is heat of reaction and reaction is exothermic
(4) all of these

84. **Assertion :** For a zero order reaction, rate of reaction in independent of conc. of reactants.
Reason : For a zero order reaction, reaction proceeds at a constant rate which is equal to rate constant of the reaction.
(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Assertion is false

85. The value of rate constant of a pseudo first order reaction
(1) depends on the concentration of reactants present in small amount.
(2) depends on the concentration of reactants present in excess.
(3) is independent of the concentration of reactants.
(4) depends only on temperature.

CHEMISTRY : SECTIION-B

This section has 15 questions, attempt any 10 questions of them.

86. For a reaction $A + B \rightarrow C + D$, if the concentration of A is doubled without altering the concentration of B the rate gets doubled. If the concentration of B is increased by 9 times without altering the concentration of A, the rate gets tripled. The order of the reaction is
(1) 2
(2) 1
(3) $\dfrac{3}{2}$
(4) $\dfrac{4}{3}$

87. Which of the following is correct about collision theory of reaction rates?
(1) It assumes that the reactants must be in correct orientation to react
(2) It says rate depends upon the frequency at which reactants collide
(3) The collisions having energy higher than the threshold value give successful reactions
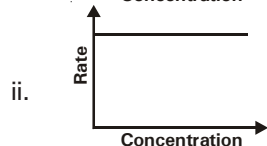(4) All are correct

88. Match the graph given in Column I with the order of reaction given in Column II.

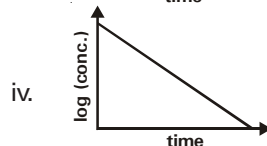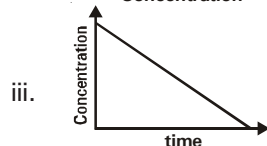**Column-I**

i.

ii.

iii.

iv.

Column-II
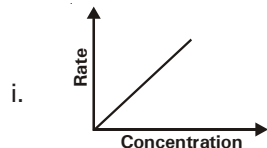
a. First order

b. Zero order

(1) i-b, ii-a, iii-b, iv-a   (2) i-a, ii-a, iii-b, iv-b
(3) i-a, ii-b, iii-b, iv-a   (4) i-b, ii-b, iii-a, iv-a

89. If the activation energy for the forward reaction is x KJ/mol and that of the reverse equation is 260 KJ/mol, ΔH for the reaction is 110 KJ/mol. Then 'x' is
(1) 110 KJ/mol   (2) 230 KJ/mol
(3) 410 KJ/mol   (4) 370 KJ/mol

90. Consider the Arrhenius equation given below and mark the correct option.

$$K = A\, e^{-E_a/RT}$$

(1) Rate constant increases exponentially with increasing activation energy and decreasing temperature.
(2) Rate constant decreases exponentially with increasing activation energy and decreasing temperature.
(3) Rate constant increases exponentially with decreasing activation energy and decreasing temperature.
(4) Rate constant increases with decreasing activation energy & decreasing temperature.

91. Half life of a certain radioactive element is such that 7/8 of a given quantity decays in 12 days. The time in which initial concentration reduced to 20% is
(1) 4 days   (2) 9.3 days
(3) 64 days   (4) 3.2 days

92. The unit of rate constant for the reaction obeying rate expression, $r = K[A]^1 [B]^{2/3}$ is
(1) $Mol^{-2/3}$ litre$^{2/3}$ time^{-1}
(2) $Mol^{-2/3}$ litre$^{-2/3}$ time^{-1}
(3) $Mol^{-5/3}$ litre$^{5/3}$ time^{-1}
(4) none of the above

93. A homogenous catalytic reaction can take place through three alternative paths by using 3 different catalysts P, Q, R as shown below
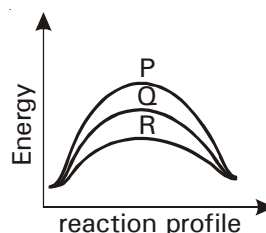
The order of catalytic efficiency of P, Q, R would be
(1) P > Q > R
(2) Q > P > R
(3) R > Q > P
(4) P = Q = R (as initial and final states are same)

94. Identify the true statement about rate of reaction
(1) It may depend on concentration of one or more reactants and products
(2) It generally decreases with the passage of time
(3) It depends on temperature and presence of catalyst
(4) All of these

95. For a zero order reaction
(1) the reaction rate is double when the initial concentration is doubled
(2) the time for half change is doubled when initial concentration is doubled
(3) the time for half-change is independent of the initial concentration
(4) the time for completion of the reaction is independent of the initial concentration

96. $2NO + O_2 \rightarrow 2NO_2$

For the above single step reaction, the volume is reduced to half by increasing the pressure on it. The ratio of final to initial rate of reaction is
  (1) 4 : 1   (2) 8 : 1
  (3) 1 : 8   (4) 1 : 4

97. A graph of ln k vs $\left(\dfrac{1}{T}\right)$ has slope equal to

  (1) $-\dfrac{E}{2.303R}$ (2) $+\dfrac{E_a}{R}$

  (3) $-\dfrac{E_a}{2.303R}$ (4) $-\dfrac{E_a}{R}$

98. In the first order reaction
  A $\rightarrow$ product
  If we start with 10 M of A, then after one average life period, concentration of A decreases to
  (1) 5 M   (2) 2.5 M
  (3) 3.7 M   (4) 6.3 M

99. A first order reaction is 50% completed in 1.26×10^{14} s. How much time would it take for 100% completion?
  (1) 1.26×10^{15} s   (2) 2.52×10^{14} s
  (3) 2.52×10^{28} s   (4) Infinite

100. Bicyclohexane was found to undergo two parallel first-order rearrangements. At 730 K, the first-order rate constant (k_1) for the formation of cyclohexane was measured as 1.26×10^{-4} s^{-1} and for the formation of methyl cyclopentene the rate constant (k_2) was 3.8×10^{-5} s^{-1}. What was the percentage distribution of cyclohexane?
  (1) 76.8%   (2) 78.6%
  (3) 67.6%   (4) 87.8%

ZOOLOGY : SECTION-A

All questions are compulsory in section A

101. Amniocentesis can not be used to detect
  (1) Down's syndrome   (2) Gender of the fetus
  (3) Cleft palate   (4) Haemophilia

102. Germ layer that differentiates towards blastocoel is
  (1) ectoderm   (2) hypoderm
  (3) endoderm   (4) mesoderm

103. In how many of the following techniques associated with ART, does fertilization occur in the fallopian tube ?
  ICSI, IUI, Test-tube baby, GIFT
  (1) One   (2) Two
  (3) Three   (4) Four

104. Which of the following hormones are produced only during pregnancy?
  (1) hCG, hPL, relaxin
  (2) progesterone, hCG, relaxin
  (3) hCG, prolactin, relaxin
  (4) hCG, prolactin hPL

105. Which of the following statement is correct?
  (1) Mesoderm is the first layer formed during embryonic development
  (2) Foetal ejection reflex is induced by mild uterine contractions
  (3) Exchange of maternal & foetal blood occurs in umbilical cord
  (4) High level of HCG stimulate synthesis of estrogen and progesterone

106. In the table given below, select & enter one correct device from the following
  a–periodic abstinence, b–tubectomy, c–Multiload 375, d–vaults, e–lactational amenorrhoea

Method of birth control	Device
IUD	
Surgical	

  (1) a and b   (2) c and e
  (3) c and b   (4) b and d

107. Identify two correctly labelled parts
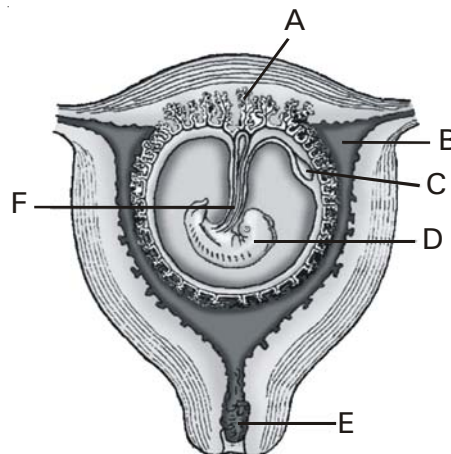
  (1) A –Villi, B– Uterine cavity
  (2) F–Umbilical cord, E–Cervical plug
  (3) C–Yolk sac, D–Embryo
  (4) All of these

108. Why is uterine endometrium not shed when implantation occurs?
  (a) Embryo produces progesterone
  (b) hCG from trophoblast takes over function of LH
  (c) Progesteron does not give a negative feedback
  (d) LH continues to be produced
  (1) b & c   (2) b & d
  (3) a & c   (4) b only

109. Process of parturition is induced by a complex neuro endocrine mechanism which involves all the below given hormones except
  (1) cortisol   (2) prolactin
  (3) estrogen   (4) oxytocin

110. **Assertion :** Cervical caps and vaults prevent conception by blocking the entry of sperms through the cervix.

  Reason : Cervical caps and vaults are disposable barriers, made of rubber that are inserted into female gential tract to keep the cervix covered during coitus.

  (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion

  (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion

  (3) Assertion is true statement but Reason is false

  (4) Assertion is false

111. Identify the correct statement

  a. The most commonly used contraceptive in India is IUD

  b. It is not essential for a surrogate mother to be a non smoker

  c. IMR and MMR can be used to indicate state of reproductive health of citizens of a country

  d. All barrier methods of contraception prevent insemination.

  (1) a, b, c & d

  (2) a & c but not b & d

  (3) a, b & d but not c

  (4) b, c & d but not a

112. Among the following single use of which contraceptive device/method provides contraception for maximum duration

  (1) cervical cap with spermicide of jellies

  (2) non-steroidal pills

  (3) IUD

  (4) lactational amenorrhoea

113. How many of the following steroidal hormones produced by placenta play a role in parturition?

  Estrogen, relaxin, cortisol, oxytocin, prolactin, ACTH

  (1) 4   (2) 1

  (3) 2   (4) 5

114. **Assertion :** Prostaglandins or oxytocin may be used to induce parturition.

  Reason : Prostaglandins and oxytocin cause smooth muscle contraction in uterus and can set up a stimulatory reflex between uterine contraction and oxytocin secretion.

  (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion

  (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion

  (3) Assertion is true statement but Reason is false

  (4) Assertion is false

115. Match the column-I and column-II

Column-I	Column-I
a. Barrier method not protecting against STDs	i. Lippes loop
b. Non-steroidal IUD	ii. LNG-20
c. Steroidal contraceptive	iii. Diaphragm
d. Barrier method used by males.	iv. Condom

  (1) a–ii, b–iii, c–iv, d–iii

  (2) a–iii, b–i, c–ii, d–iv

  (3) a–iv, b–ii, c–i, d–iii

  (4) a–iii, b–ii, c–i, d–iv

116. ART can help a man with low sperm count to have his own child through

  (1) ICSI   (2) A.I.

  (3) GIFT   (4) ZIFT

117. How many of the following oral devices are likely to thicken cervical mucus making cervix hostile to sperms?

  Saheli, LNG-20, Implants, Contraceptives pills, Multiload 375, Progestestart.

  (1) One   (2) Three

  (3) Four   (4) Five

118. Which of the following group contain hormone based contraceptive measures?

  (1) Progestasert, Cervical caps, Foams, Condoms

  (2) LNG-20, Implant, Pills, Injections

  (3) Cu7, Multiload 375, LNG-20 pills

  (4) Injections, Implants, Lippes Loop, Progestasert

119. The following structure is used to prevent conception by

  (1) avoiding physical meeting of gametes

  (2) avoiding chances of meeting of gametes

  (3) blocking transport of gametes

  (4) inhibiting gamete production

120. A female started with her menstrual cycle on 11th of a month. What would be the best time to start on oral contraceptive pills?

  (1) From 22nd to 26th to prevent ovulation

  (2) From 11th to 15th

  (3) From 16th to 20th

  (4) There is no fixed schedule, she can start ant time

121. Amnion is an extra-embryonic membrane which develops during the embryonic development in

  (1) butter fly   (2) pigeon

  (3) frog   (4) shark

122. **Statement I** : Interdigitation of chorionic villi and endometrial tissue forms an intimate connection between foetus and maternal body.

    Statement II : Placenta acts as an ultrafilter that supplies deoxygenated blood along with nutrients to foetus.
    (1) Statement-I is correct, statement-II is incorrect.
    (2) Statement-I is incorrect, statement-II is correct.
    (3) Both Statements are correct.
    (4) Both Statements are incorrect.

123. Which of the following is incorrect ?
    (1) Removal of ovaries can lead to cardiovascular diseases and dementia
    (2) MTP can be done in certain cases upto 24 weeks by consent of two registered medical practitioners
    (3) Removal of gonads can have adverse effects on body
    (4) IUDs used within 72 days of coitus are very effective as emergency contraceptive

124. A contraceptive pill prevents ovulation by
    (1) blocking fallopian tubes
    (2) inhibiting release of FSH and LH
    (3) stimulating release of FSH and LH
    (4) causing immediate degeneration of released ovum

125. Which of the following contraceptive method will be applicable to only females?
    (1) Vaults, Diaphragm and Tubectomy
    (2) Condoms, Vaults and Vasectomy
    (3) Condoms and Vasectomy
    (4) Vasectomy only

126. Creating awareness about various aspects of reproductive health can help remove misconceptions like
    a. A torn hymen in a female indicates previous sexual experience
    b. Gender of a baby is determined by the female parent
    c. MTPs are legal in India
    (1) a, b & c   (2) a & b
    (3) a & c   (4) b & c

127. If female reproductive tract is ligated at fallopain tube then
    (1) Activity of prostaglandin at uterus is inhibited
    (2) Fusion of sperm & ova can not take place
    (3) No movement of fimbriae and cilia of oviduct
    (4) All of the above are correct

128. Which of the following can be considered as temporary endocrine structures?
    (1) Placenta   (2) Corpus luteum
    (3) Ovary   (4) Both (1) & (2)

129. Transfer of an ovum collected from a donor into the fallopian tube of another female who cannot produce one, but can provide suitable environment for fertilisation and further development is
    (1) GIFT   (2) ZIFT
    (3) ICSI   (4) IUI

130. Identify the incorrect match
    (1) IUD - least popular in India
    (2) Vasectomy- poor reversibility
    (3) Coitus interruptus- high chances of failure
    (4) Saheli - developed by CDRI, Lukhnow

131.

    Which of the following is/are correct w.r.t. given figure?
    (1) Release hormones that have intracelluar receptors.
    (2) They cause ovulation and implantation
    (3) Their effective periods are much shorter than oral contraceptives
    (4) All of these

132. Identify the true statement
    (1) Abortions could happen spontaneously too
    (2) Infertility is always due to abnormality in female partner
    (3) Intense lactation can help as natural method of birth control without fail
    (4) Family planning programme was initiated in the year 1952

133. Which is true for a vasectomised male?
    (1) Semen will be without sperm
    (2) Testosterone will not be transported
    (3) Disturbance in steroidal hormone functioning
    (4) Both (1) & (2)

134. Which of these is feature(s) of foetus observed only after the first movements of foetus are felt
    a. eyelids have separated
    b. major organ systems are formed
    c. limbs are formed
    d. external genitalia are formed
    (1) a, b, c & d   (2) a & c
    (3) b & d   (4) a only

135. Sperms were deposited in vagina of female but the female did not get pregnant because
    (1) The couple could be following rhythm method
    (2) Female may be using cervical caps
    (3) Female may be using IUDs
    (4) Any of these

ZOOLOGY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

136. Correct procedure for test tube baby program for implantation to be done in more than 8 cell stage
    (1) IVF & IUI
    (2) IVF & ZIFT
    (3) IVF & GIFT
    (4) IVF & IUT

137. Find the correct option to fill in the blanks
    a. In vitro-fertilization followed by _____ is one of the ART method
    b. IVF–ET is popularly known as _____
    c. In ZIFT, egg from wife and sperms from husband are induced to form zygote in _____
    (1) IUT, test tube body programme, fallopian tube
    (2) ET, test tube baby programme, in lab conditions
    (3) ZIFT, ART, in fallopian tube
    (4) IUI, ART, in lab conditions.

138. The method of directly injecting a sperm into ovum in assisted by reproductive technology is called
    (1) GIFT
    (2) ZIFT
    (3) ICSI
    (4) ET

139. Identify incorrect statement
    (1) Teratogens cause abnormal development of foetus
    (2) Amniotic fluid prevents embryo from dehydration
    (3) High levels of steroid hormones in maternal blood towards end of pregnancy are produced by ovary
    (4) In initial stages of pregnancy, progesteron is produced by corpus luteum

140. Which of the following extra embryonic membrane acts as a temporary site of haematopoeisis in human beings?
    (1) Allantois
    (2) Amnion
    (3) Yolk sac
    (4) Chorion

141. Choose the incorrect statement
    (1) Chorionic villi are surrounded by uterine tissue and maternal blood
    (2) Placenta is connected to embryo through umblical cord which is maternal part of placenta
    (3) Finger like projections on trophoblast are called chorionic villi
    (4) Level of prolactin, thyroxine and cortisol increases during pregnancy

142. Condoms are one of the most popular contraceptives becuase of the following reasons
    (1) These are effective barriers for insemination
    (2) They do not interfere with coital act
    (3) These help in reducing the risk of STDs
    (4) All of the above

143. The factor(s) for population growth in India is/are
    (1) high birth rate
    (2) low death rate
    (3) lack of education
    (4) all of these

144. Which among the following is a correct match?

	Source	Hormones	Exception
(1)	Placenta	hCG, hPL, progesterone, estrogen, oxytocin	Oxytocin estrogen
(2)	Ovary	Estrogen, progesterone, relaxin	Progesterone
(3)	Pregnant female	Cortisol, thyroxine, prolactin secretions more	Cortisol
(4)	Corpus luteum	Progesterone, estrogen, oxytocin	Oxytocin

145. Choose the correct statement
    (1) Amniocentesis is generally performed for all pregnant women around 20 weeks of gestation
    (2) Main purpose of amniocentesis is to determine whether foetus is still alive and growing
    (3) Amniocentesis can help detect genetic disorders in foetus when it is still in the womb of mother
    (4) Amniocentesis is post natal diagnostic technique to find out genetic disorders

146. Mark the odd one out of each list
    a. CuT, Multiload 375, LNG-20
    b. IUT, ZIFT, IUI
    c. Hysterectomy, tubectomy, vasectomy
    (1) CuT, GIFT, vasectomy
    (2) Multiload 375, GIFT, Hysterectomy
    (3) LNG-20, IUI, Hysterectomy
    (4) CuT, IUI, vasectomy

147. A weekly oral contraceptive is
    (1) LNG-20
    (2) Multiload 375
    (3) Saheli
    (4) Progestasert

148. What is true for monozygotic twins?
    (1) Develop from one zygote formed by fusion of oocyte and 2 sperms
    (2) Develop from one zygote formed by union of 1 oocyte and 1 sperm
    (3) Have different gender
    (4) Show 50% similar genetic material

149. Which of the following is correct match for IUDs?
    (1) Lippes loop – Cu^{2+} releasing
    (2) Multiload 375 – non medicated
    (3) LNG-20 – hormone releasing
    (4) Progestasert – barrier acting

150. Which of these correctly describes periodic abstinence (if menstrual cycle is 28 day long) ?
   (1) Couples abstain from coitus from day 10 to 17 of menstruation cycle
   (2) Couples abstain from coitus from day 14 to 28 day of menstruation cycle
   (3) Couples abstain from coitus from day 1 to 7 of menstruation cycle
   (4) Couples abstain from coitus only from day 10 to 12 of menstruation cycle

BOTANY : SECTION-A

All questions are compulsory in section A

151. Which of the following features of pea plant expresses itself both in homozygous as well as heterozygous condition?
   a. Wrinkled seed   b. Axillary flower
   c. Green pod   d. Constricted pod
   Choose correct answer
   (1) a & b   (2) b & c
   (3) c & d   (4) b & d

152. If F_2 dwarf plant is self pollinated, the result will be
   (1) tall : dwarf in a ratio of 1 : 1
   (2) tall : dwarf in a ratio of 3 : 1
   (3) all tall
   (4) all dwarf

153. What gave greater credibility to the data that Mendel collected?
   (1) The selection of pea plant
   (2) Large sampling size
   (3) Applying mathematical logic in solving problems in biology
   (4) Applying statistical analysis

154. Which of the following will produce 4 types of gametes?
   (1) AaBB   (2) MmNNGg
   (3) XXYY   (4) YyTT

155. Enough crosses are made between male flies of the genotype 'Aa' and the female flies of genotype 'aa' to produce about 1000 offsprings. Which one of the following is the most likely distribution of genotype in the offsprings ?
   (1) 750 Aa : 250 aa
   (2) 481 Aa : 519 aa
   (3) 249 aa : 751 aa
   (4) 243 AA : 517 aa : 240 aa

156. Well known Indian breeds e.g. Sahiwal cows of Punjab were developed from wild ancestral cows by
   (1) clonal propagation
   (2) artificial selection and domestication
   (3) mutation and selection
   (4) genetic engineering

157. Who coined the term Genetics for the science of heredity and variation?
   (1) Mendel   (2) Johanssen
   (3) Bateson   (4) Punnett

158. Select the correct statement

(1) In monohybrid cross, two pairs of characters are considered
(2) Every test cross is back cross but every back cross is not a test cross
(3) Every back cross is test cross
(4) Back cross is a type of reciprocal cross

159. Reciprocal crosses are done to know
   (1) the effect of sex on character transmission
   (2) the effect of hybrid on the progeny
   (3) the effect of dominant trait
   (4) result of monohybrid cross

160. Two hybrid tall plants are crossed producing 400 plants. Of these how many are tall plants?
   (1) 200   (2) 275
   (3) 75   (4) 300

161. Formula used for calculating the type of genotypes in F_2 generation is
   (1) 2^n (2) 3^n
   (3) 4^n (4) $(gamete)^2$

162. Match the column-I with column-II

	Column-I		Column-II
a.	Genotype	i.	Inheritance of one gene
b.	Emasculation	ii.	Genetic consitution of an organism
c.	Monohybrid	iii.	Pair of alleles controlling contrasting traits
d.	Heterozygous	iv.	Removal of stamens of a bisexual flower

   (1) a–(iii); b–(ii); c–(i); d–(iv)
   (2) a–(ii); b–(iv); c–(i); d–(iii)
   (3) a–(ii); b–(i); c–(iv); d–(iii)
   (4) a–(iii); b–(ii); c–(iv); d–(i)

163. The production of gametes by the parents, formation of zygotes, the F_1 and F_2 plants, can be understood from a diagram called
   (1) Bullet square   (2) Punch Square
   (3) Punnett square   (4) Net square

164. Which of the following feature is explained by law of segregation?
   (1) Factors of one character segregate independent to factor of other character
   (2) Each individual carry two factors for a character
   (3) In a dissimilar pair of factors, one factor dominates the other
   (4) Gametes are pure for its trait

165. How many plants in F_2 generation of a dihybrid cross have both dominant traits?
   (1) $\dfrac{4}{16}$ (2) $\dfrac{1}{16}$
   (3) $\dfrac{3}{16}$ (4) $\dfrac{9}{16}$

166. Which law is used to explain the expression of only

one of the parental characters in F_1 generation of monohybrid cross and expression of both in the F_2, also explaining the proportion of 3 : 1 in F_2.
- (1) postulate of paired factros
- (2) law of independent assortment
- (3) law of dominance
- (4) law of purity of gametes

167. How many of the following are recessive traits of pea plant studied by Mendel in his experiments? Green seeds, Green pod, Terminal flower, Tall plant, Inflated pod, Wrinkled seeds, Violet flower
- (1) 2   (2) 3
- (3) 4   (4) 1

168. In F_2 progeny of a monohybrid cross, the resultant zygotes can be of genotypes 1AA : 2Aa: 1aa. This occurs as a result of
- (1) meiosis   (2) mitosis
- (3) random fertilisation (4) dominance

169. Mendel selected Pea plant for his experiments for following reasons except
- (1) Pure varieties of pea were easily available
- (2) Pea plant shows easily detectable contrasting characters
- (3) Pea flowers normally remain closed and cannot be cross bred manually
- (4) A large number of seeds are produced per plant

170. Mendel selected how many pairs of true breeding pea plant varieties in his experiments?
- (1) 7   (2) 14
- (3) 1   (4) 10

171. In humans, pointed eyebrows (B) are dominant over smooth eyebrows (b). Mary's father has pointed eyebrows, but she and her mother have smooth. What is the genotype of the father?
- (1) BB   (2) Bb
- (3) bb   (4) BBb

172. In Mendelian monohybrid cross, how many individuals were homozygous in F_2 generation?
- (1) $\dfrac{1}{4}$ (2) $\dfrac{2}{4}$
- (3) $\dfrac{3}{4}$ (4) $\dfrac{2}{3}$

173. How many characters related to flower and pod respectively were studied by Mendel?
- (1) 2, 4   (2) 2, 2
- (3) 1, 2   (4) 2, 1

174. In cats, if white coat is dominant over black coat, then in a cross between heterozygous white cat and black cat, what percentage in progeny would be homozygous white?
- (1) 25   (2) 75
- (3) zero   (4) 50

175. $Hb^A Hb^S$ –individual, roan colour in short horned

cattle are examples of
- (1) codominance
- (2) incomplete dominance
- (3) multiple alleles
- (4) complete dominance

176. Mendel conducted hybridisation experiments on _____ for years _____.
- (1) Sweet pea, 1865-1873
- (2) Garden pea, 1856-1863
- (3) Wild pea, 1956-1963
- (4) Sweet pea, 1855-1862

177. If an organism produces 32 types of gametes, its genotype should be heterozygous for
- (1) 4 genes   (2) 5 genes
- (3) 8 genes   (4) 16 genes

178. **Statement-A** : In a monohybrid test cross, the phenotypic ratio comes out to be 1:1.
Statement-B : 1:1 test cross ratio proves that the plant with dominant phenotype is homozygous
- (1) Statement-A is correct, statement-B is incorrect.
- (2) Statement-A is incorrect, statement-B is correct.
- (3) Both Statements are correct.
- (4) Both Statements are incorrect.

179. During mendel experiments, he proposed that the traits are determined by stable and discrete unit that passed from one generation to next. He termed these units as
- (1) factors   (2) genes
- (3) characters   (4) qualities

180. If a bisexual self pollinating plant has genotype Rr, what will be number of different types of pollen grains and eggs that it will produce respectively?
- (1) two & four   (2) one & one
- (3) two & two   (4) four & four

181. Mark the odd one (w.r.t. F_2 generation of Mendelian dihybrid cross)
- (1) Frequency of TtRR genotype $= 12.5\%$
- (2) Frequency of ttrr genotype $= 6.5\%$
- (3) Frequency of TTRR genotype $= 6.5\%$
- (4) Frequency of TtRr genotype $= 6.5\%$

182. An individual produce gametes 'T' and 't' in equal frequency of $\dfrac{1}{2}$ is selfed. Resultant genotypic ratio in progeny is mathematically condensable to the form of binomial expression
- (1) $ax + by$ (2) $ax^2 + by^2$
- (3) $(ax + by)^2$ (4) $(ax + by)^3$

183. Select the incorrect statement
- (1) Two alleles are present at same locus of homologous chromosome
- (2) All alleles are genes
- (3) All factors are genes
- (4) A dominant allele is expressed only in homozygous condition

184. Which of the following is incorrect match?

(1) Dihybrid test cross - 1 : 1 : 1 : 1

(2) F_2 dihybrid phenotypic ratio - 9 : 3 : 3 ; 1

(3) Type of phenotype in dihybrid F_2 - 4

(4) Type of zygote/offsprings in trihybrid F_2 – 16

185. In *Mirabilis jalapa*, the number of F_2 red flowered plants out of 4, in a cross of red–flowered x white flowered would be
(1) 2   (2) 1
(3) 3   (4) 4

BOTANY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

186. If two parent AaBB and aaBb are crossed, then which of the following genotype is not possible in their progeny?
(1) AaBb   (2) aaBB
(3) aaBb   (4) AABb

187. When Mendel crossed tall pea plants with dwarf he observed that
a. F_1 always resembled one of the parents.
b. Trait of the other parent was not seen in F_1.
c. Half of F_2 plants were tall and half were dwarfs.
(1) only a   (2) a & b both
(3) only b   (4) a, b, c

188. "When two pairs of traits are combined in a hybrid, the segregation of one pair of characters is independent of the segregation of the other pair of characters". This is
(1) Law of dominance
(2) Law of segregation
(3) Law of independent assortment
(4) None of the above

189. Alleles are
(1) homologous chromosomes
(2) recessive genes
(3) dominant genes
(4) alternate forms of a gene

190. When Mendel self pollinated the F_1 plants (RrYy), he found that dominant and recessive traits of a single character shows
(1) 9 : 1 ratio   (2) 3 : 3 ratio
(3) 3 : 1 ratio   (4) 10 : 6 ratio

191. Phenotype refers to the _____ of an individual
(1) genetic makeup
(2) actual physical appearance
(3) recessive alleles
(4) genome

192. Which of the following cannot be a gamete?
(1) Yr   (2) TRY
(3) Rr   (4) Ty

193. Which of the following statement is correct?

(1) Law of independent assortment can be explained on the basis of monohybrid cross
(2) Law of independent assortment is the first law of Mendel
(3) Emasculation is not required in unisexual flower
(4) Individual with different genotype will always have different phenotype

194. Mendel performed experiments in three stages. Correct sequence is
a. cross hybridisation
b. selfing of hybrid plant
c. selection of pure parent
(1) c, b, a   (2) a, b, c
(3) c, a, b   (4) b, a, c

195. A gene showing codominance
(1) has both alleles independently expressed in the heterozygote
(2) has one allele dominant to the other
(3) has alleles that are recessive to each other
(4) has phenotype in which both allele do not express

196. Which of the following represents a dihybrid condition?
(1) ttRr   (2) TTRR
(3) TtRr   (4) all above

197. A plant upon continous self pollination shows the stable trait inheritance and expression for several generations. It is
a. Pure line   b. True breeding
c. Impure   d. heterozygous
(1) a & b   (2) b & d
(3) a & c   (4) a & d

198. Which one of the following is incorrect?
(1) Homozygous parent produces all gametes that are similar.
(2) Dominant trait may be homozygous or heterozygous but recessive trait is always heterozygous.
(3) Genes are unit of inheritance which contain the information required to express a particular trait.
(4) Alleles can be similar or dissimilar in an individual

199. In the cross RrTt × rrtt,
(1) all the offspring will be tall with red fruit
(2) 75% (3/4) will be tall with red fruit
(3) 50% (1/2) will be tall with red fruit
(4) 25% (1/4) will be tall with red fruit

200. The phenotypic and genotypic ratio is same in case of
(1) Reciprocal cross   (2) Monohybrid cross
(3) Dihybrid cross   (4) Dihybrid test cross

M.L. Syal's Helix Institute

S.C.O. 343-345, Top Floor, Sector 34-A, Chandigarh. Ph : 0172-2623155

XII cum Competition Course for Medical – Test - 3

#	Ans	#	Ans	#	Ans	#	Ans
1.	(2)	51.	(1)	101.	(3)	151.	(2)
2.	(4)	52.	(2)	102.	(3)	152.	(4)
3.	(1)	53.	(2)	103.	(2)	153.	(2)
4.	(2)	54.	(1)	104.	(1)	154.	(2)
5.	(4)	55.	(1)	105.	(4)	155.	(2)
6.	(2)	56.	(1)	106.	(3)	156.	(2)
7.	(4)	57.	(3)	107.	(4)	157.	(3)
8.	(3)	58.	(2)	108.	(4)	158.	(2)
9.	(3)	59.	(1)	109.	(2)	159.	(1)
10.	(3)	60.	(2)	110.	(3)	160.	(4)
11.	(2)	61.	(3)	111.	(2)	161.	(2)
12.	(2)	62.	(1)	112.	(3)	162.	(2)
13.	(2)	63.	(2)	**113.**	**(2)**	163.	(3)
14.	(4)	64.	(2)	114.	(1)	164.	(4)
15.	(1)	65.	(3)	115.	(2)	165.	(4)
16.	(3)	66.	(2)	116.	(2)	166.	(3)
17.	(3)	67.	(4)	117.	(1)	167.	(2)
18.	(3)	68.	(4)	118.	(2)	168.	(3)
19.	(3)	69.	(3)	119.	(1)	169.	(3)
20.	(3)	70.	(1)	120.	(2)	170.	(1)
21.	(2)	71.	(3)	121.	(2)	171.	(2)
22.	(3)	72.	(4)	122.	(1)	172.	(2)
23.	(3)	73.	(3)	123.	(4)	173.	(2)
24.	(2)	74.	(4)	124.	(2)	174.	(3)
25.	(1)	75.	(1)	125.	(1)	175.	(1)
26.	(1)	76.	(4)	126.	(2)	176.	(2)
27.	(2)	77.	(2)	127.	(2)	177.	(2)
28.	(1)	78.	(1)	128.	(4)	178.	(1)
29.	(3)	79.	(3)	129.	(1)	179.	(1)
30.	(4)	80.	(1)	130.	(1)	180.	(3)
31.	(1)	81.	(2)	131.	(1)	181.	(4)
32.	(1)	82.	(4)	**132.**	**(1)g**	182.	(3)
33.	(3)	83.	(4)	**133.**	**(1)g**	183.	(4)
34.	(4)	84.	(1)	134.	(4)	184.	(4)
35.	(1)	85.	(2)	135.	(4)	185.	(2)
36.	(1)	86.	(3)	136.	(4)	186.	(4)
37.	(4)	87.	(4)	137.	(2)	187.	(2)
38.	(2)	88.	(3)	138.	(3)	188.	(3)
39.	(3)	89.	(4)	139.	(3)	189.	(4)
40.	(2)	90.	(2)	140.	(3)	190.	(3)
41.	(2)	91.	(2)	141.	(2)	191.	(2)
42.	(2)	92.	(1)	142.	(4)	192.	(3)
43.	(2)	93.	(3)	143.	(4)	193.	(3)
44.	(4)	94.	(4)	144.	(4)	194.	(3)
45.	(1)	95.	(2)	145.	(3)	195.	(1)
46.	(1)	96.	(2)	146.	(3)	196.	(3)
47.	(3)	97.	(4)	147.	(3)	197.	(1)
48.	(2)	98.	(3)	148.	(2)	198.	(2)
49.	(2)	99.	(4)	149.	(3)	199.	(4)
50.	(4)	100.	(1)	150.	(1)	200.	(4)

Dated :
02-06-2022

M.L. Syal's Helix Institute
S.C.O. 343-345, Top Floor, Sector 34-A, Chandigarh. Ph : 0172-2623155

MM : 720

XII cum Competition Course for Medical Test - 4(Revision)

Time : 3 hrs.20 min.

PHYSICS : ELECTROSTATICS
CHEMISTRY : SOLUTIONS, SOLID STATE, CHEMISTRY IN EVERYDAY LIFE & CHEMICAL KINETICS
ZOOLOGY : HUMAN REPRODUCTION, REPRODUCTIVE HEALTH
BOTANY : REPRODUCTION IN ORGANISM, SEXUAL REPRODUCTION IN FLOWERING PLANTS, PRINCIPLE OF INHERITANCE & VARIATION

PHYSICS : SECTION-A

All questions are compulsory in section A

1. Which statement is correct w.r.t. properties of electric charge?
   (1) It is possible to create or destroy net charge carried by any isolated system.
   (2) Electric charge may not be an integral multiple of electronic charge
   (3) If a body contains n_1 electrons and n_2 protons, the total amount of charge on the body is $(n_1 + n_2)e/2$
   (4) None of these

2. Work done on a test charge q by the electrostatic field due to any given charge configuration
   a. is independent of the path
   b. depends on the path
   c. depends on its initial and final positions
   d. is independent of its initial and final positions
   (1) both a & c   (2) both b & d
   (3) both b & c   (4) both a & d

3.
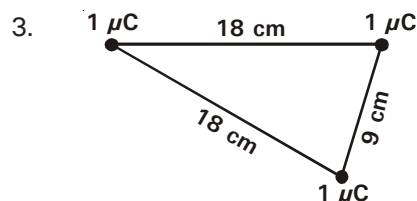
   Potential energy of a system of three charges as shown above is
   (1) 0.2 J   (2) 0.02 J
   (3) 2 J   (4) 4 J

4. Four particles, each having a charge q, are placed on the vertices of a regular pentagon. The distance of each corner from the centre is 'r'. The electric potential at the centre of the pentagon is
   (1) $\dfrac{1}{4\pi\varepsilon_0}\dfrac{q}{r}$ (2) $\dfrac{1}{4\pi\varepsilon_0}\dfrac{4q}{r}$
   (3) Zero   (4) $\dfrac{1}{4\pi\varepsilon_0}\dfrac{5q}{r^2}$

5. Two point charges $-4q$ and $-q$ are located at $x = 0$ and $x = L$ respectively. The location of a point on the x axis at which the net electric field due to these two point charges is zero is
   (1) $\dfrac{L}{2}$ (2) $\dfrac{2L}{3}$
   (3) $\dfrac{L}{4}$ (4) $\dfrac{L}{3}$

6. A charge q_1 exerts some force on a second charge q_2. If third charge q_3 is brought near, the net force on q_2
   (1) decreases
   (2) increases
   (3) remains unchanged
   (4) can increase or decrease

7. Which of the statement is true?
   (1) A capacitor stores charge in electrostatic field between plates.
   (2) Capacitance of a parallel plate capacitor does not depend upon charge given, potential raised, nature of metals and thickness of plates.
   (3) When air in a capacitor is replaced by a medium of dielectric constant K, capacity decreases K times
   (4) On increasing distance between the plates of an isolated charged parallel plate condenser, electric intensity between the plates will decrease.

8. Two small conducting spheres of equal radius have charges $+10\,\mu C$ and $-30\,\mu C$ respectively and placed at a distance R from each other experience force F_1. If they are brought in contact and separated to the same distance, they experience force F_2. The ratio of F_1 to F_2 is
   (1) 1 : 8   (2) −8 : 1
   (3) −3 : 1   (4) 3 : 1

9. The ratio of acceleration of electron to that of proton due to the electrical force of their mutual attraction when they are 1 Å apart is ($m_P = 1.67 \times 10^{-27}$ kg, $m_E = 9.11 \times 10^{-31}$ kg).
   (1) 180   (2) 1833
   (3) 2500   (4) 1260

10.
   4×10^{-7} C • |← 9 cm →| •P

   Work done in bringing a charge of 2×10^{-9} C from infinity to the point P, which is 9 cm away from charge of 4×10^{-7} C as shown above, is
   (1) 8×10^{-5} J   (2) 4×10^{-5} J
   (3) 4×10^{-6} J   (4) 6×10^{-6} J

11. In the circuit shown, the equivalent capacitance between the points P and Q is
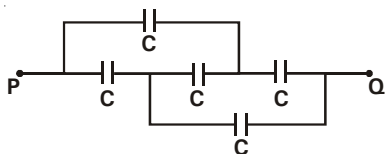
   (1) C/5   (2) C/3
   (3) C/2   (4) C

12. An electric dipole is kept in non-uniform electric field. It may not experience
   (1) a force
   (2) a torque
   (3) both a force and a torque
   (4) an acceleration

12. An electric dipole is kept in non-uniform electric field. It may not experience
   (1) a force
   (2) a torque
   (3) both a force and a torque
   (4) any of the above

13.
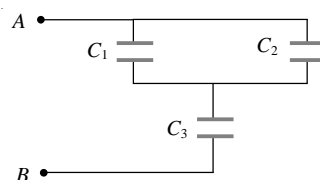
   In the given network capacitance, $C_1 = 10\,\mu F$, $C_2 = 5\,\mu F$ and $C_3 = 4\,\mu F$. What is the resultant capacitance between A and B
   (1) $2.2\,\mu F$ (2) $3.2\,\mu F$
   (3) $1.2\,\mu F$ (4) $4.7\,\mu F$

14. A polythene piece rubbed with wool is found to have a negative charge of 6.4×10^{-7}C. The number of electrons transferred is
   (1) 2×10^{12} (2) 4×10^{12}
   (3) 2×10^{15} (4) 3×10^{12}

15. A point charge causes an electric flux of 5×10^3 Nm²/C to pass through a spherical Gaussian surface of 10 cm radius centred on the charge. If radius of Gaussian surface were doubled, how much flux would pass through the surface?
   (1) -5×10^3 Nm²/C   (2) 2.5×10^3 Nm²/C
   (3) zero   (4) 5×10^3 Nm²/C

16. Which of the statement is true?
   (1) Number of field lines crossing a given area is constant, whatever its distance from the charge.
   (2) A hollow cylinder is placed in a uniform electric field parallel to its axis. Net flux

through the surface of the cylinder is zero.

(3) Gauss's law should be valid even if inverse square law were not exactly true.

(4) If an electric dipole is placed in north-south direction in a sphere, electric flux entering into and leaving sphere are different.

17. Two electrons move towards each other with a speed of 2×10^6 m/s each from a large distance. The closest distance of approach between them is
   (1) 2.5×10^{-10} m
   (2) 1.3×10^{-10} m
   (3) 6.5×10^{-9} m
   (4) 6.3×10^{-11} m

18. The electric potential V is given as a function of distance x (metre) by $V = (x^2 + 2x + 8)$ volt. Value of electric field at $x = 2$ m is
   (1) -16 V/m
   (2) 6 V/m
   (3) -6 V/m
   (4) 16 V/m

19.
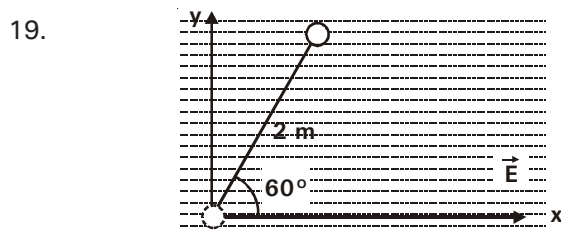
If the work done on a charge 0.2 C which moves through a distance of 2 m along the line as shown above is 4J, the value of $\vec{E}$ is
   (1) $\sqrt{3}$ N/C
   (2) 4 N/C
   (3) 5 N/C
   (4) 20 N/C

20.
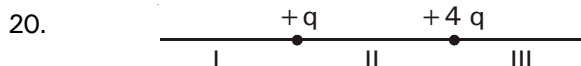
Electric field can be zero at some point on the line shown in the zone marked as
   (1) I
   (2) II
   (3) III
   (4) none of these

21. A given point on the extension of an ideal electric dipole has electric field E. If the dipole is suddenly turned by $90°$ about a perpendicular bisector, electric field at the same point will be
   (1) E
   (2) 0.5 E
   (3) 2E
   (4) Zero

22. Match physical quantities in column-I with their dimensions in column-II

Column-I		Column-II	
a.	Electric field	p.	$[ML^3 T^{-3} A^{-1}]$
b.	Electric flux	q.	$[LTA]$
c.	Dipole moment	r.	$[MLT^{-3} A^{-1}]$

   (1) a-r, b-p, c-q
   (2) a-p, b-r, c-q
   (3) a-r, b-q, c-p
   (4) a-q, b-r, c-p

23. Consider a uniform electric field $E = 3 \times 10^3 \ \hat{i}$ N/C. What is the flux of this field through a square of 10 cm side whose plane is parallel to the yz-plane?
   (1) 15 Nm^2/C
   (2) 30 Nm^2/C
   (3) 45 Nm^2/C
   (4) 0 Nm^2/C

24. The inward and outward electric flux for a closed surface (in N-m^2/C) are respectively 10^3 and 2×10^3. Then the total charge inside the surface (in coulombs) is
   [ε_0 = electrical permittivity of vacuum]
   (1) 8.85×10^{-9}
   (2) 1×10^3
   (3) $\dfrac{-1 \times 10^3}{\varepsilon_0}$
   (4) $-1 \times 10^3 \ \varepsilon_0$

25. The capacity of a condenser is 2×10^{-6} farad and its potential is 500 volts. The energy released on discharging it fully will be
   (1) 0.02 J
   (2) 0.4 J
   (3) 0.1 J
   (4) 0.25 J

26. With symbols having their usual meanings, the correct condition is
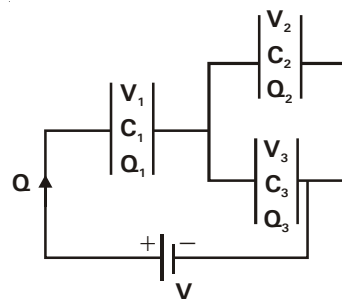
   (1) $Q_1 = Q_2 = Q_3$ and $V_1 = V_2 = V_3 = V$
   (2) $Q_1 = Q_2 + Q_3$ and $V = V_1 + V_2 + V_3$
   (3) $Q_1 = Q_2 + Q_3$ and $V = V_1 + V_2$
   (4) $Q_3 = Q_2$ and $V_2 = V_3$

27. A uniform electric field having a magnitude E_0 and direction along the positive x-axis exists. If the potential is zero at $x = 8$ m, then its value at $x = 2$ m will be
(1) $+2E_0$ (2) $-6E_0$
(3) $+6E_0$ (4) $-2E_0$

28. The variation of potential with distance R from a fixed point is as shown in the figure. The electric field at $R = 1$ m is
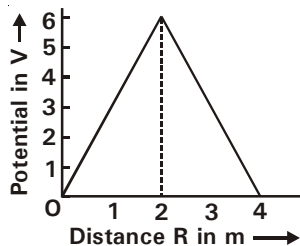
(1) 3 volt/m   (2) -3 volt/m
(3) 6 volt/m   (4) -6 volt/m

29. Equipotential surfaces in a region are equidistant planes parallel to x-z plane. Field in region is
(1) uniform, parallel to x-axis
(2) non-uniform, perpendicular to y-axis
(3) uniform, parallel to y-axis
(4) non-uniform, parallel to x-axis

30. Which of the following statements is false?
(1) Coulomb force is weaker than gravitational force
(2) When charges are shared between any two bodies, no charge is really lost, but some loss of energy does occur.
(3) A charge q_1 exerts some force on a second charge q_2. If third charge q_3 is brought near, the force which q_1 exerted on q_2 remains same.
(4) None of these

31. An earthed conductor
(1) is always at a $+$ve potential
(2) is always at zero potential
(3) is always at a negative potential
(4) may be at $+$ve, zero or $-$ve potential

32. Two charge $+q$ and $-q$ are situated at a certain distance. At the point exactly midway between them
(1) electric field and potential both are zero
(2) electric field is zero but potential is not zero
(3) electric field is not zero but potential is zero
(4) neither electric field nor potential is zero

33.
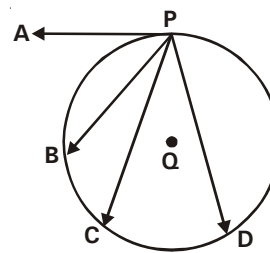
In the figure, charge Q is at the centre of the circle. Work done is non-zero when another charge is taken from point P to
(1) A   (2) B
(3) C   (4) D

34. If a charged spherical conductor of radius 10 cm has potential V at a point distant 5 cm from its centre, then the potential at a point distant 15 cm from the centre will be
(1) $\dfrac{1}{3}V$ (2) $\dfrac{2}{3}V$
(3) $\dfrac{1}{9}V$ (4) $\dfrac{1}{2}V$

35.
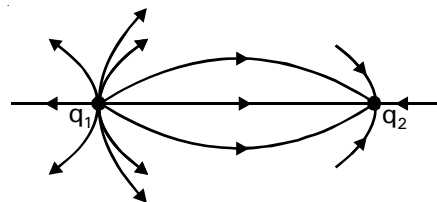
In the figure, electric lines of force associated with charges q_1 and q_2 as drawn by a student are shown.

Then ratio $\dfrac{q_1}{q_2}$ is

(1) $\dfrac{5}{6}$ (2) $-\dfrac{2}{3}$
(3) $-\dfrac{5}{3}$ (4) $\dfrac{4}{5}$

PHYSICS : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

36. Two charges 4×10^{-8} C and 2×10^{-8} C are located 10 cm apart. At what distance from the 4×10^{-8} C charge on the line joining the two charges is the electric potential zero?
    (1) 10 cm
    (2) 5 cm
    (3) 6.67 cm
    (4) no where

37. Figures below show regular hexagons, with charges at the vertices. In which of the following cases the electric field at the centre is not zero?
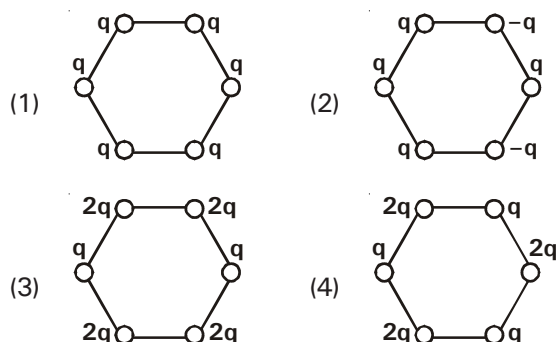
38. A charge 'q' is placed at the centre of the open end of cylindrical vessel. The flux of the electric field through the surface of the vessel is

    (1) Zero
    (2) $\dfrac{q}{\varepsilon_0}$

    (3) $\dfrac{q}{2\varepsilon_0}$
    (4) $\dfrac{q}{6\varepsilon_0}$

39. In a charged capacitor, the energy resides
    (1) in the positive charge
    (2) in both the positive and negative charges
    (3) the field between the plates
    (4) around the edge of the capacitor plates

40. Force of attraction between the plates of a parallel plate charged capacitor having a charge 'q' and plate area A is

    (1) $\dfrac{q^2}{2\varepsilon_0 A}$
    (2) $\dfrac{q^2}{\varepsilon_0 A}$

    (3) $\dfrac{q^2}{4\varepsilon_0 A}$
    (4) $\dfrac{q^2}{2\varepsilon_0 A^2}$

41. A parallel plate capacitor is connected to a battery and a dielectric slab is introduced. Which of the following will happen?

	Charge	Capacitance	Stored Energy
(1)	increases	increases	increases
(2)	decreases	decreases	decreases
(3)	decreases	increases	increases
(4)	increases	increases	decreases

42. A slab is placed between the two parallel isolated charged plates as shown. If E_p and E_Q denote the intensity of electric field at P and Q
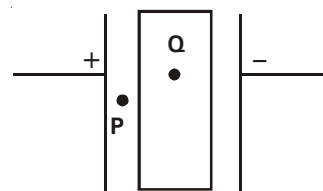
    (1) E_p is reduced by the presence of slab if it is metallic
    (2) E_q is increased by the presence of slab if it is dielectric
    (3) E_q is in the opposite sense to E_p if slab is metallic
    (4) E_q is zero if slab is metallic

43. The negatively charged conductor has been connected to earth. Then the flow of electrons will be from
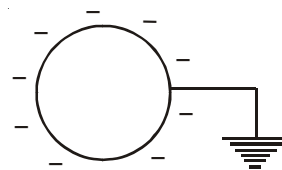
    (1) earth to conductor   (2) conductor to earth
    (3) air to conductor   (4) no flow of electron

44. A capacitor of 1 μF is charged to a potential of 50 V. It is now connected to an uncharged capacitor of 4 μF. The common potential is
(1) 10 V (2) 50 V
(3) 25 V (4) 100 V

45. A conducting body shown in figure is given some negative charge. If radii of curvature of two surfaces S_1 and S_2 is in ratio 10 : 1, then charge density is

(1) more on surface S_1 because charge is negative
(2) more on surface S_2 because charge is negative
(3) equal on both the surfaces
(4) more on surface S_2 because of higher curvature

46. The maximum electric field at a point on the axis a uniformly charged ring is E_0. At how many points on the axis will the magnitude of electric field be $E_0/2$
(1) 1 (2) 2
(3) 3 (4) 4

47.
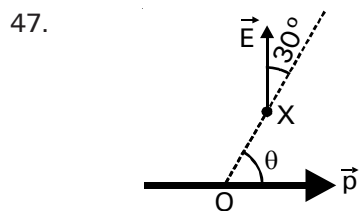
If net electric field $\vec{E}$ due to an ideal dipole at a point X makes an angle 30° with the line OX as shown. Then the value of angle θ is

(1) $\tan^{-1}\left(\dfrac{1}{\sqrt{2}}\right)$ (2) $\tan^{-1}\sqrt{2}$

(3) $\tan^{-1}\left(\dfrac{2}{\sqrt{3}}\right)$ (4) $\tan^{-1}\left(\dfrac{\sqrt{3}}{2}\right)$

48.
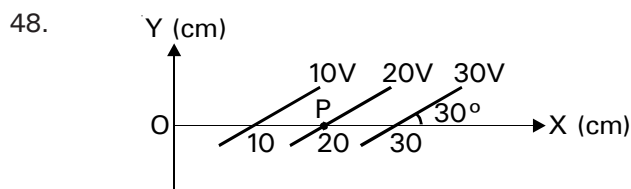
Equipotential surfaces are shown in the figure. Then the electric field strength at P will be
(1) 100 Vm^{-1} along X axis
(2) 200 Vm^{-1} at an angle 60° with X axis
(3) 200 Vm^{-1} at an angle 120° with X axis
(4) 50 Vm^{-1} at an angle 120° with X axis

49.
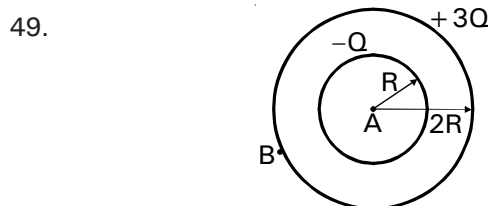
Figure shows two concentric charged conducting shells. Ratio of the potentials at points A and B is
(1) 1 : 2 (2) −2 : 1
(3) −1 : 1 (4) 2 : 1

50.
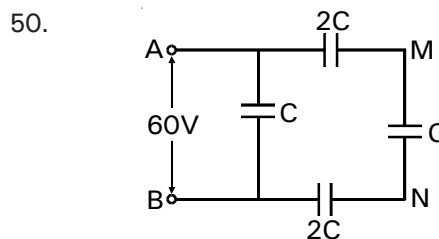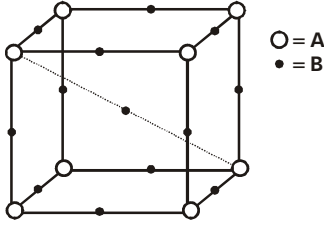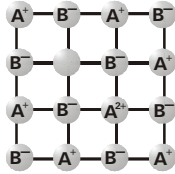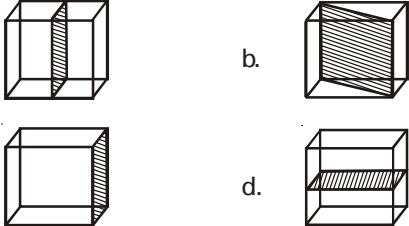
In the shown circuit, a potential difference of 60V is applied across AB. The potential difference between the points M and N is
(1) 10V (2) 15V
(3) 20V (4) 30V

CHEMISTRY : SECTION-A

All questions are compulsory in section A

51. Which of the following colligative properties can provide molar mass of proteins (or polymers or colloids) with greater precision?
    (1) Relative lowering of vapour pressure
    (2) Elevation of boiling point
    (3) Depression in freezing point
    (4) Osmotic pressure

52. Which of the folloiwng is narcotic analgesic?
    (1) Aspirin   (2) Paracetamol
    (3) Morphine   (4) Analgin

53. When CH_3COOH is added to water,
    (1) boiling point of water increases
    (2) boiling point of water decreases
    (3) freezing point of water increases
    (4) vapour pressure of water increases

54. 0.2% aqueous solution of phenol is used
    (1) disinfectant   (2) antibiotic
    (3) antiseptic   (4) none of these

55. In a 0.5% aqueous solution of common salt (degree of dissociation $= x$), the observed molar mass obtained by freezing point depression method is related to the actual molar mass (M) as
    (1) $M(1-x)$ (2) $M/(1+x)$
    (3) $M/2x$ (4) $M/(1-x)$

56. If hcp layers are stacked over each other such that the resultant arrangement is ABAB… type. The packing fraction would be
    (1) 74%   (2) 52.4%
    (3) 26%   (4) 34%

57. The vapour pressure of pure liquids A and B are 450 and 700 mm Hg respectively at 350 K. The composition of the liquid mixture if total vapour pressure is 600 mm Hg is
    (1) $X_A=0.4$ $X_B=0.6$
    (2) $X_A=0.6$ $X_B=0.4$
    (3) $X_A=0.3$ $X_B=0.7$
    (4) $X_A=0.7$ $X_B=0.3$

58. The radius ratio $\dfrac{r^+}{r^-}=0.732-1$ holds good for the structure
    (1) NaCl   (2) CsCl
    (3) Na_2O (4) NH_4Br

59. The rate constant for the reaction, $2N_2O_5 \rightarrow 4NO_2 + O_2$ is 3×10^{-5} sec^{-1}. If the rate is 2.40×10^{-5} mol litre^{-1} sec^{-1}, then the concentration of N_2O_5 (in mol litre^{-1}) is
    (1) 1.4   (2) 1.2
    (3) 0.04   (4) 0.8

60. Sodium salts of which of the following acids is not used as food preservatives?
    (1) Benzoic acid   (2) Aspartic acid
    (3) Sorbic acid   (4) Propanoic acid

61. Which of the following is characteristic of H_2O & CH_3CH_2OH mixture?
    (1) $\Delta H_{Sol} > O$ $\Delta S_{Sol} = O$
    (2) $\Delta H_{Sol} > O$ $\Delta S_{Sol} > O$
    (3) $\Delta H_{Sol} < O$ $\Delta V_{Sol} > O$
    (4) $\Delta H_{Sol} > O$ $\Delta V_{Sol} < O$

62. Oxygen is available in plenty in air yet fuels do not burn by themselves at room temperature. This is because
    (1) fuels are thermodynamically stable
    (2) fuels are kinetically stable
    (3) high activation energy is required
    (4) both (2) and (3)

63. Which one of the following is a combination of both vacancy and interstitial defect?
    (1) Frenkel defect   (2) Schottky defect
    (3) Electronic defect   (4) Impurity defect

64. NaCl is added to 1L water to such an extent that $\Delta T_f/K_f$ becomes 1/500, the weight of NaCl added is
    (1) 5.85 g   (2) 0.585 g
    (3) 0.0585 g   (4) 0.117 g

65. Which of the following statements is not true?
    (1) Paramagnetic substances are weakly attracted by magnetic field.
    (2) Ferromagnetic substances cannot be magnetised permanently.
    (3) The domains in antiferromagnetic substances are oppositely oriented with respect to each other.
    (4) Pairing of electrons cancels their magnetic moment in the diamagnetic substances.

66. The net change of 'i' for ferrous sulphate solution on addition of KCN is from
$FeSO_4(aq) + 6KCN \rightarrow K_4[Fe(CN)_6](aq) + K_2SO_4(aq)$
(assume complete consumption of all reactants)
(1) 2 units to 8 units (2) 2 units to 5 units
(3) 1 unit to 5 units (4) 1 unit to 8 units

67. Select the rate law that corresponds to data shown for reaction : $A + B \rightarrow$ Products

Exp.	[A]	[B]	initial rate
1	0.012	0.035	0.1
2	0.024	0.070	0.8
3	0.024	0.035	0.1
4	0.012	0.070	0.8

(1) rate $= k [B]^3$ (2) rate $= k [B]^4$
(3) rate $= k [A] [B]^3$ (4) rate $= k [A]^2 [B]^2$

68. The mass of urea to be dissolved in 171g of water so as to decrease the vapour pressure of water by 5% (assume the solution to be dilute) is
(1) 15 g (2) 20g
(3) 25g (4) 28.5g

69. _____ is converted into fresh water by reverse osmosis
(1) heavy water (2) bromine water
(3) sea water (4) all of the above

70. The rate expression for a chemical reaction, $2NO_2Br \rightarrow 2NO_2 + Br_2$ is given as : Rate = k $[NO_2Br]$. Rate determining step is
(1) $2NO_2Br \rightarrow 2NO_2 + Br_2$
(2) $NO_2Br + Br \rightarrow NO_2 + Br_2$.
(3) $NO_2Br \rightarrow NO_2 + Br$.
(4) $NO_2 + Br \rightarrow NO_2Br_2$.

71. Arrhenius factor/constant is also called
(1) steric factor (2) frequency factor
(3) probability factor (4) both (1) and (3)

72. The volume of NaCl unit cell is Vcm^3 (molar mass of NaCl is 'M'), then density of crystal is given as
(1) $\dfrac{2M}{VN_0}$ (2) $\dfrac{3M}{VN_0}$
(3) $\dfrac{4M}{VN_0}$ (4) none of these

73. Which one of the following is anisotropic & covalent solid?
(1) NaCl (2) Graphite
(3) Cu (4) Sn

74. A compound has a unit cell of the type shown in the figure. The formula of the compound is

O = A
• = B

(1) A_2B_3 (2) AB_3
(3) A_3B (4) AB_4

75. Which of the following intrinsic defect is shown by the figure below?

(1) Schottky defect
(2) Frenkel defect
(3) Metal deficient defect
(4) Metal excess defect

76. The following are unit cells of an element crystallising in fcc packing.

a. b.

c. d.

Atoms from the shaded planes are being removed from the unit cell. Which of the shaded planes will lead to removal of five lattice points?
(1) a (2) b
(3) c (4) d

77. Which of the following is not correct for reactions of first order?
(1) $k = \dfrac{1}{t} \ln(C_0/C_t)$
(2) $t = \dfrac{2.303}{k} \log[a/(a - x)]$
(3) $[A]_0 = [A]e^{-kt}$
(4) $t_{1/2} = (0.693)/k$

78. For the given reaction $A + B \rightarrow$ products, the following data were given

Exp.	Initial conc. (mol/L)		initial rate $(\text{mol L}^{-1}\text{sec}^{-1})$
	A	B	
(1)	0.1	0.1	0.05
(2)	0.2	0.1	0.1
(3)	0.1	0.2	0.05

Then the k for the reaction is
(1) 0.5 sec^{-1} (2) $0.5 \text{ L mol}^{-1} \text{ sec}^{-1}$
(3) 5 sec^{-1} (4) $5 \text{ L mol}^{-1} \text{ sec}^{-1}$

79. Detergents are better cleansing agent than soaps becuase
(1) they wash clothes better
(2) absorb the hardness of water
(3) they are less affected by hard water
(4) they are less soapy

80. Which of the following statements is FALSE?
(1) Cationic detergents have germicidal properties
(2) Bacteria can degrade the detergents containing highly branched chains.
(3) Some synthetic detergents can give foam even in ice cold water.
(4) Synthetic detergents are not soaps.

81.
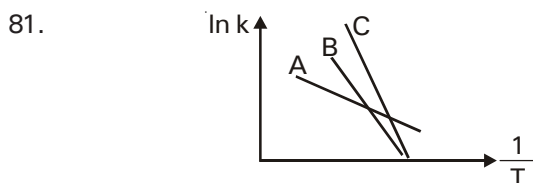
For the reactions A, B, C, the order of activation energy is
(1) $A > B > C$ (2) $B > C > A$
(3) $C > B > A$ (4) $A < B > C$

82. Addition of catalyst affects
(1) ΔG (2) ΔH
(3) E_a (4) K_{eq}

83. Half life of a certain radioactive element is such that 7/8 of a given quantity decays in 12 days. What fraction decays in 32 days?
(1) 0   (2) 1/128
(3) 1/256   (4) 255/256

84. For the reaction $2A + B \rightarrow 3C + D$ which of the following is not the correct expression for the reaction rate?

(1) $-\dfrac{d[C]}{3dt}$ (2) $-\dfrac{d[B]}{dt}$

(3) $\dfrac{d[D]}{dt}$ (4) $-\dfrac{d[A]}{2dt}$

85. If NaCl is doped with 10^{-3} mol% of $SrCl_2$, the concentration of cation vacancies is
(1) 6.02×10^{18} (2) 6.02×10^{16}
(3) 6.02×10^{20} (4) 3.01×10^{18}

CHEMISTRY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

86. If the activation energy for the forward reaction is 150 KJ/mol and that of the reverse equation is 260 KJ/mol, ΔH for the reaction is
(1) 410 KJ/mol   (2) -110 KJ/mol
(3) 110 KJ/mol   (4) -410 KJ/mol

87. The half life period of a 3rd order reaction is found to be one hour when we start with a concentration of 0.3 mol / litre of reactant. If we start with 0.1 mol/L, the half life period in hours will be
(1) 0.09   (2) 9
(3) 0.03   (4) 3

88. 50% of a zero order reaction completes in 50 minute. 100 % of the same reaction under similar conditions shall complete in
(1) 50 min   (2) 100 min
(3) 200 min   (4) infinite time

89. The unit of ebullioscopic constant is
(1) $K \text{ kg mol}^{-1}$ (2) mol kg K^{-1}
(3) $\text{kg mol}^{-1} \text{ K}^{-1}$ (4) $K \text{ mol kg}^{-1}$

90. Which of the following artificial sweetening agents is least stable to heat?
(1) Aspartame   (2) Sucralose
(3) Alitame   (4) Saccharin

91. The co-ordination number of a sphere in simple cubic lattice is
(1) 8   (2) 6
(3) 2   (4) 10

92. The ratio of $t_{2/3}$ and $t_{1/2}$ of a first order reaction $2A \rightarrow B + C$ is

(1) $\log\dfrac{2}{3}$ (2) $\log\dfrac{3}{2}$

(3) $\dfrac{\log 2}{\log 3}$ (4) $\dfrac{\log 3}{\log 2}$

93. Which of the following statements is correct?
    (1) Some tranquilisers function by inhibiting the enzymes which catalyse the degradation of noradrenaline.
    (2) Tranquilisers are narcotic drugs.
    (3) Transquilisers are chemical compounds that do not affect the message transfer from nerve to receptor.
    (4) Tranquilisers are chemical compounds that can relieve pain and fever.

94. Arrange the following aqueous solutions in the order of their increasing boiling points
    (i) 0.001 M NaCl   (ii) 0.001 M urea
    (iii) 0.001 M MgCl$_2$ (iv) 0.01 M NaCl
    (1) ii < i < iii < iv   (2) i < ii < iv < iii
    (3) ii < i = iii < iv   (4) iv < iii < i < ii

95. A solid made up of A and B atoms has A in ccp arrangement. Atoms of B occupy all the octahedral voids and half the tetrahedral voids. The formula of compound is
    (1) AB   (2) AB$_2$
    (3) AB$_4$ (4) A$_2$B$_3$

96. The Henry's law constant for the solubility of N$_2$ gas in water at 298 K is 1.0×10^5 atm. The mole fraction of N$_2$ in air is 0.8. The number of moles of N$_2$ from air dissolved in 10 moles of water at 298K and 5 atm pressure is
    (1) 4.0×10^{-4} (2) 4.0×10^{-5}
    (3) 5.0×10^{-4} (4) 4.0×10^{-6}

97. Which of the following statements is correct if the intermolecular forces in liquids A, B and C are in the order A < B < C ?
    (1) B evaporates more readily than A
    (2) B evaporates less readily than C
    (3) A and B evaporate at the same rate
    (4) A evaporates more readily than C

98. Which of the following pairs contain ferromagnetic and ferrimagnetic substance respectively?
    (1) Fe$_2$O$_3$, Fe$_3$O$_4$ (2) Fe$_3$O$_4$, Cr$_2$O$_3$
    (3) Cr$_2$O$_3$, CrO$_2$ (4) CrO$_2$, Fe$_3$O$_4$

99. Which class of drugs is used in sleeping pills?
    (1) alkaloids   (2) tranquilizer
    (3) antihistamines   (4) antipyretics

100. A metallic element crystallised into a lattice containing sequence of layer ABABAB ....(having square close packed layers). The vacant percentage volume of this lattice is
    (1) 74   (2) 26
    (3) 32   (4) 68

ZOOLOGY : SECTION-A
All questions are compulsory in section A

101. At the time of birth human ovary does not contain
    a. primary oocytes   b. secondary oocytes
    c. tertiary oocytes   d. graffian follicles
    (1) a, b , c & d   (2) b, c & d
    (3) c & d   (4) d only

102. By the time the first movements of foetus are observed
    a. eyelids have separated
    b. major organ systems are formed
    c. limbs are formed
    d. external genitalia are formed
    (1) a, b, c & d   (2) a, b & c
    (3) b, c & d   (4) a, c & d

103. Secretion of which of the following ducts is essential for maturation and motility of sperms
    a. epididymis   b. vas deferens
    c. seminal vesicle   d. prostate gland
    e. cowper's gland
    (1) a, b, c, d   (2) b, c, e
    (3) a, c, d, e   (4) a and b

104. Foetal ejection reflex is
    (1) mild uterine contractions induced by fully formed foetus only
    (2) strong uterine contractions induced by fully formed foetus and placenta
    (3) mild uterine contractions induced by fully formed foetus and placenta
    (4) strong uterine contractions induced by placenta only

105. Mark the mismatch
    (1) Gamete production ceases in females around the age of 50years – Menopause
    (2) Middle layer of wall of uterus – undergoes strong contractions during child birth
    (3) Life span of sperm after ejaculation – 24 to 48 hours
    (4) Secretion of seminal vesicles–Contain disaccharide fructose

106. How many of the following techniques involve invivo fertilization ?
    ICSI, IUI, GIFT, ZIFT, IUT
    (1) Two   (2) Three
    (3) Four   (4) Five

107. Which of the following hormone is not secreted by primary sex organs?
    (1) Testosterone   (2) Inhibin
    (3) Progesterone   (4) FSH

108. Which of the following statement about Saheli is correct?
    (1) It is an oral contraceptive taken once a week
    (2) It has very few side effects and high contraceptive value
    (3) It is non steroidal preparation formulated by CDRI, Luckhnow
    (4) All are correct

109. Match the columns
    a. Number of testicular lobules per testis   i.   4-5
    b. Length of testis _____ cm   ii.   10-12
    c. Length of fallopian tube _____ cm   iii.   250
    d. Each testicular lobule contains _____ seminiferous tubules   iv.   1-3
    (1) a-iii, b-iv, c-ii, d-i   (2) a-iii, b-i, c-ii, d-iv
    (3) a-iv, b-i, c-iii, d-ii   (4) a-i, b-ii, c-iii, d-iv

110. Which of the following is a correct match?
    (1) Condoms   – barrier that cover penis in male & ovary in female
    (2) Diaphragms   – reusable, used in females and males
    (3) IUDs   – self-inserted, intra-uterine devices
    (4) Oral contraceptive pills – inhibit ovulation and implantation

111. Which of the following is the correct match?

	Category	Features /composition	Exception
(1)	Composition of seminal plasma	Prostaglandins, fructose, calcium	Fructose
(2)	Cells lining the seminiferous tubules	Immunologically competent cells, spermatogonia	Spermatogonia
(3)	Characteristics of semen	Acidic, has calcium ions	Acidic
(4)	Components of the intratesticular genital duct system	Vas deferns, epididymis, tubuli recti	Tubuli recti

112. The function of copper ions in copper releasing IUD's is
    (1) to inhibit gametogenesis
    (2) to make uterus unsuitable for implantation
    (3) to inhibit ovulation
    (4) to suppress sperm motility and fertilising capacity of sperms.

113. Semen
    a. is sperms with seminal plasma
    b. carries prostaglandins from seminal vesicles
    c. acquires milky appearance due to secretions of prostate gland
    (1) only a and b   (2) only b and c
    (3) a, b and c   (4) only b

114. The regions just outside the seminiferous tubules contain
    (1) small blood vessels but lack interstitial cells
    (2) cells which secrete testosterone
    (3) cells which get stimulated by LH from hypothalamus
    (4) both (2) and (3)

115. Hysterectomy is surgical removal of
    (1) uterus   (2) prostate gland
    (3) vas deferens (4) mammary glands

116. A women took the oral contraceptive pills on the 25th day of the menstrual cycle. After 21 days, she discontinues the pill but there is no withdrawl bleeding/menstruation. This could be because
    (1) She may have been pregnant by the time she started taking the pills
    (2) Discontinuation of the pill usually does not cause withdrawl bleeding
    (3) She took the pill for double the number of days
    (4) None of these

117. Which of the following does not occur between 15−28 day of menstrual cycle in a 28 day cycle?
    (1) Premenstrual phase
    (2) Luteal phase
    (3) Secretory phase
    (4) Follicular phase

118. Which of the following is component of implants
    (1) Progesterone and centchroman
    (2) Oxytocin and progesterone
    (3) Relaxin and oestrogen
    (4) Progesterone and oestrogen

119. If the following ducts are arranged in accordance of passage of sperm from these, which would be the third duct through which the sperms would pass?
    Vas deferens, Vasa efferentia, Ejaculatory duct, Epididymis, Rete testis
    (1) Vas deferens   (2) Vasa efferentia
    (3) Ejaculatory duct (4) Epididymis

120. Which one of the following statement is correct for test tube baby?
    (1) A prematurely born baby developed in an incubator
    (2) In vitro fertilization and transfer of embryo into mother's uterus
    (3) In vitro fertilisation and development of the embryo in the large test tube with nutrients
    (4) In vitro fertilization and development of the embryo in a laboratory dish

121. What is not true for corpus luteum?
    (1) It secretes both estrogen and progesterone
    (2) It grows under the influence of LH during luteal phase
    (3) It is maintained by proteinaceous hormone from posterior pituitary
    (4) It can be seen in ovary after ovulation

122. Which of the following is correct about lactational amenorrhoea?
    (1) High dose of FSH and LH in blood
    (2) Occurance of regular menstruation
    (3) Antigonadotrophin action of prolactin
    (4) Effective for one year after child birth

123. Choose the correct pair
    (1) Primary – Formed as a result of first
        spermatocyte meiotic division during
        sperm formation
    (2) Spermatid – Diploid having 46 chromo
        somes
    (3) Spermiation – Release of sperms from
        seminiferous tubules
    (4) Spermiogenesis– involves the transformation
        of sperms into spermatids

124. Which of the following is correctly matched data?
    (1) 2001 census report of India's population
        growth rate = 17%
    (2) World's population in 1900 = 1 Billion
    (3) World's population in 2000 = 6 Billion
    (4) India's population in 1947 = 1 Billion

125. The following figure is diagrammatic representation
    of
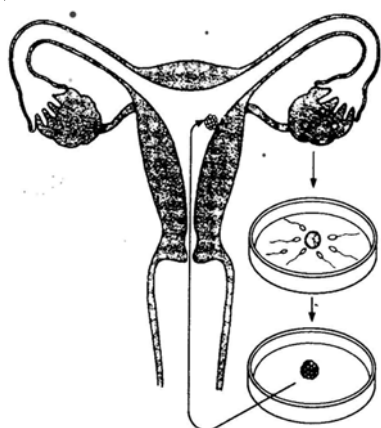
    (1) intracytoplasmic sperm injection & embryo
        transfer
    (2) in vitro fertilization and embryo transfer
    (3) in vitro fertilization and ZIFT
    (4) in vivo fertilization and embryo transfer

126. Which of the following is incorrect w.r.t.
    Amniocentesis?
    (1) It is test based on chromosomal pattern in
        cells obtained from amniotic fluid
    (2) Detects all types of defects in foetus like cleft
        palate
    (3) Detects enzymatic and biochemical
        abnormalities
    (4) Legally banned for sex determination in India

127. Which of the following is correct pertaining to
    mammary glands?
    a. Ejection of milk occurs under influence of
        oxytocin
    b. Lie over pectoralis major muscles
    c. Structure varies with sex and physiology
    (1) a, b and c   (2) b and c
    (3) a and c   (4) a and b

128. Which of the following is an incorrect statement?
    (1) Number of MTPs in a year in the world
        accounts for 20% of total number of
        pregnancies
    (2) MTP is safe upto first trimester
    (3) MTPs involve social, emotional, ethical and
        religious issues
    (4) Govt of India legalized MTP in 1871

129. Which of these is an indicator of improved
    reproductive health of a society?
    a. Reduced infant mortality rate.
    b. Reduced maternal mortality rate.
    c. Reduced number of couples with small
        families.
    d. Strong infrastructural facilities for sex-related
        problems.
    e. Decreasing number of females
    (1) b, c & d   (2) a, c & e
    (3) a, b & e   (4) a, b & d

130. Choose the correct statement(s)
    a. Spermicidal creams are used along with IUDs
    b. Nirodh is a popular brand of male condom
    c. Lactational amenorrhoea is barrier method
    d. Surgical methods are also called sterilization
        methods
    (1) a, b, c   (2) b, c, d
    (3) b and c   (4) b and d

131. Arrange the sequence in which milk is secreted
    sucked out from mammary gland if :
    Mammary duct-a, Lactiferous duct-b, Mammary
    tubules-c, Mammary ampulla-d
    (1) c–a–d–b   (2) a–c–d–b
    (3) a–d–c–b   (4) d–a–b–c

132.

    Which of the following is/are correct w.r.t. given
    figure?
    (1) These are implants having progestogen and
        LH alone
    (2) They prevent ovulation and implantation
    (3) Their effective periods are much longer than
        injections
    (4) Both (2) and (3)

133. What is true about the sperm and oocyte when
    released from gonads?
    (1) both have same DNA content
    (2) both structures are end results of meiosis-II
    (3) both structures are motile
    (4) both exhibit haploid nature

134. Which of the following statements are correct?
   a. IUD needs surgery
   b. Tubectomy can also be done through abdomen
   c. For vasectomy, a small cut can be given on scrotum or testes
   d. Condoms give protection from STDs
   (1) b, d
   (2) a, b, d
   (3) b,c, d
   (4) a, b, c

135. In humans, twins that develop from two fertilised ova are
   (1) always of the same sex
   (2) of the same sex but are very similar if not identical in appearance
   (3) of the same or different sexes and as similar to each other as regular siblings
   (4) always of different sexes

ZOOLOGY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

136. Number of chromosomes in secondary oocyte and ootid stage of human egg respectively
   (1) 23, 23
   (2) 92, 46
   (3) 46, 46
   (4) 23, 46

137. Which of the following set is devoid of side effects of steroidal hormones?
   (1) Vaults, progestasert, combined pills
   (2) Cu 7, LNG 20, Nirodh
   (3) Lippe's loop, Saheli, Cu 7
   (4) Lippe's loop, LNG 20, Saheli

138. A post coital contraceptive pill works by
   (1) producing thick cervical mucus
   (2) promoting ovulation
   (3) making the endometrium out of phase with fertilization
   (4) both (2) and (3)

139. Which of the following are correct statements?
   a. All IUDs inhibit the release of gonadotropins
   b. Diaphragms and cervical caps donot protect from STDs.
   c. Periodic abstinence is a method in which couples avoid coitus all through the luteal phase of menstrual cycle
   d. Barrier methods of contraception prevent physical meeting of ovum and sperms
   (1) a and b
   (2) b and c
   (3) b and d
   (4) a, c and d

140. How many of these contraceptives contain natural or synthetic steroids?
   Oral pills, LNG-20, Implants, Saheli, Multiload 375
   (1) 2
   (2) 3
   (3) 4
   (4) 5

141. Impotency is not sterility. If a couple is infertile because of male impotency, they can have their own genetic baby by which techniques
   (1) AI
   (2) IUI
   (3) ICSI
   (4) All of these

142. What is not true for emergency contraceptive?
   (1) They can be used to avoid possible pregnancy due to casual unprotected intercourse
   (2) Administration of progesterone or progesterone oestrogen combination within 72 hours of coitus
   (3) It is effective for terminating unwanted pregnancy
   (4) Insertion of intra uterine devices within 72 hrs of coitus is effective.

143. Match the ARTs with their description
   i. Collected gametes are made to form zygote in the lab   a. ZIFT
   ii. Transfer of ovum from donor to the oviduct of the recipient   b. GIFT
   iii. Sperm is injected into the ovum in vitro.   c. ICSI
                                                                   d. AI
                                                                   e. IVF
   (1) i−e, ii−c, iii−d
   (2) i−e, ii−d, iii−d
   (3) i−b, ii−a, iii−d
   (4) i−e, ii−b, iii−c

144. A somatic cell that has just completed the s-phase of its cell cycle as compared to gamete of same species has
   (1) same number of chromosomes but twice the amount of DNA
   (2) twice the number of chromosomes and four times the amount of DNA
   (3) four times the number of chromosomes and twice the amount of DNA
   (4) twice the number of chromosomes and twice the amount of DNA

145.
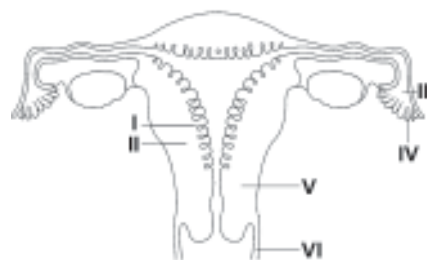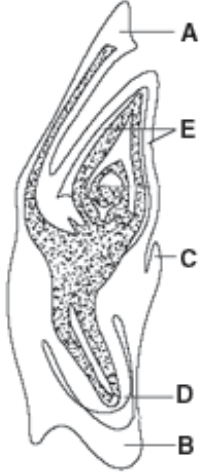
Given is the sectional view of female reproductive system. From the following options identify which are correctly matched?
   (1) I−Endometrium, V−Cervical canal, III−Infundibulum, VI−Vagina
   (2) II−Myometrium, IV−Fimbriae, III−Infundibulum, V - Cervix
   (3) II−Endometrium, III−Infundibulum, VI−Cervical canal, I - Perimetrium
   (4) III−Infundibulum, IV - Ostia, V−Cervix, VI−Cervical canal

146. What is true about blastocyst?
 a. consists of trophoectoderm
 b. has inner cell mass
 c. never without zona pellucida
 d. size is same as morula always
 e. has blastocoel
 (1) a and b only   (2) a, b and e
 (3) c, b and e only   (4) a,b, c and e

147. Which is the correct statement?
 a. Proximal centriole gives rise to axial filament of sperm tail
 b. Anterior portion of sperm head has an enzyme filled, cap-like acrosome
 c. Numerous mitochondria in the head of sperm produce energy for movement of its tail
 d. During a coitus human male ejaculates 200-300 million sperms
 (1) both a & b   (2) both a & c
 (3) both b & c   (4) both b & d

148. **Assertion :** Gonads are controlled by hormone from the pituitary gland while the reproductive ducts are controlled by the sex hormones.
 Reason : Gonadotropins are released by hypothalamus which directly control the growth of reproductive organs.
 (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
 (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
 (3) Assertion is true statement but Reason is false
 (4) Assertion is false

149. Primary oocyte and secondary oocyte are suspended at which of the stages of meiosis, respectively
 (1) metaphase and diplotene stage
 (2) diplotene and metaphase I
 (3) diplotene and metaphase II
 (4) metapahse II and diplotene

150. What is the effect of menopause on the levels of FSH, LH, estrogen and GnRH?
 (1) FSH ↓, LH↓, estrogen↓, Gn RH↑
 (2) FSH ↑, LH↑, estrogen↓, Gn RH↓
 (3) FSH ↑, LH↑, estrogen↓, Gn RH↑
 (4) FSH ↓, LH↓, estrogen↑, Gn RH↑

BOTANY : SECTION-A

All questions are compulsory in section A

151. It is more economical to propagate potato and artichoke through
 (1) pieces of tubers   (2) bulb
 (3) seeds   (4) tissue culture

152. Genotype is
 (1) genetic composition of an individual
 (2) genetic composition of plastids
 (3) genetic composition of germ cells
 (4) phenotypic composition of an individual

153. In angiosperm megasporangium is equivalent to
 (1) ovule   (2) embryo sac
 (3) ovary   (4) egg apparatus

154. Out of linear tetrad which one is the functional megaspore generally?
 (1) micropylar
 (2) any of the middle ones
 (3) chalazal
 (4) any of the four

155. How many meiosis and mitosis are required for the formation of one embryo sac?
 (1) One meiosis and three mitosis
 (2) Three meiosis and one mitosis
 (3) One meiosis and one mitosis
 (4) One meiosis and two mitosis

156. Which is more common?
 (1) Mesogamy   (2) Porogamy
 (3) Chalazogamy   (4) Apogamy

157. In angiosperms, endosperm is generally
 (1) diploid   (2) triploid
 (3) haploid   (4) polyploid

158. Probability of genotype TTrr in F_2 generation of a dihybrid cross is
 (1) 1/16   (2) 3/16
 (3) 9/16   (4) 6/16

159. Which of the following are monocarpic plant?
 (1) Wheat   (2) Rice
 (3) Mango   (4) Both (1) and (2)

160. Diploid chromosome number in meiocytes of fruit fly is
 (1) 8   (2) 380
 (3) 12   (4) 20

161. What is the cross between the progeny of F1 and the homozygous recessive parent called?
 (1) Out cross   (2) Back cross
 (3) Test cross   (4) Reciprocal cross

162. Match the terms in column-I with column-II

	Column-I		Column-II
a.	Tall	i.	homozygous
b.	Pure variety	ii.	recessive
c.	Monohybrid cross	iii.	single character
d.	Green seeds	iv.	dominant

 (1) a–iv, b–i, c–iii, d–ii (2) a–i, b–iii, c–iv, d–ii
 (3) a–ii, b–iv, c–i, d–iii (4) a–iii, b–i, c–iv, d–ii

163. During embryogenesis, zygote undergoes
 (1) cell division   (2) cell differentiation
 (3) both (1) and (2)   (4) only meiosis

164. For the flower colour in pea, given one statement is correct
    (1) violet is dominant over white
    (2) white is dominant over violet
    (3) round is dominant over wrinkled
    (4) yellow is dominant over green

165. How many pollen grains out of a total of 4800, formed by a dihybrid pea plant, would have both dominant factors?
    (1) 2400   (2) 1600
    (3) 1200   (4) 800

166. Which of the following statement about Mendel's breeding experiments is correct?
    (1) None of the parental plants were true breeding
    (2) Half of the F_1 progeny resembled one of the parents
    (3) All of the F_2 showed a phenotype that was intermediate between the two parental
    (4) All F_1 progeny resembled one of the parental plants, but only some of the F_2 resembled one of the parental type

167. When crossing a homozygous recessive with a heterozygote for one character, what is the chance of getting an offspring with the homozygous, recessive phenotype?
    (1) 25%   (2) 0%
    (3) 50%   (4) 75%

168. Diploid chromosome number in *Lathyrus odoratus* is 14. Seven chromosomes will be present in
    (1) leaf cells   (2) synergids
    (3) endosperm cells   (4) nucellar cells

169. Function of filiform apparatus is to
    (1) recognize the suitable pollen at stigma
    (2) stimulate division of generative cell
    (3) produce nectar
    (4) guide the entry of pollen tube in synergid

170. The phenomenon observed in some plants wherein parts of the sexual apparatus is used for forming embryos without fertilisation is called:
    (1) parthenocarpy
    (2) apomixis
    (3) vegetative propagation
    (4) sexual reproduction

171. The test cross ratio demonstrated by the genotype AABBCCDdEE will be
    (1) 1 : 1
    (2) 1 : 1 : 1 : 1
    (3) 1 : 1 : 1 : 1 : 1 : 1 : 1 : 1
    (4) 1 : 1 : 1

172. Zoospore formation and conidia is the feature of (respectively)
    (1) *Ulothrix* and *Oedogonium*
    (2) *Ulothrix* and *Penicillium*
    (3) *Ectocarpus* and *Spongilla*
    (4) *Aspergillus* and *Ectocarpus*

173. If the stock has chromosome number 2n = 40 and scion has 2n = 36 then what is the number of chromosomes in the egg cell and root cell ?
    (1) 36,40   (2) 40,36
    (3) 10,36   (4) 18,40

174. Identify the following diagram and label its parts

    (1) A-Scutellum, B-Epiblast, C-Coleorhiza, D-Radicle, E-Coleoptile
    (2) A-Scutellum, B-Coleorhiza, C-Epiblast, D-Radicle, E-Coleoptile
    (3) A-Epiblast, B-Scutellum, C-Coleoptile, D-Radicle, E-Coleorhiza
    (4) A-Coleoptile, B-Radicle, C-Coleorhiza, D-Epiblast, E-Scutellum

175. How many microsporocytes are required for the formation of 1000 pollen grains ?
    (1) 250   (2) 1000
    (3) 500   (4) 2000

176. Three strategies that chasmogamous flowers can evolve to prevent self pollination are
    (1) dichogamy, unisexuality, herkogamy
    (2) dichogamy, cleistogamy, herkogamy
    (3) bisexuality, cleistogamy, herkogamy
    (4) dichogamy, bisexuality herkogamy

177. Given one is not the example of incomplete dominance
    (1) Flower colour in *Mirabilis jalapa*.
    (2) Feather colour in Andulasian fowls
    (3) Flower colour in *Pisum*
    (4) Flower colour in *Antirrhinum*

178. **Assertion** : Pollen with pollen tube is fully developed male gametophyte in angiosperms.
    Reason : Male gametophyte in angiosperms is 8-nucleate.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

179. If an F_1 dihybrid tall and purple flower pea plant undergoes selfing, what is the expected number of phenotypes and genotypes in F_2 generation respectively?
    (1) 4, 6   (2) 9, 7
    (3) 4, 9   (4) 4, 4

180. Which is correct w.r.t. unusual flowering phenomenon exhibited by a few plants?
    a. Bamboo species flower only once in their life time, generally after 50-100 years, produce large number of flowers and die
    b. Bamboo species flower two times in their life time, generally after 50-100 years, produce large number of fruits and die
    c. Neelkuranji flowers once in 12 years
    d. Neelkuranji flowers once in 6 years
    (1) both b & c   (2) both a & c
    (3) both a & d   (4) both b & d

181. Which of the following phase in the post emergence life of an angiospermic plant, begins just after germination of seed and ends when the plant develops the capacity to reproduce?
    (1) Death   (2) Ageing
    (3) Juvenility   (4) Maturity

182. Identify incorrect statement regarding exine
    (1) Hard inner layer of pollen grain
    (2) Exine is made up of sporopollenin, the most resistant organic material
    (3) No enzyme can degrades sporopollenin
    (4) It can withstand high temperature and strong acid and alkali

183. Chance of survival of young one is greater in
    (1) viviparous organism
    (2) oviparous organism
    (3) both
    (4) reptiles and birds

184. Hereditary characters are transferred from parents to offsprings chiefly through
    (1) gametes   (2) enzymes
    (3) cytoplasm   (4) centriole

185. Match the organism in column-I with the approximate life spans in column-II

	Column-I		Column-II
a.	Crow	p.	60 years
b.	Parrot	q.	100-150 years
c.	Crocodile	r.	15 years
d.	Tortoise	s.	140 years

    (1) a-r, b-s, c-p, d-q   (2) a-q, b-s, c-p, d-r
    (3) a-r, b-p, c-s, d-q   (4) a-r, b-s, c-q, d-p

BOTANY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

186. In cattle, roan coat colour occurs in the heterozygous(Rr) offspring of red (RR) and white (rr) homozygotes. Which of the following crosses would produce offspring in the ratio of 1 red : 2 roan : 1 white?
    (1) red × white   (2) roan × roan
    (3) white × roan   (4) red × roan

187. How many of the following statments are correct?
    a. There is a characteristic distribution of cells within the embryo sac
    b. The large central cell in embryo sac has two polar nuclei
    c. The method of embryo sac formation from single megaspore is termed as monosporic development
    d. Most common type of ovule is anatropous in angiosperm
    (1) one   (2) three
    (3) two   (4) four

188. If leaf cell of a plant has 46 chromosomes, how many chromosomes wil be present in integument, egg, zygote and primary endosperm cell
    (1) 23, 23, 46, 46
    (2) 46, 23, 46, 69
    (3) 23, 23, 46, 69
    (4) 46, 23, 46, 46

189. Identify the incorrect statement
    (1) morphologically and genetically similar individuals are known as clones
    (2) asexual reproduction is common among plants and animals with relatively complex organisation
    (3) In bacteria, organism divides into two to give rise to new individual
    (4) In yeast, cell division is unequal

190. How many of the following statements are correct?
    a. In plants, after fertilisation the sepals, petals and stamens of the flower wither and fall off
    b. After syngamy diploid zygote is formed inside the ovule which forms embryo
    c. Ovules with embryo develop into fruits
    d. Wall of fruit is called pericarp
    (1) Two   (2) Three
    (3) One   (4) Four

191. Which of the following pair is mismatched?
    (1) Mature pollen grain−male gametophyte
    (2) *Parthenium* −pollen allergy
    (3) Tapetum−protection
    (4) Microsporangium−pollen sac

192. Which one of the following is correct about *Chara*?
    (1) Antheridiophore and archegoniophore on the same plant
    (2) Stamen and carpel on the same plant
    (3) Upper antheridium and lower oogonium on the same plant
    (4) Upper oogonium and lower antheridium on the same plant

193. What phenotypic ratio would you expect when a capsulated pathogenic strain of *Pneumococcus* is allowed to mate a non capsulated non-pathogenic strain?
    (1) 3 : 1   (2) 1 : 2 : 1
    (3) 9 : 3 : 3 : 1 (4) None of these

194. Read the following statements and identify the correct one
    (1) pollen grains are rich in nutrients
    (2) pollen grains have to land on stigma after they lose viability
    (3) the period for which pollen grains remain viable is constant
    (4) pollen grains cannot be stored in pollen banks for crop breeding programmes

195. Even in absence of pollinating agents seed-setting is assured in
    (1) Fig
    (2) *Commellina*
    (3) *Zostera*
    (4) *Salvia*

196.
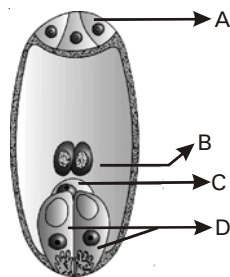
A, B, C & D marked in the above figure of the mature embryo sac are respectively
    (1) Egg apparatus, polar nuclei, egg, antipodal cell
    (2) Antipodals, central cell, egg, synergids
    (3) Central cell, polar nuclei, egg, synergids
    (4) Egg, antipodal cell, central cell, polar nuclei

197. If in a mendelian monohybrid cross, F_2 generation shows identical genotypic and phenotypic ratios it means, alleles show
    (1) Co-dominance
    (2) Incomplete dominance
    (3) Independent assortment
    (4) Both (1) & (2)

198. What will be the percentage of double homozygous in Mendelian dihybrid F_2?
    (1) 25%   (2) 12.5%
    (3) 50%   (4) none of these

199. In water hyacinth and water lily, pollination takes place by
    (1) water currents only
    (2) wind and water
    (3) insects and water
    (4) insects or wind

200. **Assertion** :Meiosis never occurs in the life cycle of organisms that are haploid.
    Reason : Gametes are haploid, even if parent plant body from which they arise is either haploid or diploid.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

Dated :
02-6-2022

M.L. Syal's Helix Institute
S.C.O. 343-345, Top Floor, Sector 34-A, Chandigarh. Ph : 0172-2623155

XII cum Competition Course for Medical – Test - 4

1.	(4)	51.	(4)	101.	(2)	151.	(1)
2.	(1)	52.	(3)	102.	(3)	152.	(1)
3.	(1)	53.	(1)	103.	(4)	153.	(1)
4.	(2)	54.	(3)	104.	(3)	154.	(3)
5.	(2)	55.	(2)	105.	(4)	155.	(1)
6.	(4)	56.	(1)	106.	(1)	156.	(2)
7.	(2)	57.	(1)	107.	(4)	157.	(2)
8.	(3)	58.	(2)	108.	(4)	158.	(1)
9.	(2)	59.	(4)	109.	(2)	159.	(4)
10.	(1)	60.	(2)	110.	(4)	160.	(1)
11.	(4)	61.	(2)	111.	(3)	161.	(3)
12.	(2)g	62.	(4)	112.	(4)	162.	(1)
13.	(2)	63.	(1)	113.	(3)	163.	(3)
14.	(2)	64.	(3)	114.	(2)	164.	(1)
15.	(4)	65.	(2)	115.	(1)	165.	(3)
16.	(2)	66.	(1)	116.	(1)	166.	(4)
17.	(4)	67.	(1)	117.	(4)	167.	(3)
18.	(3)	68.	(4)	118.	(4)	168.	(2)
19.	(4)	69.	(3)	119.	(4)	169.	(4)
20.	(2)	70.	(3)	120.	(2)	170.	(2)
21.	(2)	71.	(2)	121.	(3)	171.	(1)
22.	(1)	72.	(3)	122.	(3)	172.	(2)
23.	(2)	73.	(2)	123.	(3)	173.	(4)
24.	(1)	74.	(4)	124.	(3)	174.	(2)
25.	(4)	75.	(3)	125.	(2)	175.	(1)
26.	(3)	76.	(3)	126.	(2)	176.	(1)
27.	(3)	77.	(3)	127.	(1)	177.	(3)
28.	(2)	78.	(1)	128.	(4)	178.	(3)
29.	(3)	79.	(3)	129.	(4)	179.	(3)
30.	(1)	80.	(2)	130.	(4)	180.	(2)
31.	(2)	81.	(3)	131.	(1)	181.	(3)
32.	(3)	82.	(3)	132.	(4)	182.	(1)
33.	(1)	83.	(4)	133.	(4)	183.	(1)
34.	(2)	84.	(1)	134.	(1)	184.	(1)
35.	(3)	85.	(1)	135.	(3)	185.	(1)
36.	(4)	86.	(2)	136.	(1)	186.	(2)
37.	(2)	87.	(2)	137.	(3)	187.	(4)
38.	(3)	88.	(2)	138.	(3)	188.	(2)
39.	(3)	89.	(1)	139.	(3)	189.	(2)
40.	(1)	90.	(1)	140.	(2)	190.	(2)
41.	(1)	91.	(2)	141.	(4)	191.	(3)
42.	(4)	92.	(4)	142.	(3)	192.	(4)
43.	(2)	93.	(1)	143.	(4)	193.	(4)
44.	(1)	94.	(1)	144.	(2)	194.	(1)
45.	(4)	95.	(2)	145.	(2)	195.	(2)
46.	(4)	96.	(1)	146.	(2)	196.	(2)
47.	(3)	97.	(4)	147.	(4)	197.	(4)
48.	(3)	98.	(4)	148.	(3)	198.	(1)
49.	(1)	99.	(2)	149.	(3)	199.	(4)
50.	(4)	100.	(3)	150.	(3)	200.	(4)

Dated :
23-06-2022

M.L. Syal's Helix Institute
S.C.O. 343-345, Top Floor, Sector 34-A, Chandigarh. Ph : 0172-2623155

Code-A

MM : 720   **XII cum Competition Course for Medical**   **Time : 3 hrs.**
Test - 5

Physics	:	**Current Electricity**
Chemistry	:	**Extraction , Electrochemistry**
Zoology	:	**Human helath & diseases, Immune system-I (except vaccination & disorders of immune system)**
Botany	:	**Non-Mendelian Inheritance, Chromosomal Basis of Inheritance-I, Chromosome, Linkage**

PHYSICS : SECTION-A

All questions are compulsory in section A

1. When the current I is flowing through a conductor, the drift velocity is v. If 2I current is flowing through the same metal but having double the area of cross-section, then the drift velocity will be
   (1) v/4   (2) v/2
   (3) v   (4) 4v

2.
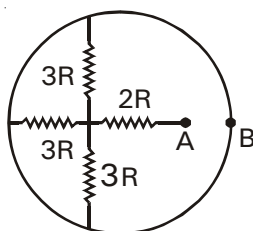
   Equivalent resistance between points A and B for above circuit is

   (1) $\dfrac{R}{3}$ (2) R

   (3) $\dfrac{4R}{3}$ (4) 3R

3. The terminal potential difference will be equal to the e.m.f. of the battery when the external resistance is equal to
   (1) infinity
   (2) internal resistance of battery
   (3) zero
   (4) non zero but very small

4. Find equivalent resistance between the points A and B of network of resistors shown in figure.
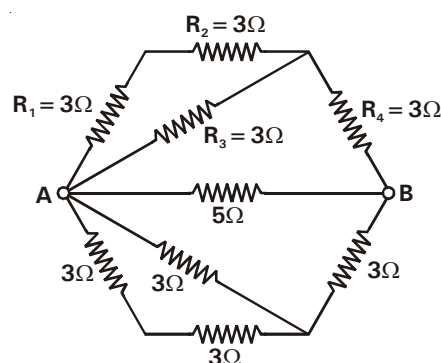
   (1) $\dfrac{3}{5}\,\Omega$ (2) $\dfrac{6}{5}\,\Omega$

   (3) $\dfrac{4}{5}\,\Omega$ (4) $\dfrac{5}{3}\,\Omega$

5. A 2 volt battery, a 15 Ω resistor and a potentiometer of 100 cm length, all are connected in series. If the resistance of potentiometer wire is 5 Ω, then the potential gradient of the potentiometer wire is
   (1) 0.005 V/cm   (2) 0.05 V/cm
   (3) 0.02 V/cm   (4) 0.2 V/cm

6. A battery of 90 cells, each of emf 1.5 V and internal resistance $1\,\Omega$ is to be connected in order to send the maximum current through a $10\,\Omega$ resistor. The correct arrangement of cells will be
   (1) 5 rows in parallel, each having 18 cells in series
   (2) 6 rows in parallel, each having 15 cells in series
   (3) 3 rows in parallel, each having 30 cells in series
   (4) all in series

7. A voltmeter of range 10V has a resistance of $9988\,\Omega$ in series with a galvanometer of current capacity 1mA. Series resistance is removed and shunt is connected with galvanometer to make it an ammeter of capacity 1A. Required shunt resistance is about
   (1) $6\,m\Omega$ (2) $12\,m\Omega$
   (3) $18\,m\Omega$ (4) $24\,m\Omega$

8. In the circuit shown, A and V are ideal ammeter and voltmeter respectively. Reading of the voltmeter will be
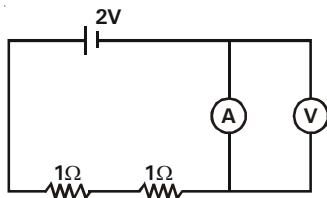
   (1) 2 V   (2) 1 V
   (3) 0.5 V   (4) Zero

9. An ammeter of $1\,\Omega$ resistance can read 10 mA. If it is to be used to read 10 volts, how much resistance is to be connected in series?
   (1) $999\,\Omega$ (2) $9.9\,\Omega$
   (3) $9999\,\Omega$ (4) $99\,\Omega$

10. Terminal potential difference of a battery is 1.8 V when current drawn is 1 A and becomes 1.2 V when current drawn is 1.5 A. Its internal resistance is
    (1) $2\,\Omega$ (2) $1.5\,\Omega$
    (3) $1.2\,\Omega$ (4) $0.9\,\Omega$

11.
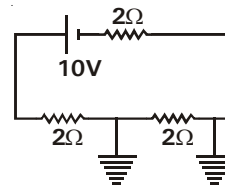
    What is current supplied by cell in above figure?
    (1) $\dfrac{2}{3}$ A   (2) $\dfrac{5}{4}$ A

    (3) 5 A   (4) $\dfrac{5}{2}$ A

12. When a non-ideal battery is connected with external variable resistance, the current in the circuit is 40% of short circuit current of the battery. If we start decreasing the value of external resistance, heat produced per second in it
    (1) increases continously
    (2) decreases continously
    (3) first increases then decreases
    (4) first decreases then increases

13. The potential difference across the cell
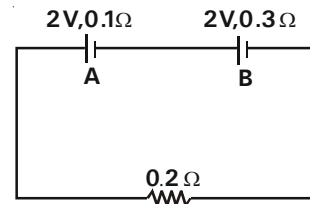
    (1) B will be zero   (2) A will be zero
    (3) A will be 2V   (4) none of these

14. The colour of a carbon resistor are red, yellow, blue as read from left to right. The resistance is
    (1) $(24 \times 10^4 \pm 5\%)\,\Omega$
    (2) $(24 \times 10^6 \pm 20\%)\,\Omega$
    (3) $(14 \times 10^4 \pm 20\%)\,\Omega$
    (4) $(14 \times 10^6 \pm 10\%)\,\Omega$

15. The charge on the capacitor in steady state in the figure shown is

2V, 0.5 Ω
1μF
4 Ω
1 Ω

(1) 2 μC
(2) 2/3 μC
(3) 4/3 μC
(4) zero

16.

15 A
18 A
10 A
13 A
i
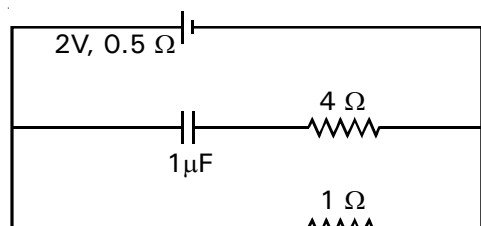
The figure below shows currents in a part of electric circuit. The current i is
(1) 16 A
(2) 14 A
(3) 13 A
(4) 10 A

17.

I(A)
t(s)
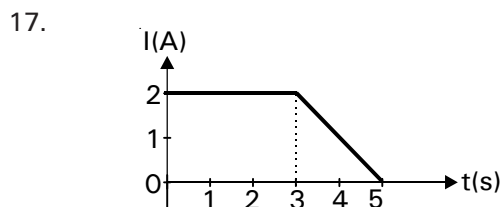
The graph shows the variation of current with time in a circuit. The average current from 0 to 5 seconds is
(1) 2 A
(2) 1.8 A
(3) 1.6 A
(4) 1.5 A

18. In a metre-bridge experiment, for two resistances P and Q, bridge is balanced on length 20 cm. If P and Q are interchanged balancing length changes by
(1) Zero
(2) 20 cm
(3) 60 cm
(4) 80 cm

19. In the given circuit, the potential of the point B is

A
E 1Ω
8V
D
B
5Ω
C
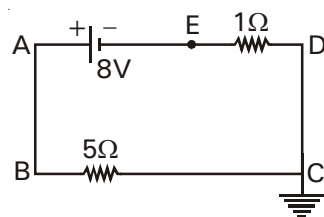
(1) Zero
(2) 6.67 V
(3) 4.33 V
(4) 1.33 V

20.

V
i
A
R
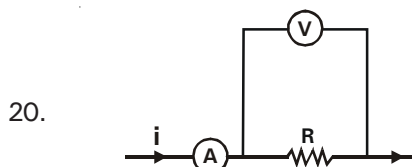
In the circuit used to measure resistance R, voltmeter is ideal but ammeter is non-ideal. Then resistance R as determined from circuit is
(1) same as actual resistance R
(2) smaller than actual resistance R
(3) larger than actual resistance R
(4) cannot say

21.

1A
3Ω
A
5Ω
D
2A
3Ω
I_1
1Ω
4μF
1Ω
I_2
I_3
2A
B
2Ω
C
4Ω
3Ω
1A
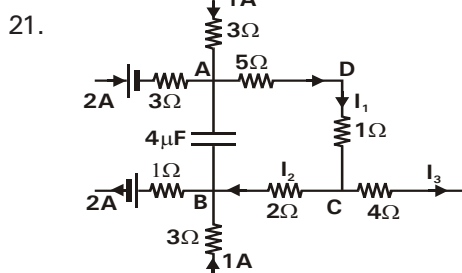
A part of a circuit in steady-state along with the current flowing in the branches, with value of each resistance is shown in figure. Calculate the energy stored in the capacitor.
(1) 10^{-4} J
(2) 2×10^{-4} J
(3) 8×10^{-4} J
(4) 12×10^{-4} J

22.
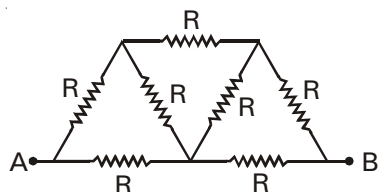
Find equivalent resistance between the points A and B of network of resistors shown in figure.

(1) 7R/6
(2) 8R/7
(3) 6R/5
(4) R

23. A current of 3A flows through a wire shown in figure. What is the potential difference between A and B?
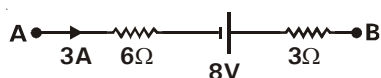
(1) 29 V
(2) 19 V
(3) 9 V
(4) 0.9 V

24. In the presence of an applied electric field ($\vec{E}$) in a metallic conductor.

(1) electrons move steadily in the direction of $\vec{E}$

(2) electrons move steadily in a direction opposite to $\vec{E}$

(3) electrons may move in any direction randomly, but slowly drift in the direction of $\vec{E}$.

(4) electrons move randomly but slowly drift in a direction opposite to $\vec{E}$

25 A galvanometer gives full scale deflection with a current of 1 ampere. It is converted into an ammeter of range 10 ampere. The ratio of the resistance of ammeter formed to the shunt resistance used is

(1) 9 : 10
(2) 1 : 2
(3) 3 : 5
(4) 9 : 8

26.
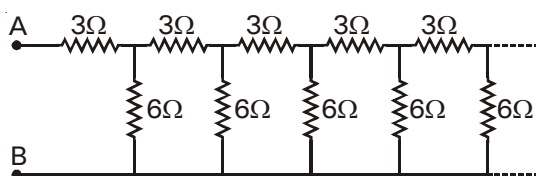
In the above arrangement of an infinite sequence of resistances, the resultant resistance between A and B will be

(1) $6\,\Omega$
(2) $3\,\Omega$
(3) $18\,\Omega$
(4) infinite

27. Two bulbs B_1 (40W, 220V) and B_2 (100W, 220V) are connected in series to an e.m.f. of 220V. Which of these glows brighter?

(1) 40 W
(2) 100 W
(3) Both glow equally
(4) 40 W bulb fuses

28.
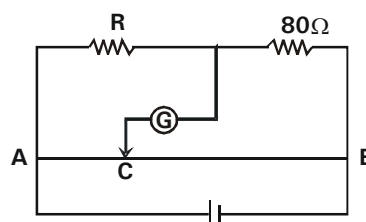
AB is a wire of uniform resistance. The galvanometer G shows no current when the length AC = 25cm and CB = 75 cm. The resistance R is about

(1) $27\,\Omega$
(2) $240\,\Omega$
(3) $20\,\Omega$
(4) $25\,\Omega$

29.
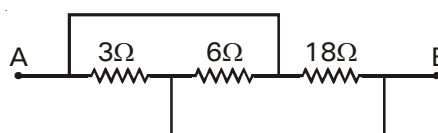
In the above arrangement of three resistors, the net resistance between A and B is

(1) $3.6\ \Omega$
(2) $1.8\ \Omega$
(3) $1.2\ \Omega$
(4) $27\ \Omega$

30. A battery is connected to a variable resistance so that the current (in A) in the circuit increases with time as $I = 2t + 4$, where t is time in seconds. Then, the total charge that will flow in first five seconds will be
   (1) 10C
   (2) 20C
   (3) 25C
   (4) 45C

31. Two electric bulbs have tungsten filaments of same length. If one of them gives 60 watt and other 100 watt, then
   (1) 100 watt bulb has thicker filament
   (2) 60 watt bulb has thicker filament
   (3) Both filaments are of same thickness
   (4) It is possible to get different wattage unless the lengths are different

32. The potential gradient along the length of a uniform wire is 10 volt/metre. B and C are the two points at 30 cm and 60 cm point on a meter scale fitted along the wire. The potential difference between B and C will be
   (1) 3 volt
   (2) 0.4 volt
   (3) 7 volt
   (4) 4 volt

33.
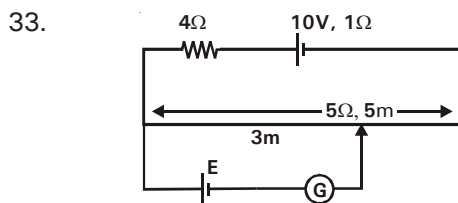
   A resistance of 4Ω and a wire of length 5 metre and resistance 5Ω are joined in series and connectd to a cell of e.m.f. 10V and internal resistance 1Ω. Another cell is balanced across 300 cm of the wire. The e.m.f. E of this cell is
   (1) 1.5V
   (2) 3.0V
   (3) 2.67V
   (4) 2.33V

34. If the current in electric bulb decreases by 0.5%, then the power in the bulb decreases by approximately
   (1) 1%
   (2) 2%
   (3) 0.5%
   (4) 0.25%

35.
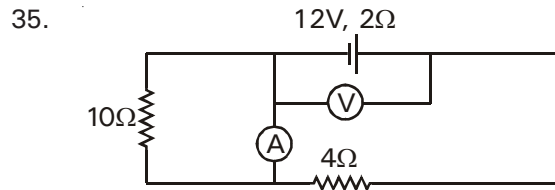
   In the circuit shown here, the readings of the ideal ammeter and voltmeter are
   (1) 2 amperes and 10 volts
   (2) 0.5 amperes and 11 volts
   (3) 0.75 ampere and 10.5 volts
   (4) 2 amperes and 8 volts

PHYSICS : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

36. In the figure ratio of current in 6 Ω and 1 Ω resistance is
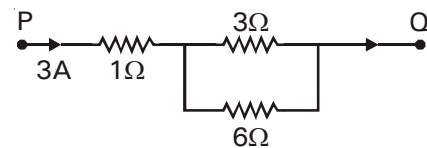
   (1) 1
   (2) 3
   (3) $\dfrac{2}{3}$
   (4) $\dfrac{1}{3}$

37.
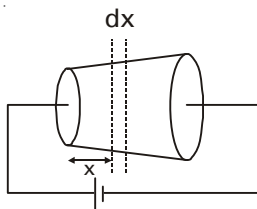
Consider a solid conductor with a shape as shown connected with a battery. Which of the following quantities when plotted against 'x' generate similar graph

a. electric field in the conductor
b. heat produced per unit time in thickness dx of conductor
c. drift velocity of electrons

(1) a and b
(2) b and c
(3) a and c
(4) a, b and c

38. A Daniel cell is balanced on 125 cm length of a potentiometer wire. Now the cell is short-circuited by a resistance 2 ohm and the balance is obtained at 100 cm. The internal resistance of the Daniel cell is

(1) 0.5 ohm
(2) 1.5 ohm
(3) 1.25 ohm
(4) 0.8 ohm

39. If each resistance in the figure is of $9\,\Omega$ then reading of ammeter is
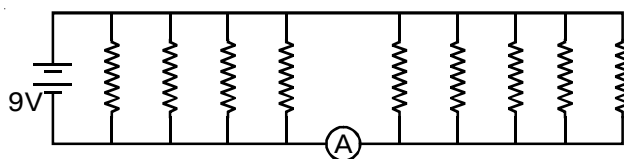
(1) 5 A
(2) 8 A
(3) 2 A
(4) 9 A

40. A potentiometer is more sensitive when

(1) Its wire is small
(2) Applied potential difference is large
(3) Its wire has small cross sectional area
(4) Potential gradient along the wire is small

41. In the circuit shown in figure, equivalent resistance between A and B is
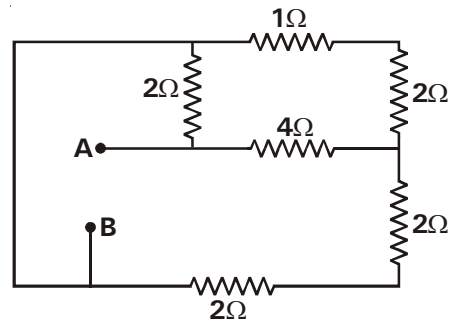
(1) $8\,\Omega$
(2) $\dfrac{40}{21}\,\Omega$
(3) $\dfrac{40}{27}\,\Omega$
(4) none of these

42. If the resistance of a conductor at $100°C$ is $40\,\Omega$ and at $150°C$ is $50\,\Omega$, then its resistance at $0°C$ is

(1) $20\,\Omega$
(2) $10\,\Omega$
(3) $25\,\Omega$
(4) $15\,\Omega$

43. Heat produced in $4\,\Omega$ resistor is 2 cal/sec. Heat produced in $10\,\Omega$ will be
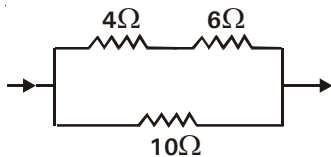
(1) 1 cal/sec   (2) 5 cal/sec
(3) 10 cal/sec   (4) 4 cal/sec

44. There are N cells in the following circuit each of e.m.f. E and internal resistance r. The points A and B in the circuit divide the circuit into n and (N − n) cells. The current in the circuit is
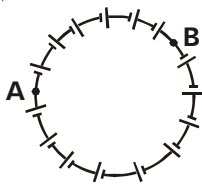
(1) $\dfrac{E}{r}$ (2) $\dfrac{nE}{r}$

(3) $\dfrac{NE}{nr}$ (4) 0

45. If a 0.1 % increase in length due to stretching, the percentage increase in its resistance will be

(1) 0.2 %   (2) 2 %
(3) 1 %   (4) 0.1 %

46. Two resistors when connected in series with a 10V battery produce a total power of 2W. Power produced becomes 8.33W when they are connected in parallel with the same battery. One of the resistance may be

(1) $15\ \Omega$ (2) $20\ \Omega$
(3) $25\,\Omega$ (4) $18\ \Omega$

47.
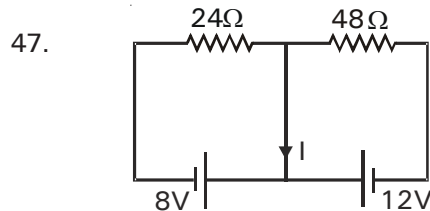
The current 'I' in the above circuit is

(1) $-\dfrac{7}{12}$ amp   (2) $\dfrac{7}{8}$ amp

(3) − 3 amp   (4) $-\dfrac{12}{7}$ amp

48.
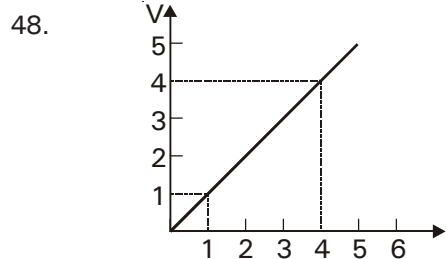
Variation of current and voltage for a conductor has been shown in the diagram. The resistance of the conductor is

(1) 4 ohm   (2) 2 ohm
(3) 3 ohm   (4) 1 ohm

49.
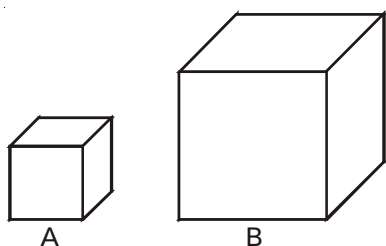
A and B are two aluminium cubes but the volume of B is eight times the volume of A. If the resistance of A between two opposite faces is 10 Ω, that of B is

(1) $10\,\Omega$ (2) $5\,\Omega$

(3) $20\,\Omega$ (4) $2.5\,\Omega$

50.
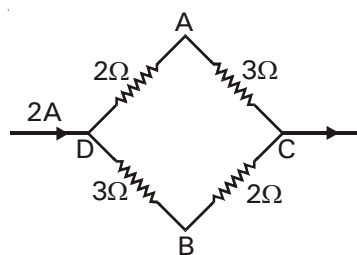
A current of 2 A flows in a system of conductors as shown. Potential difference $(V_A - V_B)$ will be

(1) $+2\,V$ (2) $+1\,V$

(3) $-1\,V$ (4) $-2\,V$

CHEMISTRY : SECTION-A

All questions are compulsory in section A

51. In the metallurgy of iron, limestone is added to the blast furnace. The calcium ions ends up as

(1) slag   (2) gangue

(3) $CaCO_3$ (4) metallic calcium

52. What is amount of chlorine evolved when 3 amperes of current is passed for 40 minutes in aqueous solution of NaCl?

(1) 66 gm   (2) 33 gm

(3) 1.3 gm   (4) none of these

53. Which of the folloiwng are found as sulphide ores?

(1) Ag, Al, Au   (2) Ag, Cu, Ca

(3) Ag, Cu, Hg   (4) Cu, Al, Au

54. For cell, Pt, H_2(1atm)$|H^+|H_2$ (5atm), Pt at 25°, E_{cell} is

(1) $-0.0103V$ (2) $-0.0412V$

(3) $-0.0206V$ (4) $-0.0618V$

55. Given $E^o_{Co^{3+}/Co^{2+}} = 1.82\,V$,

$E^o_{O_2/H_2O} = -1.23\,V$

Choose the correct statement

(1) Co(III) is highly stable in water

(2) Co(III) is unstable in aqueous medium and oxidises water

(3) Water oxidises Co^{2+} to Co^{3+}

(4) There shall be no reaction between Co^{3+} and H_2O

56. Which of the following results in increase in concentration of given electrolytic solution after electrolysis ?

a. Zinc sulphate using graphite(inert) electrodes

b. Zinc sulphate using Zn electrodes

c. Zinc sulphate using Zn cathode

d. Sodium sulphate using graphite(inert) electrodes

(1) b & c only   (2) a & d only

(3) a & c only   (4) c & d only

57. In SHE, the pH of the acid solution should be

(1) 7   (2) 14

(3) 0   (4) 4

58. The standard reduction potential values of three metallic cations, X, Y, Z are 0.52, −3.03 and −1.18 V respectively. The order of reducing power of the corresponding metals is

(1) $Y > Z > X$ (2) $X > Y > Z$

(3) $Z > Y > X$ (4) $Z > X > Y$

59. The standard e.m.f. of a cell involving one electron change is found to be 0.591 V at 25°C. The equilibrium constant of the reaction is

(1) 10^{30} (2) 10^5

(3) 10^{10} (4) 10^1

60. The reaction occuring at anode when the electrolysis of an aqueous solution containing Na_2SO_4 and $CuSO_4$ is done using Pt electrode is
    (1) $Cu \rightarrow Cu^{+2} + 2e^-$
    (2) $2H_2O \rightarrow O_2 + 4H^+ + 4e^-$
    (3) $2Cl^- \rightarrow Cl_2 + 2e^-$
    (4) None of these

61. $\wedge_m = \wedge_m^0 - A\sqrt{C}$

    For the above equation, value of A is different for
    (1) NaCl   (2) $CaSO_4$
    (3) KBr   (4) NaI

62. How many Coulombs are required in the change when HCl is mixed with $Cr_2O_7^{-2}$?

    $(Cr_2O_7^{2-} + HCl \rightarrow CrCl_3)$

    (1) 2×96500 C   (2) 3×96500 C
    (3) 96500 C   (4) 6×96500 C

63. The amount of sulphuric acid consumed in lead-storage battery on passing 96.5 C electricity is
    (1) 0.049g   (2) 0.49g
    (3) 0.098g   (4) 0.98g

64. 0.1 M H_2SO_4 is diluted to 0.01 M H_2SO_4 hence, its molar conductance will be

    (1) 10 times   (2) $\frac{1}{10}$ times

    (2) 100 times   (4) 10000 times

65. Which of the following statements is correct?
    (1) Saline water slows down the rusting
    (2) Alkaline medium inhibits rusting
    (3) Iron can rust in vacuum
    (4) Pure metals undergo corrosion faster than impure metals

66. Equivalent conductance of NaCl, HCl and CH_3COONa at infinite dilution are 126.45, 426.16 and 91 ohm^{-1} cm^2 respectively. The equivalent conductance of CH_3COOH at infinite dilution would be
    (1) 101.38 ohm^{-1} cm^2 (2) 253.62 ohm^{-1} cm^2
    (3) 390.71 ohm^{-1} cm^2 (4) 678.90 ohm^{-1} cm^2

67. The cell constant of a conductivity cell
    (1) changes with change of electrolyte
    (2) changes with change of concentration of electrolyte
    (3) changes with temperature of electrolyte
    (4) remains constant for a cell

68. The main function of roasting is
    (1) to remove the volatile impurities
    (2) oxidation
    (3) reduction
    (4) to make slag

69. $Ag_2S + NaCN \rightarrow [A]$

    $[A] + Zn \rightarrow [B]$

    [B] is a metal. Hence, [A] and [B] are
    (1) $Na_2[Zn(CN)_4]$, Zn
    (2) $Na_2[Zn(CN)_4]$, Ag
    (3) $Na[Ag(CN)_2]$, Ag
    (4) $Na_3[Ag(CN)_4]$, Ag

70. Three faraday of electricity is passed through molten $AgNO_3$, $NiSO_4$ and $CrCl_3$ kept in three vessels using inert electrodes. The ratio in mol in which the metals Ag, Ni and Cr will be deposited is
    (1) 1 : 2 : 3   (2) 3 : 2 : 1
    (3) 6 : 3 : 2   (4) 2 : 3 : 2

71. When aqueous $AgNO_3$ is electrolysed using inert electrodes, the products obtained at cathode and an anode respectively are
    (1) H_2, O_2 (2) Ag, NO_2
    (3) Ag, O_2 (4) H_2, NO_2

72. The limiting molar conductivities of $BaCl_2$, $Ba(OH)_2$ and NH_4Cl are x, y and z s cm^2 mol^{-1} respectively. Then the limiting molar conductivity of NH_4OH will be
    (1) $y + z - x$ (2) $2y + 2z - x$
    (3) $\frac{1}{2}y + z - \frac{1}{2}x$ (4) $\frac{1}{2}y + \frac{1}{2}z - x$

73. Which of the following plot is correct when mass of the product produced (m) is plotted against the electric charge Q ?

(1)

slope = electrochemical equivalent

(2)

slope = electrochemical equivalent

(3)

slope = gm equivalent

(4)

slope = gm equivalent
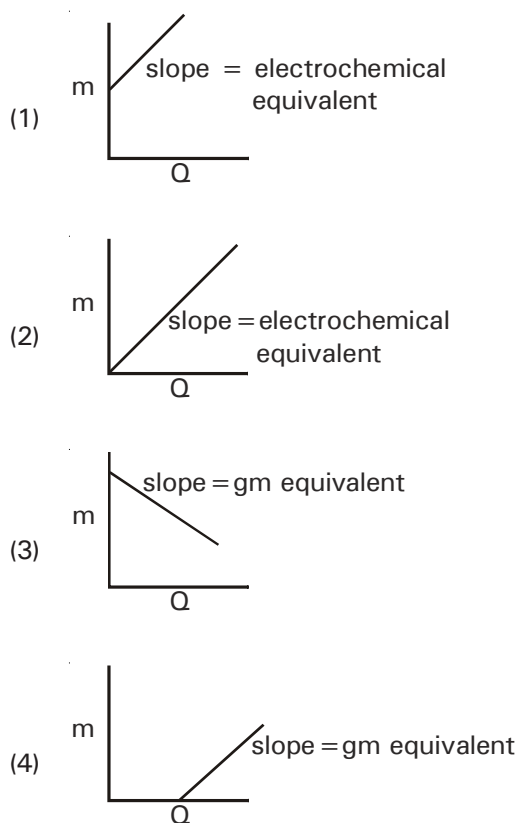
74. Match the terms given in Column I with the units given in Column II.

Column		Column II	
i.	Λ_m	a.	$S\,cm^{-1}$
ii.	E_{Cell}	b.	m^{-1}
iii.	κ	c.	$S\,cm^2\,mol^{-1}$
iv.	G^*	d.	V

(1) i-a, ii-d, iii-c, iv-b   (2) i-c, ii-a, iii-d, iv-b
(3) i-c, ii-b, iii-a, iv-d   (4) i-c, ii-d, iii-a, iv-b

75. Solutions of two electrolytes 'A' and 'B' are diluted. The Λ_m of 'B' increases 1.5 times while that of A increases 25 times. Then
   (1) B is stronger than A
   (2) A is stronger than B
   (3) both are equally strong
   (4) both are weak electrolyte

76. **Assertion** : Λ_m for weak electrolytes shows a sharp increase when the electrolytic solution is diluted.
   Reason :For weak electrolytes degree of dissociation increases with dilution of solution.
   (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
   (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
   (3) Assertion is true statement but Reason is false
   (4) Assertion is false

77. Which of the following method is used for refining of metals used as semiconductors?
   (1) van Arkel method   (2) Zone refining
   (3) crystallization   (4) sublimation

78. Identify the false statement
   (1) Kohlrausch law is valid for both strong & weak electrolytes
   (2) Kohlrausch law is also called law of independent migration of ions
   (3) Conductivity & resistivity remains same as concentration of electrolyte changes
   (4) On dilution the number of ions per unit volume (that carry the current) decrease

79. The most electropositive metals are isolated from their ores by
   (1) high temperature reduction with carbon
   (2) self reduction
   (3) thermal decomposition
   (4) electroylsis of fused ionic salts

80. Which of the following expressions correctly represents the equivalent conductance at infinite dilution of $Al_2(SO_4)_3$. Given that $\lambda^o Al^{3+}$ and $\lambda^o SO_4^{2-}$ are the molar conductances at infinite dilution of the respective ions

(1) $2\lambda^o Al^{3+} + 3\lambda^o SO_4^{2-}$

(2) $\lambda^o Al^{3+} + \lambda^o SO_4^{2-}$

(3) $(\lambda^o Al^{3+} + \lambda^o SO_4^{2-}) \times 6$

(4) $\dfrac{1}{3}\lambda^o Al^{3+} + \dfrac{1}{2}\lambda^o SO_4^{2-}$

81. Which of the following can act as strongest reducing agent below T_1K?
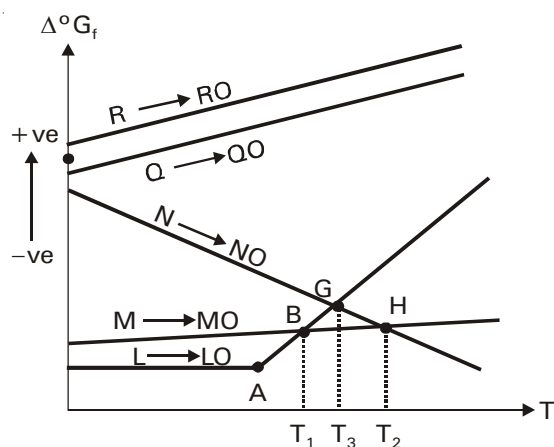
(1) L (2) M
(3) Q (4) R

82. Which of the following is/are true about ellingham lines ?
(1) Mg can reduce Al_2O_3 below 1623 K
(2) C, CO line slopes downwards
(3) ZnO cannnot be reduced by CO
(4) All of these

83. Which one of the following graph between Λ_m vs $\sqrt{c}$ is correct (for aqueous solution of electrolytes at a given temperature) ?

(1)

(2)

(3)

(4)
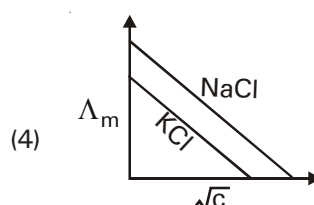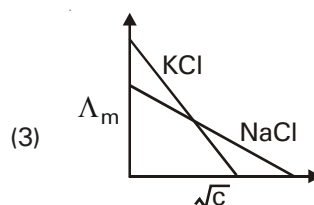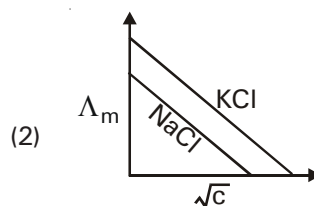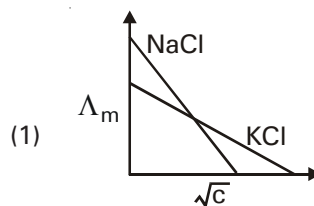
84. E_{Cell} and $\Delta_r G$ of cell reaction are properties which may be respectively

(1) extensive & extensive
(2) intensive & intensive
(3) intensive & extensive
(4) extensive & intensive

85. An electrochemical cell can behave like an electrolytic cell when

(1) $E_{cell} = 0$ (2) $E_{cell} > E_{ext}$
(3) $E_{ext} > E_{cell}$ (4) $E_{cell} = E_{ext}$

CHEMISTRY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

86. Cassiterite is an ore of

(1) Al   (2) Mg
(3) Sn   (4) Mn

87. Which of the following is not correct for dry cell?

(1) Zinc is used as anode
(2) Manganese is reduced
(3) It is a primary cell
(4) NH_3 gas is liberated out

88. In H_2-O_2 fuel cell, 67.2 L of H_2 at STP reacts in 15 minutes. The average current produced is

(1) 643.3 A   (2) 6.433 A
(3) $38.6 \times 10^3 A$ (4) 386 A

89. For the formation of Cr_2O_3 is -540 KJ mol^{-1} and that of Al_2O_3 is -827 KJ mol^{-1}. The correct statement is

(1) reduction of Cr_2O_3 is possible with aluminimum
(2) reduction of Al_2O_3 is possible with Cr
(3) Al can act as reducing agent for Cr_2O_3
(4) both (1) and (3)

90. Calculate the standard cell potential (in V) of the cell in which following reaction takes place :
$Fe^{2+}(aq) + Ag^+(aq) \rightarrow Fe^{3+}(aq) + Ag(s)$
Given that

$E^0_{Ag^+/Ag} = x$ V

$E^0_{Fe^{2+}/Fe} = y$ V

$E^0_{Fe^{3+}/Fe} = z$V

(1) $x - z$ (2) $x-y$
(3) $x + 2y - 3z$ (4) $x + y - z$

91. Which of the following step is not involved in the extraction of copper from copper pyrite ?

(1) crushing followed by the concentration of ore by froth floatation process
(2) removal of iron as slag
(3) self reduction to produce blister copper followed by evolution of SO_2
(4) refining of blister copper by carbon reduction

92. Which of the following process(es) is not used for purification of Bauxite ore?

(1) Hall's process
(2) Serpeck's process
(3) Baeyer's process
(4) Mond's process

93. Match the entries in column-I with their corresponding entries in column-II

	Column-I		Column-I
i.	Malachite	a.	carbonates
ii.	Calamine	b.	oxides
iii.	Zincite	c.	sulphides
iv.	Sphalerite	d.	both iron & copper
v.	Copper pyrites		

(1) i-a, d ; ii-c ; iii-b ; iv-c ; v-c
(2) i-a ; ii-a ; iii-b ; iv-c ; v-c, d
(3) i-b ; ii-a ; iii-b, d ; iv-c ; v-d
(4) i-c ; ii-c, d ; iii-b ; iv-c ; v-a

94. For the redox reaction

    $Zn(s) + Cu^{2+}(0.1M) \rightarrow Zn^{2+}(1\ M) + Cu(s)$ taking

    place in a cell, E^0_{cell} is 1.10 volt. E_{cell} for the cell

    will be
    (1) 2.14 volt   (2) 1.80 volt
    (3) 1.07 volt   (4) 0.82 volt

95. A solution containing one mole per litre of each $Cu(NO_3)_2$, $AgNO_3$, $Hg(NO_3)_2$, $Mg(NO_3)_2$ is being electrolysed by using inert electrodes. The values of standard electrode potentials in volts are $Ag^+/Ag = +0.80$, $Hg^{+2}/Hg = +0.79$, $Cu^{2+}/Cu = +0.34$, $Mg^{2+}/Mg = -2.37$. The sequence of deposition of metals on the cathode will be
    (1) Ag, Hg, Cu, Mg   (2) Mg, Cu, Hg, Ag
    (3) Cu, Hg, Ag   (4) Ag, Hg, Cu

96. The molar conductivity of 0.025 mol L^{-1} methanoic acid is 46.1 S cm^2 mol^{-1}. Then, its degree of dissociation is [Given $\lambda^0(H^+) = 349.6$ S cm^2 mol^{-1} and $\lambda^0(HCOO^-) = 54.6$ S cm^2 mol^{-1}]
    (1) 0.114   (2) 0.367
    (3) 0.215   (4) 11.4

97. The pressure of H_2 required to make the potential of H_2 electrode zero in pure water at 298 K is
    (1) 10^{-4} atm   (2) 10^{-14} atm
    (3) 10^{-12} atm   (4) 10^{-10} atm

98. The oxidation potentials of Zn, Cu, Ag, H_2 and Ni are 0.76, -0.34, -0.80, 0 and 0.25 volt respectively. Which of the following reactions will provide maximum voltage?
    (1) $Zn + Cu^{2+} \longrightarrow Cu + Zn^{2+}$
    (2) $Zn + 2Ag^+ \longrightarrow 2Ag + Zn^{2+}$
    (3) $H_2 + Cu^{2+} \longrightarrow 2H^+ + Cu$
    (4) $H_2 + NI^{2+} \longrightarrow 2H^+ + Ni$

99. The factors which influence the conductance of solution?
    (1) Solute - solute interaction
    (2) viscosity of solvent
    (3) Temperature
    (4) All of the above

100. Conductivity, is equal to

    a. $\dfrac{\ell}{aR}$ b. $\dfrac{G^*}{R}$

    c. Λ_m d. $\dfrac{\ell}{a}$

    (1) Both a & b   (2) Both a & c
    (3) Both b & d   (4) Both a & d

ZOOLOGY : SECTION-A

All questions are compulsory in section A

101. The disease caused by flagellated protozoan is
    (1) Malaria   (2) Amoebic dysentery
    (3) Trypanosomiasis   (4) Filariasis

102. The site/organ where antigen interacts with lymphocytes and proliferate to become effector cells is/are
    (1) spleen   (2) thymus
    (3) bone marrow   (4) all of these

103. The mosquito, *Anopheles* is infective
    (1) sometime after sporogony
    (2) before sporogony
    (3) sometime after schizogony
    (4) in the ookinete stage

104. Dermatophytoses : Ringworm as
    (1) *Salmonella typhi* : Enteric fever
    (2) Malaria   : *Plasmodium*
    (3) Typhoid   : Enteric fever
    (4) House fly   : Amoebiasis

105. Set of insect vector borne diseases is
    (1) Typhoid, Malaria, Dengue
    (2) Diphtheria, Malaria, Chikungunya
    (3) Plague, Dysentery, Ringworm
    (4) Dengue, Filariasis, Chikungunya

106. A novel virus emerges as a pandemic, making it difficult to control the infection. Probable cause(s) could be
    a. Lack of vaccination
    b. Improperly understood mode of transmission
    c. Time taken for origin of antigen specific lymphocytes
    d. Improperly understood line of treatment
    (1) a, b, c & d   (2) a, b & d
    (3) a, c & d   (4) b, c & d

107. Which of the following bacteria live in intestine?
    (1) *Clostridium tetani*
    (2) *Salmonella typhi*
    (3) *Haemophilus influenzae*
    (4) *Ascaris*

108. A person complains of nasal congestion, sore throat & fever. Fearing Covid-19 he goes for an X-ray. However his lungs are clear of infection. He is most probably infected with
    (1) *Rhinovirus*
    (2) *Haemophilus influenzae*
    (3) *Mycobacterium*
    (4) Both (1) & (2)

109. What is common to Syphilis and Gonorrhoea?
    (1) Bacterial diseases
    (2) Venereal diseases
    (3) Transmission by sexual contact
    (4) All of these

110. How many of the following pathogens enter body through routes other than faeco-oral route?

    Salmonella typhi*, *Rhinovirus*, Pneumonia, HIV, Herpes simplex virus, Hepatitis B virus, *Haemophilus influenzae*, *Plasmodium vivax*, *Filarial worm

    (1) Seven   (2) Six
    (3) Five   (4) Four

111. Which of the following statement is incorrect?
    (1) All parasites are pathogens and cause harm to host by living in or on them
    (2) Malignant malaria is caused by *Plasmodium falciparum*
    (3) Yoga has been practised since time immemorial to achieve physical and mental health.
    (4) Ebola, Syphilis and HIV can be transmitted by the semen of infected male

112. Which among the following is responsible for the chill, high fever recurring every three to four days?
    (1) Entry of sporozoites into the body
    (2) Release of cryptozoites from the liver cells
    (3) Release of cryptozoites from ruptured RBCs
    (4) Release of haemozoin from ruptured RBCs

113. Which of the following is first event that occurs after the introduction of sporozoites in the body of human?
    (1) Release of haemozoin
    (2) Transport of sporozoites to RBCs
    (3) Multiplication of parasite in the liver cells
    (4) Chill, shivering and fever

114. How many of the following statements are correct?
    a. Axillary lymph nodes are solid structures which trap antigens from tissue fluid
    b. Thymus is an endocrine gland present on ventral side of heart and aorta
    c. Peyer's patches and appendix are secondary lymphoid structures and are vestigeal
    d. Thymus secretes thymosin for differentiation of T-lymphocyte
    e. Bone marrow and thymus provide micro-environment for development and maturation of B-lympocytes
    (1) Two   (2) Three
    (3) Five   (4) Four

115. It is noted that the body acquires life long immunity against a certain viral disease 'X' when it is infected with the virus responsible for another viral disease 'Y'. Most likely explanation for this is
    (1) Virus Y functions as antibody for virus X
    (2) Virus X & Y share some antigenic determinants
    (3) Passive immunisation done against Y helps against X also
    (4) NK cells get activated to destroy the virus infected cells after first exposure to the virus in the body.

116. How many of the following cells are components of specific immunity?
    NK cells, Macrophages, B-cells, Antibodies, Neutrophils, Interferons, Plasma cells, Memory cells
    (1) Four   (2) Three
    (3) Six   (4) Five

117. Mosquito larvivorous fish is used to check protozoan diseases such as
    (1) Malaria   (2) Chikungunya
    (2) Dengue   (4) All of these

118. How many of the following statements are correct?
    a. Hepatitis-B is STI but not RTI
    b. All STIs are treatable
    c. STIs are self invited infections
    d. All viral STIs are incurable
    (1) One   (2) Three
    (3) Two   (4) Four

119. Which of the following set represents the viral diseases?
    (1) Influenza, Tuberculosis, Common cold, Mumps
    (2) Rabies, Polio, Flu, Enteric fever
    (3) Measles, Pneumonia, Diphtheria, Rabies
    (4) Mumps, Dengue, Chickungunya, Measles

120. Injecting the microbes deliberately during immunisation induces_____
    (1) Natural Active acquired immunity
    (2) Artificial Active acquired immunity
    (3) Natural passive acquired immunity
    (4) Artificial passive acquired immunity

121. **Statement -A** In severe cases of pneumonia, lips and nails of patient turn blue.

Statement -B Accumulation of mucus and fluids in alveoli lead to insufficient oxygenation of blood.
    (1) A is correct while B is incorrect
    (2) B is correct while A is incorrect
    (3) Events in A are a result of events in B
    (4) Events in B are a result of events in A

122. Which of the following activates/induces antibody production?
    (1) Tumor cells
    (2) Graft /organ transplantation
    (3) Pathogen circulating in Blood
    (4) T-Killer cells

123. The active form of *Entamoeba histolytica* feeds upon
    (1) mucosa and submucosa of colon only
    (2) food in intestine
    (3) blood only
    (4) erythrocytes, mucosa and submucosa of colon

124. Identify X, Y, A and B in the given graph and choose the correct answer
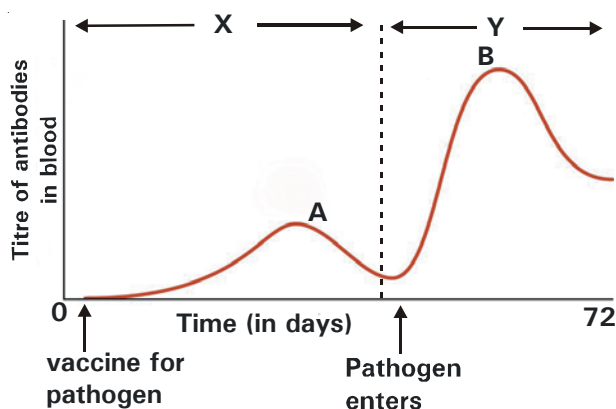
    (1) A = Ig G concentration increases after exposure to antigen for 1st time.
    (2) Y = represents secondary immune response after exposure to antigen for 1st time
    (3) B = Heightened antibody titre due to activity of memory cells
    (4) X = Primary immune response which lasts for longer duration

125. What deters an individual infected with STIs for timely detection and treatment of the same?
    a. Social stigma attached to veneral diseases
    b. Asymptomatic infected female in early stages
    c. Expensive diagnosis and treatment
    d. Less significant symptoms in early stages
    (1) a, b and c   (2) b, c and d
    (3) a, b and d   (4) a and b

126. Multiple fission in *Plasmodium* occurs in
    (1) Liver of secondary host
    (2) Gut of secondary host
    (3) Blood cells of primary host
    (4) Lumen of gut of primary host

127. Which of following is not a prophylactic measure?
    (1) Introduction of *Gambusia* fish in ponds
    (2) Prevention of overcrowding
    (3) Consumption of suitable antibiotic with least side effects
    (4) Hygiene and vaccination

128. If you suspect major deficiency of antibodies in a person to which of the following would you look for confirmatory evidence ?
    (1) serum globulins
    (2) fibrinogen in plasma
    (3) haemocytes
    (4) serum albumins

129. How many variable segments are present in IgG molecule?
    (1) one   (2) two
    (3) four   (4) three

130. Identify the correctly matched pair of diseases to its method of spreading
    (1) Typhoid and amoebiasis - Airborne
    (2) Babesiosis and Leishmaniasis - Vector borne
    (3) Common cold and pneumonia - Food & water
    (4) All are correctly matched

131. The genus of dermatophytes which can infect skin, nails and scalp is
    (1) *Epidermophyrton*   (2) *Trichophyton*
    (3) *Microsporum*   (4) Tinea

132. Which of the following diseases is known to affect nervous system?
    (1) sleeping sickness   (2) poliomyelitis
    (3) rabies   (4) all of these

133. A correct pair of disease, pathogen and mode of infection is

	Disease	Pathogen	Mode of infection
(1)	Infantile paralysis	Entero virus	Contaminated food and water
(2)	Break bone fever	Myxovirus	Arthropod vector
(3)	Hepatitis B	Arbovirus	Droplet infection
(4)	Chickungunya	Rhinovirus	Blood transfusion

134. How many of the following are true for lysozyme?
Antibacterial, Cellular barrier, Present in saliva, Innate immunity, Second line of defence
    (1) four   (2) five
    (3) three   (4) two

135. **Assertion**: Ascariasis and Amoebiasis are transmitted by arthropod vectors which introduce the infective stage into body directly.

Reason: Housefly transmits ascariasis and amoebiasis.

(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion

(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion

(3) Assertion is true statement but Reason is false

(4) Assertion is false

ZOOLOGY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

136. Which of the following pathogen can be observed inside RBC?
    (1) *Entamoeba histolytica*
    (2) *Plasmodium*
    (3) *Wuchereria*
    (4) Both (1) and (2)

137. Which of the following statements is incorrect?
    (1) Typhoid fever can be confirmed by Widal test
    (2) Pneumonia & common cold are air-borne diseases
    (3) Mode of transmission of rabies, polio and taeniasis is same
    (4) Intestinal perforation occurs in severe cases of typhoid

138. The antibody which acts as B-cell receptor is
    (1) IgE   (2) IgD
    (3) IgG   (4) IgA

139. Choose the incorrect pair of a disease and its common name

Disease		Common name
(1) Leprosy	–	Kusht rog
(2) Tetanus	–	Dhanustamba
(3) Diptheria	–	Gal ghotu
(4) Pertussis	–	Lock jaw

140. Anamnestic response is
    (1) primary response
    (2) secondary response
    (3) primary infection
    (4) passive immunity

141. Symptoms like anemia, fever, inflammation, deformities etc. are associated with
    (1) Amoebiasis   (2) Elephantiasis
    (3) Trichomoniasis   (4) Enteritis

142. Which of the following is incorrect w.r.t. malarial parasite?
    (1) Fertilization & development – In Mosquito Gut
    (2) Gametocyte development – In Human RBCs
    (3) Storage of sporozoites – In Salivary glands of mosquito
    (4) Asexual multiplication – In Mosquito Gut

143. Which of the following is common to ascariasis and elephantiasis?
    (1) Mode of transmission
    (2) Intestinal parasites
    (3) Causative agents belong to the same phylum
    (4) Mechanical carriers

144. Mary Mallon is associated with
    (1) Typhoid, a viral disease
    (2) Pneumonia, a viral disease
    (3) Plague, a bacterial disease
    (4) Typhoid, a bacterial disease

145. T cell of the cell-mediated immune system make specific proteins, similar to antibodies, that become
    (1) embedded within membranes of lymph nodes
    (2) receptors on the plasma membrane of the T cells
    (3) embedded in interstitial fluid
    (4) linked to antibody by disulphide bridges

146. Symptoms like dry, scaly lesions on skin, nails and scalp are associated with pathogens belonging to the group
    (1) Helminthes   (2) Protozoans
    (3) Fungi   (4) Rhinoviruses

147. Incurable communicable disease/diseases caused by contamination of food and water affecting nervous system is/are
    (1) tetanus   (2) poliomyelitis
    (3) tetanus and polio   (4) typhoid

148. Which of the following is viviparous aschelminthes?
    (1) *Ancyclostoma*   (2) *Wuchereria*
    (3) *Taenia*   (4) Ascaris

149. Which of the following helminthes infect people who move barefooted and where hygiene is neglected
    (1) *Wuchereria*   (2) *Taenia*
    (3) *Ancylostoma*   (4) *Ascaris*

150. How many of the following diseases are non-infectious?

    Marasmus, CAD, Cancer, Renal failure, AIDS, Influenza, Allergy

    (1) 4   (2) 5
    (3) 6   (4) 7

BOTANY : SECTION-A

All questions are compulsory in section A

151. The number of linkage groups in male *Drosophila* and Human female are respectively
    (1) 4,24   (2) 5,23
    (3) 4,22   (4) 5,22

152. Which of the following part of chromosome possesses points for attachment of microtubules of chromosomal fibres?
    (1) trabant   (2) satellite
    (3) centromere   (3) telomere

153. Find the correct sequence of genes x, y, z if they lie on the same chromosome and show following cross over %.

x, y = 10% ;   y, z = 2% ;   x, z = 8%

(1) x, y, z   (2) x, z, y
(3) z, x, y   (4) y, x, z

154. Find the incorrect match
(1) Bridges-- Nondisjunction
(2) Morgan -- Linkage
(3) Sturtevant-- Genetic map
(4) Davenport-- Wheat kernel colour

155. In gene mapping, one unit of map distance is equivalent to
(1) 1% cross over   (2) 10% cross over
(3) 50% cross over   (4) 100% cross over

156. The two genes are showing complete linkage. Their dihybrid cross ratio in F_2 generation is
(1) 1 : 1   (2) 3 : 1
(3) 1 : 1 : 1 : 1   (4) 9 : 3 : 3 : 1

157. Term chromosome was coined by
(1) Waldeyer   (2) Hofmeister
(3) Morgan   (4) Boveri

158. Which of the following is not a secondary effect of Sickle cell anaemia?
(1) RBCs become sickle shaped
(2) In beta polypeptide chain of haemoglobin glutamic acid is replaced by valine
(3) Haemolysis
(4) Clogging of blood capillaries

159. What is wrong w.r.t. polygenic inheritance?
(1) They are easily influenced by environment
(2) They show continuous variations in population
(3) Very few individuals show medium/intermediate phenotype
(4) The alleles contribute additively to the phenotype

160. Who raised the generalisations of Mendel to the level of laws of heredity?
(1) Bateson   (2) Carl Correns
(3) De vries   (4) Tschemark

161. Select the incorrect statement
a. Balbiani (1881) discovered lampbrush chromosomes in salivary glands of *Chironomous larva*
b. Lampbrush chromosomes represent diplotene chromosome bivalents which have undergone crossing over
c. Large puff's in Lampbrush chromosomes is called Balbiani ring
(1) only a incorrect
(2) a and b incorrect
(3) a and c incorrect
(4) a, b and c all incorrect

162. Morgan in his experiments on *Drosophila* crossed white eyed female with red eyed male. The results were
(1) all flies red eyed
(2) all flies white eyed
(3) 50% of the male flies red eyed and 50% of the female flies white eyed
(4) All females red eyed and all males white eyed

163. How many SAT chromosomes are present in the ear cell of Mrs. Jenifer?
(1) 7   (2) 10
(3) 11   (4) 6

164. If modified allele produces functional enzyme of different kind, then which of the following allelic interaction can be seen?
(1) Complete dominance
(2) Incomplete dominance
(3) Codominance
(4) Complementary gene interaction

165. The phenotypic F_2 ratio in complementary interaction is
(1) 3 : 1   (2) 9 : 3 : 3 : 1
(3) 9 : 7   (4) 1 : 2 : 1

166. Mendel published his work in _____ year but got recognition in _____ year.
(1) 1884, 1900   (2) 1834, 1860
(3) 1865, 1900   (4) 1860, 1900

167. The chromosome in which all four arms are equal is
(1) Acrocentric   (2) Telocentric
(3) Sub-metacentric (4) Metacentric

168. Barr body in human female is an example of
(1) facultative heterochromatin
(2) constitutive heterochromatin
(3) euchromatin
(4) permanent heterochromatin

169. Frequency of recombinants between y−w genes of *Drosophila* is 1.3% and that of w−m genes is 37.2%. It indicates that
(1) 'w' and 'm' genes are present on non-homologous chromosome
(2) 'y' and 'w' genes are present on non-homologous chromosomes.
(3) Strength of linkage between 'y'−'w' is more as compared to 'w'−'m'
(4) strength of linkage between 'w'−'m' is more as compared to 'y'−'w'

170. Gene A and B are 12 map units apart. A heterozygous individual, whose parents were AAbb and aaBB would be expected to produce gamete in the following frequency
(1) 44% AB, 6% Ab, 6% aB, 44% ab
(2) 6% AB, 44% Ab, 44% aB, 6% ab
(3) 12% AB, 38% Ab, 38% aB 12% ab
(4) 38% AB, 12% Ab, 12% aB, 38% ab

171. Degree of linkage depends upon the
     (1) number of genes
     (2) distance between the unlinked genes
     (3) distance between the linked genes
     (4) size of chromosome

172. In multiple allelism
     (1) one gene influences 2 or more characters
     (2) there are present more than 2 alternate forms of same gene in gene pool
     (3) 2 or more genes control same character
     (4) gametes carry 2 or more alleles for controlling same character

173. Work of Mendel remained unnoticed for 35 years because
     (1) he could explain continuous variations
     (2) of proper communication in those times
     (3) use of mathematical logics
     (4) he could provide physical proof for existence of factors

174. What is the correct number of pairs of polygenes controlling human height, human intelligence and human skin colour?
     (1) 5, 25, 3   (2) 3, 24, 4
     (3) 25, 5, 3   (4) 5, 25, 5

175. Select the incorrect one w. r. t. telomeres
     (1) Terminal ends of chromosome
     (2) Possess repetitive DNA
     (3) Allow the chromosome to get attached to nuclear membrane
     (4) Allow the chromosome to attach it to other chromosome

176. According to Sutton and Boveri segregation of a pair of factors is because of
     (1) splitting of chromosomes at anaphase of mitosis
     (2) pairing and then segregation of homologous chromosomes at Anaphase of Meiosis−I
     (3) random arrangement of chromosomes at equator during meiosis−I
     (4) random arrangement of chromosomes at equator during mitosis

177. Match the following

Column-I		Column-II	
a.	Rabbit coat colour	i.	Pleiotropism
b.	Pea seed starch synthesis	ii.	Multiple alleles
c.	Corn cob length	iii.	Crossing over
d.	Recombinants	iv.	Quantitative genes

     (1) a−i, b−ii , c−iii, d−iv
     (2) a−ii, b−i , c−iv, d−iii
     (3) a−i, b−iv , c−ii, d−iii
     (4) a−ii, b−iv, c−iii, d−i

178. *Drosophila* is used in genetic studies because of all the following reasons except
     (1) male and female show sexual dimorphism
     (2) it can be grown on simple synthetic medium
     (3) life cycle time is small (about 14 days)
     (4) a small number of progeny is produced after each mating

179. How many of the following statements are incorrect?
     a. One pair of chromosomes always segregates independently of another pair.
     b. Dominance is an autonomous feature of a gene or the product that it has information for.
     c. Kinetochore is a trilaminar proteinaceous plate on secondary constriction .
     d. Crossing over takes place at four chromatid stage
     (1) 1   (2) 2
     (3) 3   (4) 4

180. When yellow-bodied, white eyed females are hybridised to brown bodied, red-eyed males and their F_1 progeny is intercrossed, then
     (1) two genes did not segregate independently of each other
     (2) two genes segregate independently of each other
     (3) F_2 ratio deviate very significantly from the 9:3:3:1 ratio
     (4) Both (1) and (3)

181. Crossing over is
     (1) Physical exchange of genetic material between non homologous chromosome
     (2) Chemical exchange of genetic material between non homologous chromosome
     (3) Physical exchange of genetic material between homologous chromosome
     (4) Physical exchange of genetic material between sister chromatid of homologous chromosome

182. **Assertion :** Mendel's law of Independent assortment is not universal.
     Reason : Only those gene pairs show independent assortment which are present on heterologous chromosomes.
     (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
     (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
     (3) Assertion is true statement but Reason is false
     (4) Assertion is false

183. Bridges found occasional white eyed females *Drosophila* in a cross between white eyed females and red eyed males. These white eyed females had sex chromosome complement.
   (1) xyy
   (2) xy
   (3) xx
   (4) xxy

184. The NOR has genes coding for
   (1) 28 s, mRNA
   (2) 28 s, 18s, 5.8 s mRNA
   (3) 28 s, 18 s, 5.8 s rRNA
   (4) 13, 14, 15, 21, 22 chromosomes

185. Pick the false statement
   (1) Eye colour gene and body colour gene in *Drosophila* show complete linkage.
   (2) Recombinants are produced whenever crossing over occurs between linked genes.
   (3) Eye colour gene in *Drosophila* is present on X chromosome.
   (4) Genes present on the same chromosome can also show independent assortment.

BOTANY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

186. How many mullatoes are likely to be produced when a trihybrid mullato is test crossed?
   (1) 25%
   (2) 12.50%
   (3) 31%
   (4) 50%

187. Which of the following is an example of pleiotropism?
   (1) ABO blood group
   (2) Human height
   (3) Flower colour in sweet pea
   (4) Phenylketonuria

188. Genes for 7 characters chosen by Mendel are found on how many chromosomes?
   (1) 7
   (2) 1
   (3) 4
   (4) 3

189. Bulk of eukaryotic chromosome is made up of
   (1) lipids and DNA
   (2) lipids and RNA
   (3) non-histone proteins & RNA
   (4) histone proteins & DNA

190. Which pteridophyte has the maximum chromosome number?
   (1) *Ophioglossum reticulatum*
   (2) *Azolla pinnata*
   (3) *Lycopodium cernuum*
   (4) *Aulocantha*

191. In F_2 generation a ratio of 1 : 4 : 6 : 4 : 1 is obtained instead of 9 : 3 : 3 : 1 when two pairs of genes are considered. It indicates
   (1) pleiotropic effect to genes
   (2) quantitative inheritance
   (3) incomplete dominance
   (4) qualitative inheritance

192. The advantage of $Hb^A Hb^S$ individual is
   (1) resistance to blood sugar
   (2) resistance of malaria parasite
   (3) resistance against cancer
   (4) all of the above

193. Select the incorrect statement w.r.t. prokaryotic chromosome.
   (1) Prokaryotic chromosome is made up of single stranded DNA and histones
   (2) DNA is circular, double stranded structure
   (3) DNA coiled around polyamines and RNA
   (4) In prokaryotic chromosome histone is absent

194. How many phenotypes can be present for human intelligence?
   (1) 25
   (2) 51
   (3) 5
   (4) 11

195. A tetraploid (4x) individual with 32 chromosomes has the haploid (n) and monoploid (x) number respectively
   (1) n = 16, x = 8
   (2) n = 8, x = 16
   (3) n = 16, x = 16
   (4) n = 8, x = 8

196. A mother with the blood group A and the father with the blood group B bears a child with blood group A. It assures that
   (1) both the parents are heterozygous
   (2) the other possible blood groups in the progeny are B, AB and O
   (3) the father is heterozygous
   (4) the mother is heterozygous

197. The giant chromosome with large number of chromonemata are found in
   (1) Spermatocytes
   (2) Oocytes
   (3) Salivary glands of insects
   (4) *Acetabularia*

198. Which of the following is incorrect w.r.t. genes?
   (1) A unit of inheritance
   (2) Occur in pairs
   (3) Allelic pairs segregate at the time of gamete formation
   (4) One pair always segregate independently of another pair

199. Morgan by his experiments concluded that
   (1) sex linked traits show criss-cross inheritance
   (2) sex linked traits are absent
   (3) sex chromosomes are without genes
   (4) sex chromosomes have all the genes for all traits of *Drosophila*

200. The chiasma frequency is _____ the frequency of cross over products
   (1) twice
   (2) thrice
   (3) four times
   (4) five times

Dated : 23-06-2022

M.L. Syal's Helix Institute

S.C.O. 343-345, Top Floor, Sector 34-A, Chandigarh. Ph : 0172-2623155

Code-A

XII cum Competition Course for Medical – Test - 5

1.	(3)	51.	(1)	101.	(3)	151.	(2)
2.	(4)	52.	(4)	102.	(1)	152.	(3)
3.	(1)	53.	(3)	103.	(1)	153.	(2)
4.	(4)	54.	(3)	104.	(3)	154.	(4)
5.	(1)	55.	(2)	105.	(4)	155.	(1)
6.	(3)	56.	(2)	106.	(2)	156.	(2)
7.	(2)	57.	(3)	107.	(2)	157.	(1)
8.	(4)	58.	(1)	108.	(1)	158.	(2)
9.	(1)	59.	(3)	109.	(4)	159.	(3)
10.	(3)	60.	(2)	110.	(1)	160.	(2)
11.	(4)	61.	(2)	111.	(1)	161.	(3)
12.	(3)	62.	(4)	112.	(4)	162.	(4)
13.	(1)	63.	(3)	113.	(3)	163.	(2)
14.	(2)	64.	(1)	114.	(2)	164.	(3)
15.	(3)	65.	(2)	115.	(2)	165.	(3)
16.	(4)	66.	(3)	116.	(2)	166.	(3)
17.	(3)	67.	(4)	117.	(1)	167.	(4)
18.	(3)	68.	(2)	118.	(2)	168.	(1)
19.	(2)	69.	(3)	119.	(4)	169.	(3)
20.	(1)	70.	(3)	120.	(2)	170.	(2)
21.	(3)	71.	(3)	121.	(3)	171.	(3)
22.	(2)	72.	(3)	122.	(3)	172.	(2)
23.	(2)	73.	(2)	123.	(4)	173.	(3)
24.	(4)	74.	(4)	124.	(3)	174.	(1)
25.	(1)	75.	(1)	125.	(3)	175.	(4)
26.	(1)	76.	(1)	126.	(1)	176.	(2)
27.	(1)	77.	(2)	127.	(3)	177.	(2)
28.	(1)	78.	(3)	128.	(1)	178.	(4)
29.	(2)	79.	(4)	129.	(3)	179.	(2)
30.	(4)	80.	(4)	130.	(2)	180.	(4)
31.	(1)	81.	(1)	131.	(2)	181.	(3)
32.	(1)	82.	(4)	132.	(4)	**182.**	**(3)**
33.	(2)	83.	(2)	133.	(1)	183.	(4)
34.	(1)	84.	(3)	134.	(3)	184.	(3)
35.	(4)	85.	(3)	135.	(4)	185.	(1)
36.	(4)	86.	(3)	136.	(2)	186.	(2)
37.	(4)	87.	(4)	137.	(3)	187.	(4)
38.	(1)	88.	(1)	138.	(2)	188.	(3)
39.	(1)	89.	(4)	139.	(4)	189.	(4)
40.	(4)	90.	(3)	140.	(2)	190.	(1)
41.	(3)	91.	(4)	141.	(2)	191.	(2)
42.	(1)	92.	(4)	142.	(4)	192.	(2)
43.	(2)	93.	(2)	143.	(3)	193.	(1)
44.	(1)	94.	(3)	144.	(4)	194.	(2)
45.	(1)	95.	(4)	145.	(2)	195.	(1)
46.	(2)	96.	(1)	146.	(3)	196.	(3)
47.	(1)	97.	(2)	147.	(2)	197.	(3)
48.	(4)	98.	(2)	148.	(2)	198.	(4)
49.	(2)	99.	(4)	149.	(3)	199.	(1)
50.	(2)	100.	(1)	150.	(2)	200.	(1)

M.L. Syal's Helix Institute

S.C.O. 343-345, Top Floor, Sector 34-A, Chandigarh. Ph : 0172-2623155

MM : 720   **XII cum Competition Course for Medical**   **Time : 3 hrs.**
Test - 6

PHYSICS	:	MAGNETIC EFFECTS OF CURRENT
CHEMISTRY	:	G.O.C & HYDROGCARBON, OPTICAL ISOMERISM
ZOOLOGY	:	HUMAN HEALTH AND DISEASES-II, IMMUNE SYSTEM-II AIDS, CANCER, DRUGS)
BOTANY	:	CHROMOSOMAL BASIS OF INHERITANCE-II, SEX DETERMINATION (GNETIC VARIATIONS & HUMAN GENETICS)

PHYSICS : SECTION-A

All questions are compulsory in section A

1. The magnetic induction at a point P which is distant 4 cm from a long current carrying wire is 10^{-8} T. The field of induction at a distance 12 cm from the same current would be
   - (1) 3.33×10^{-9} T
   - (2) 1.11×10^{-4} T
   - (3) 3×10^{-3} T
   - (4) 9×10^{-2} T

2. Magnetic induction at a point on the line of straight current carrying wire carrying current 'I' and of length 'd' is
   - (1) $\mu_0 I$
   - (2) $\dfrac{\mu_0 I}{\pi}$
   - (3) zero
   - (4) $\mu_0 I d$

3. 2 A current is flowing in a circular coil of radius 20 cm. If magnetic field at the centre of the coil is found to be $2\pi \times 10^{-3}$ T, then number of turns in the coil are
   - (1) 500
   - (2) 1000
   - (3) 100
   - (4) 2000

4.
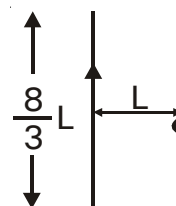
   A current of 10 A is flowing in a straight conductor of length $\dfrac{8}{3}$ L. The magnetic field at a point distant L from the mid point of conductor is
   - (1) $\dfrac{\mu_0}{\pi L}$
   - (2) $\dfrac{2\mu_0}{\pi L}$
   - (3) $\dfrac{5\mu_0}{2\pi L}$
   - (4) $\dfrac{4\mu_0}{\pi L}$

5. The direction of magnetic lines of forces close to a straight conductor carrying current will be
   - (1) along the length of the conductor
   - (2) radially outward
   - (3) circular in a plane perpendicular to conductor
   - (4) helical

6. The magnetic field induction at the centre P due to the uniform circular wire shown in the following circuit is
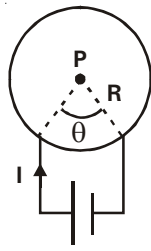
(1) Proportional to θ
(2) Proportional to $(2\pi - \theta)$
(3) Zero only for $\theta = \pi$
(4) Zero for all values of θ

7.
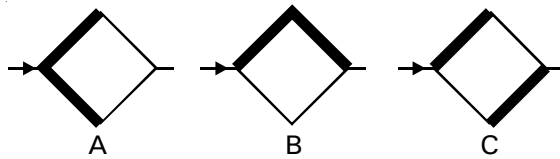
Two thick and two thin wires, all of same material and same length are arranged to form a square in three different ways A, B and C as shown. Magnetic field at the centre of the square is zero in

(1) A only   (2) both A & B
(3) both B & C   (4) both A & C

8. A proton (charge 'e' and mass 'm') is being accelerated in a cyclotron with magnetic field B and potential difference 'V' between the two DEE's. After the proton has completed 64 revolutions starting from rest, the radius of its orbit at that instant will be

(1) $\dfrac{64}{B}\sqrt{\dfrac{mV}{e}}$ (2) $\dfrac{8}{B}\sqrt{\dfrac{mV}{e}}$

(3) $\dfrac{16}{B}\sqrt{\dfrac{mV}{e}}$ (4) $\dfrac{32}{B}\sqrt{\dfrac{mV}{e}}$

9.
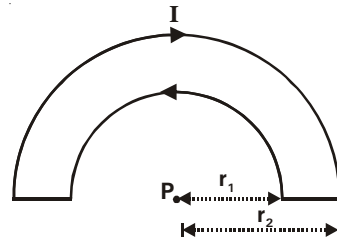
Find the magnetic field at point P due to the current carrying loop shown.

(1) $\dfrac{\mu_0}{4\pi}I\left(\dfrac{1}{r_1} - \dfrac{1}{r_2}\right)$ (2) $\dfrac{\mu_0}{4\pi}\pi I\left(\dfrac{1}{r_1} - \dfrac{1}{r_2}\right)$

(3) $\dfrac{\mu_0}{4\pi}I\left(\dfrac{1}{r_1} + \dfrac{1}{r_2}\right)$ (4) $\dfrac{\mu_0}{4\pi}\pi I\left(\dfrac{1}{r_1} + \dfrac{1}{r_2}\right)$

10. Two thin long straight wires are parallel to each other at a separation 'r' apart and they carry current I each along same direction as shown. Magnetic field (B) varies with distance (x) along the line joining two wires as

(1)   (2)

(3)   (4)
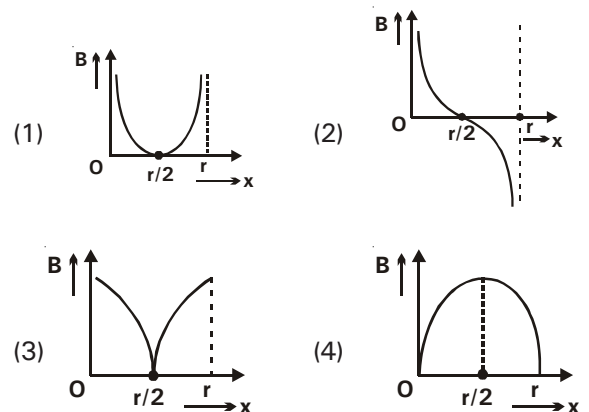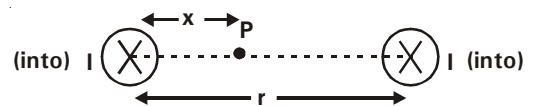
11. A very long solenoid has $400/\pi$ turns per metre length. A current of 2 amp flows through it. The magnetic field induction at an end of the solenoid on the axis is
(1) 2.56×10^{-4} T (2) 1.6×10^{-4} T
(3) 3.2×10^{-4} T (4) 4.8×10^{-4} T

12. A proton moving with a constant velocity passes through a region of space without change in its velocity. If E and B represent electric and magnetic fields respectively this region of space may not have
(1) $E = 0, B = 0$ (2) $E = 0, B \neq 0$
(3) $E \neq 0, B = 0$ (4) $E \neq 0, B \neq 0$

13. Two concentric coils each of radius equal to π cm are placed at right angles to each other. 6 ampere and 8 ampere are the currents flowing in each coil respectively. The magnetic induction in weber/m^2 at the centre of the coils will be
(1) 5×10^{-5} (2) 4×10^{-4}
(3) 2×10^{-4} (4) 10^{-4}

14.
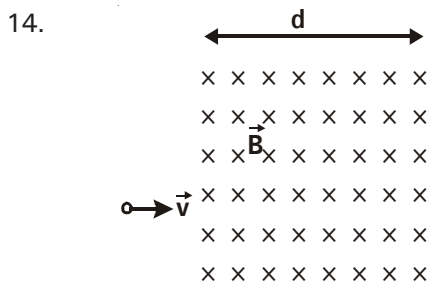
A particle with mass 'm' and charge 'q' accelerated by a potential difference V from rest travels through a uniform transverse magnetic field with induction B as shown. The field occupies a region of space 'd' in thickness. The angle through which the particle deviates from the initial direction of its motion assuming that it emerges from other side is

(1) $\sin^{-1}\left(Bd\sqrt{\dfrac{q}{mV}}\right)$ (2) $\tan^{-1}\left(Bd\sqrt{\dfrac{q}{2mV}}\right)$

(3) $\cos^{-1}\left(Bd\sqrt{\dfrac{q}{mV}}\right)$ (4) $\sin^{-1}\left(Bd\sqrt{\dfrac{q}{2mV}}\right)$

15.
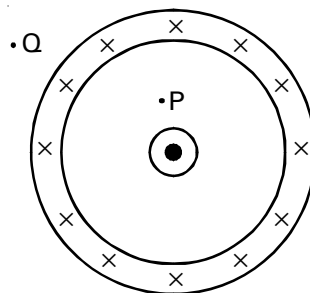
The figure shows the cross-section of two long coaxial tubes each carrying current 'I' in opposite directions. If B_P and B_Q are magnetic fields at points P and Q, then
(1) $B_P \neq 0$; $B_Q = 0$ (2) $B_P = 0$; $B_Q = 0$
(3) $B_P \neq 0$; $B_Q \neq 0$ (4) $B_P = 0$; $B_Q \neq 0$

16.

A current carrying loop of radius R is kept in a uniform magnetic field B as shown in the figure. If the loop carries current I, then the net force on the loop is
(1) IRB (2) $\sqrt{2}$ IRB

(3) zero (4) $\dfrac{3}{2}$ pIRB

17.
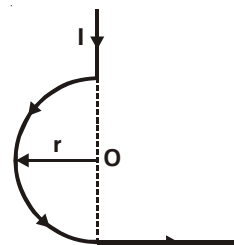
In the figure, what is magnetic field at the point O

(1) $\dfrac{\mu_0 I}{4\pi r}$ (2) $\dfrac{\mu_0 I}{4\pi r} + \dfrac{\mu_0 I}{2\pi r}$

(3) $\dfrac{\mu_0 I}{4r} + \dfrac{\mu_0 I}{4\pi r}$ (4) $\dfrac{\mu_0 I}{4r} - \dfrac{\mu_0 I}{4\pi r}$

18. A square loop of edge 'a' carries a current I. The magnetic field at the centre of the loop is

    (1) $\dfrac{\mu_0 I}{2\sqrt{2}\pi a}$

    (2) $\dfrac{2\sqrt{2}\mu_0 I}{\pi a}$

    (3) $\dfrac{\mu_0 I}{\sqrt{2}\pi a}$

    (4) $\dfrac{\sqrt{2}\mu_0 I}{\pi a}$

19. A proton, deuteron and α-particle are projected in a perpendicular magnetic field with same velocity, then the ratio of the areas of circles will be
    (1) $A_P : A_D : A_\alpha = 1 : 2 : 2$
    (2) $A_P : A_D : A_\alpha = 1 : 4 : 4$
    (3) $A_P : A_D : A_\alpha = 1 : 1 : 4$
    (4) $A_P : A_D : A_\alpha = 1 : 1 : 2$

20.
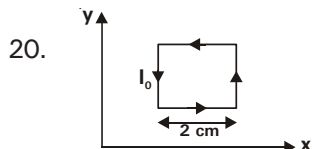
A square loop of side 2 cm carrying current I_0 is placed in x-y plane in a magnetic field $\vec{B} = (4\hat{i} + 3\hat{j})$. The axis about which it will start rotating is parallel to unit vector

    (1) $\dfrac{4\hat{j} + 3\hat{i}}{5}$

    (2) $\dfrac{-\hat{j} + \sqrt{3}\,\hat{i}}{2}$

    (3) $\dfrac{\hat{j} + \sqrt{3}\,\hat{i}}{2}$

    (4) $\dfrac{4\hat{j} - 3\hat{i}}{5}$

21. Two wires of same length are shaped into a square and a circle respectively. If they carry same current, ratio of their magnetic moments is
    (1) $2 : \pi$
    (2) $\pi : 3$
    (3) $\pi : 4$
    (4) $1 : \pi$

22. If a charged particle is projected in uniform magnetic field then which of the following may not be zero?
    (1) Power
    (2) Work done
    (3) Change in momentum
    (4) Change in kinetic energy

23.
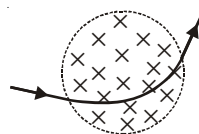
There is a magnetic field acting in a plane perpendicular to this sheet of paper into the paper. Particle in vacuum moves in plane of paper from left to right as shown in figure. Path indicated by arrow could be due to
    (1) proton   (2) neutron
    (3) electron   (4) none

24. Field inside a long solenoid is
    (1) directly proportional to its length
    (2) directly proportional to current
    (3) inversely proportional to total number of turns
    (4) inversely proportional to current

25.
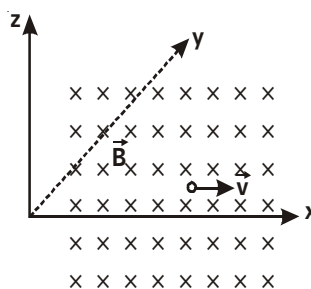
If the magnetic field is parallel to positive y-axis and an electron is moving parallel to positive x-axis as shown in figure, the Lorentz force for the electron will be along
    (1) $-x$-axis   (2) $-z$-axis
    (3) y-axis   (4) $-y$-axis

26. A square loop of side L carries a current 'i'. It is placed in a magnetic field B such that the plane of the loop is at $37°$ to direction of magnetic field. The torque on the loop is
    (1) Zero   (2) iBL^2
    (3) $0.8BL^2i$ (4) $0.6BL^2i$

27. The deflection in a moving coil galvanometer for a given current flowing through it is
    (1) directly proportional to the torsional constant
    (2) directly proportional to the number of turns in the coil
    (3) inversely proportional to the area of the coil
    (4) inversely proportional to the magnetic field

28. Which of the following graphs represents variation of magnetic field B with distance 'r' from the axis of a straight long solid cylinder carrying current with uniform current density?
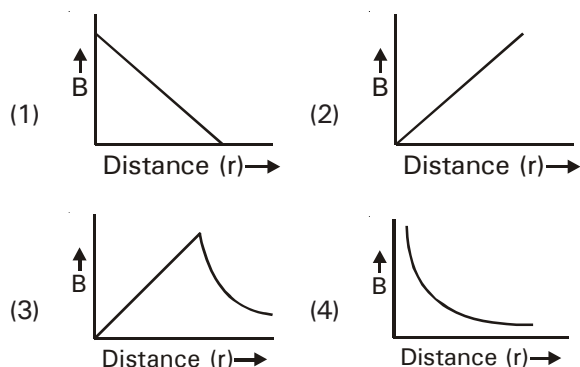
29. A horizontal overhead power line carries a current of 90 A in east to west direction. What is the magnitude and direction of the magnetic field due to the current 1.5 m below the line?
    (1) 1.2×10^{-5} T towards south
    (2) 4.5×10^{-5} T towards north
    (3) 6×10^{-5} T towards south
    (4) 3.5×10^{-5} T towards south

30. Around the loop shown, taking the direction of $\vec{dl}$ as that of the arrows, the value of $\oint \vec{B}.\vec{dl}$ will be
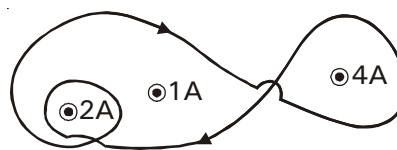
    (1) μ_0 (2) $-\mu_0$
    (3) $2\mu_0$ (4) $-2\mu_0$

31. What is the ratio of pitch of a proton and a-particle moving with a velocity 2v and v respectively at an angle $37°$ and $53°$ respectively with a uniform magnetic field B?
    (1) 2 : 1   (2) 3 : 4
    (3) 1 : 1   (4) 4 : 3

32. A conducting loop carrying a current I is placed in uniform magnetic field pointing into the plane of paper as shown. The loop will have a tendency to
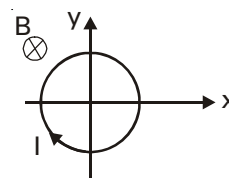
    (1) contract
    (2) expand
    (3) move towards +ve x-axis
    (4) move towards −ve x-axis

33. **Assertion**: Magnetic force per unit length between two current carrying long straight and parallel wires is inversely proportional to distance between them.
    Reason: Magnetic field of a long straight current carrying wire is inversely proportional to distance from the wire.
    (1) Both Assertion and Reason are true and reason is the correct explanation of assertion
    (2) Both Assertion and Reason are true but reason is not the correct explanation of assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

34. A conductor in the form of a right angle ABC with AB = 3 cm and BC = 4 cm carries a current of 10 A. There is a uniform magnetic field of 5 T perpendicular to the plane of the conductor. The force on the conductor will be
    (1) 1.5 N   (2) 2.0 N
    (3) 2.5 N   (4) 3.5 N

35. DEE shaped chambers in a cyclotron are made from metal to ensure
    (1) no magnetic field inside a DEE
    (2) no electric field inside a DEE
    (3) no potential difference between two DEEs
    (4) all of thes

PHYSICS : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

36. A uniform disc of radius R, made of an insulating material carries a charge Q uniformly distributed on its area. If the disc rotates about the axis passing through its centre and normal to plane of the disc with constant angular speed ω, then the magnitude of the magnetic moment of the disc is

    (1) $Q\omega R^2$ (2) $\dfrac{Q\omega R^2}{2}$

    (3) $\dfrac{Q\omega R^2}{8}$ (4) $\dfrac{Q\omega R^2}{4}$

37. If a particle with charge 'q' and mass 'm' is projected in a transverse magnetic field such that it just touches the other plate, the value of R will be

    (1) $\dfrac{2mv}{qB}$ (2) $\dfrac{mv}{2qB}$
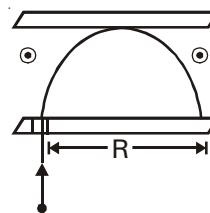
    (3) $\dfrac{mv^2}{qB}$ (4) $\dfrac{mv^2}{2qB}$

38. Three long, straight parallel wires carrying current, are arranged as shown in figure. The force experienced by a 25 cm length of wire C is
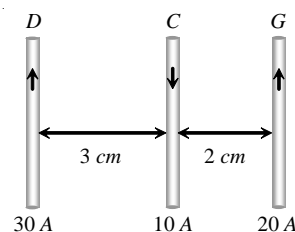
    (1) 10^{-3} N   (2) 2.5×10^{-3} N
    (3) Zero   (4) 1.5×10^{-3} N

39.
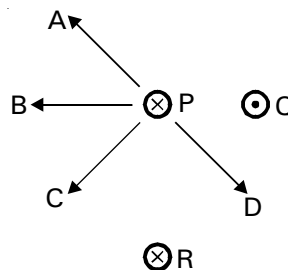
    Figure shows three long straight wires P, Q and R carrying currents normal to the plane of the paper. All three currents have the same magnitude. Which arrow best shows the direction of the resultant force on the wire P
    (1) A   (2) B
    (3) C   (4) D

40. A stream of electrons is projected horizontally to the right. A straight conductor carrying a current is supported parallel to electron stream and above it. If the current in the conductor is from left to right then electron stream will be pulled
(1) upward
(2) downward
(3) right
(4) left

41.
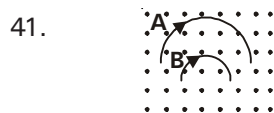
Two particles A and B of masses m_A and m_B respectively and having the same charge are moving in a plane. A uniform magnetic field exists perpendicular to this plane. The speeds of the particles are v_A and v_B respectively and trajectories are as shown in the figure. Then
(1) $m_A v_A < m_B v_B$
(2) $m_A v_A > m_B v_B$
(3) $m_A < m_B$ and $v_A < v_B$
(4) $m_A = m_B$ and $v_A = v_B$

42. What is shape of magnet in moving coil galvanometer to make a radial magnetic field ?
(1) Concave
(2) Horse shoe magnet
(3) Convex
(4) None of these

43.
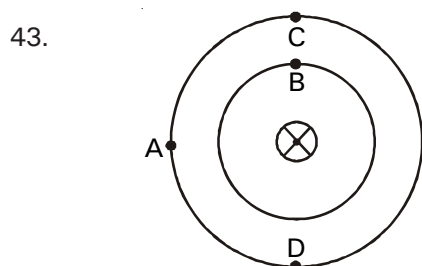
Figure shows two magnetic field lines of a long conducting wire which is perpendicular to the plane of the figure and carries an inward current. In which of the points shown, the magnetic field points to the right and has the lowest magnitude.
(1) A
(2) B
(3) C
(4) D

44. Which of the following is the expression for Ampere's circuital law to determine magnetic flux density?
(1) $\oint \vec{B}.\overrightarrow{ds} = \mu_0 I$
(2) $\oint \vec{B}.\overrightarrow{dl} = \mu_0 I$
(3) $\oint \vec{B}.\overrightarrow{dv} = \mu_0 I$
(4) None of these

45. A charged particle moving in a magnetic field experiences a magnetic force
(1) In a direction parallel to velocity
(2) In the direction perpendicular to both the field and its velocity
(3) In the direction of the field
(4) In the direction opposite to that field

46. An α-particle moving in a circular orbit of radius 'a' makes 'n' revolutions per second. The magnetic field produced at the centre is
(1) zero
(2) $\dfrac{\mu_0 ne}{2a\pi}$
(3) $\dfrac{\mu_0 n^2 e}{a}$
(4) $\dfrac{\mu_0 ne}{a}$

47. Two parallel conductors carrying current in the same direction attract each other, while two parallel beams of electrons moving in the same direction repel each other. Which of the following statements can not be the reason for this?
(1) The conductors are electrically neutral
(2) The conductors produce magnetic fields on each other
(3) The electron beams do not produce magnetic fields on each other
(4) Magnetic forces caused by the electron beams on each other are weaker than electrostatic forces between them

48. Magnetic induction at centre of current carrying circular coil of radius 'R' is B_0. Magnetic induction at distance 'x' from centre is

(1) $B = B_0 \dfrac{R^2}{R^2 + x^2}$

(2) $B = B_0 \dfrac{x^2}{R^2}$

(3) $B = B_0 \dfrac{R^3}{(R^2 + x^2)^{3/2}}$

(4) $B = B_0 \dfrac{x^3}{R^3}$

49. A current carrying circular loop is located in a uniform external magnetic field. If the loop is free to turn, then in stable equilibrium, flux of the total field (external field + field produced by the loop) crossing the area of loop is

(1) minimum

(2) maximum

(3) zero

(4) infinite

50. A long straight conductor carrying current I into the plane of paper is kept at 'O'. A loop of wire carrying current 'I' is kept near this conductor as shown in figure. What is the net force experienced by the loop ?
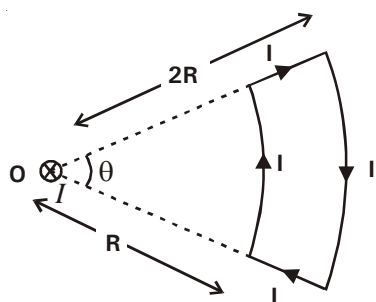
(1) $\dfrac{\mu_0 I^2}{2\pi R}(R + R\theta)$

(2) $\dfrac{\mu_0 I^2}{\pi}\log 2$

(3) $\dfrac{\mu_0 I^2}{2\pi}\log 2$

(4) Zero

CHEMISTRY : SECTION-A

All questions are compulsory in section A

51. Which step is chain propagation step in the following mechanism?

(1) $Cl_2 \xrightarrow{h\nu} \overset{\bullet}{Cl} + \overset{\bullet}{Cl}$

(2) $\overset{\bullet}{Cl} + CH_4 \longrightarrow \overset{\bullet}{CH_3} + HCl$

(3) $\overset{\bullet}{Cl} + \overset{\bullet}{Cl} \longrightarrow Cl_2$

(4) $\overset{\bullet}{CH_3} + \overset{\bullet}{Cl} \longrightarrow CH_3Cl$
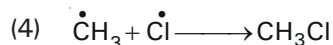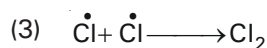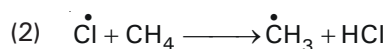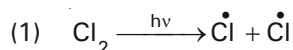
52. Anti-Markovnikov's addition of HBr is not observed in

(1) propene

(2) but-1-ene

(3) but-2-ene

(4) pent-2-ene

53. The addition of HBr to 2-pentene gives

(1) 2-bromopentane only

(2) 3-bromopentane only

(3) 2-bromopentane and 3-bromopentane

(4) none of the above

54. Which of the following show resonance?

(1) $CH_2 = CH - CH_2^+$

(2) $CH_2 = C = CH_2$

(3) $CH_2 = CH - CH_2^-$

(4) Both (1) and (3)

55. Which of the following shows + R effect ?

(1) −OH

(2) $-NH_2$

(3) −OR

(4) All of these

56. The number of 1° and 2° carbon atoms in n-pentane are respectively

(1) 2, 3

(2) 3, 2

(3) 2, 4

(4) 1, 3

57. Which of the following is an electrophile?

(1) NH_3

(2) H_2O

(3) CH_3^+

(4) CH_3^-

58. Correct Fischer projection for the structure

is

(1)

(2)

(3)

(4)
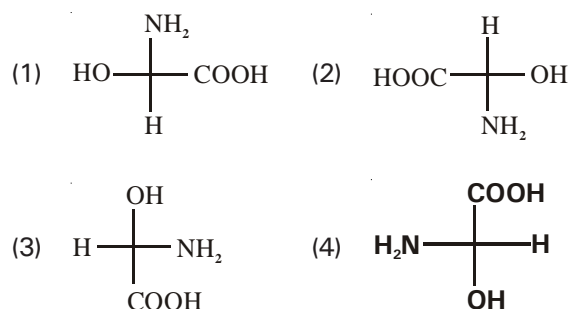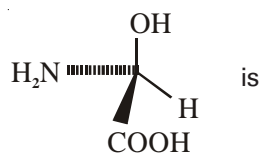
59. In which of the following $-CH_3$ group does not show $+I$ effect ?
    (1) $C_6H_5-CH_3$ (2) $CH_3-CH_2-CH_3$
    (3) CH_3-CH_2-Cl (4) $CH_3-CH=CH_2$
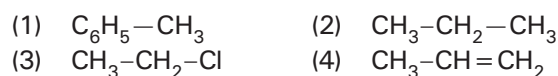
60. The number of chiral carbon present in the following molecule are

    (1) 1 (2) 3
    (3) 2 (4) 0
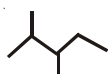
61. In the product of monochlorination of propane the major product is
    (1) $CH_3\underset{Cl}{CH}CH_3$
    (2) $CH_3CH_2CH_2Cl$
    (3) both (1) & (2) are formed in equal amounts
    (4) $ClCH_2CH_2CH_3$

62. The molecule
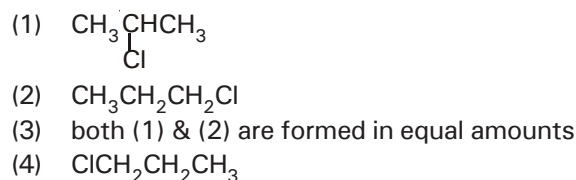
    (1) has no chiral carbons
    (2) is meso
    (3) is disymmetric
    (4) has no stereocentre
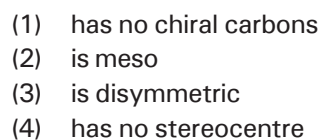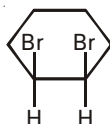
63. The number of optically active isomers possible in a molecule with one assymetric carbon are
    (1) 1 (2) 2
    (3) 3 (4) 4

64. What is definitely true about S−enantiomer of lactic acid ?
    (1) it can not be dextrorotatory
    (2) it can not be optically active
    (3) it is an equimolar mixture of d and ℓ forms
    (4) it is the mirror image of R−enantiomer of lactic acid
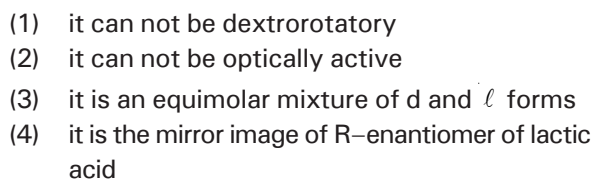
65. In which case [C−O] bond length is minimum

    (1)

    (2)

    (3)

    (4)

66. $CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH=CH_2 \xrightarrow{HBr} P(major)$

    (1) $CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH_2-CH_2Br$

    (2) $CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{Br}{|}}{C}}-CH\overset{CH_3}{\underset{CH_3}{<}}$

    (3) $CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH(Br)CH_3$

    (4) $CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH(Br)CH_2Br$
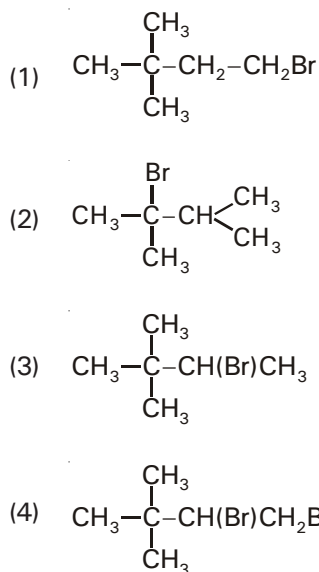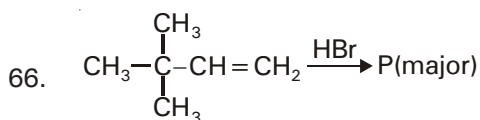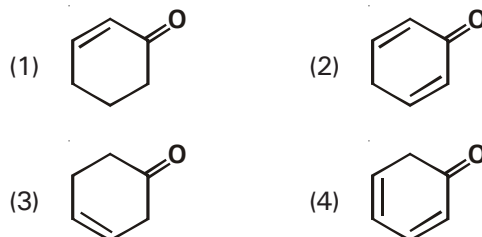
67. The least stable cation among the following is

(1) $\overset{\oplus}{C}H_2\,OCH_3$

(2) $\overset{\oplus}{C}H_2\,N(CH_3)_2$

(3) $\overset{\oplus}{C}H_2F$

(4) $\overset{\oplus}{C}H_2\,NH_2$

68.
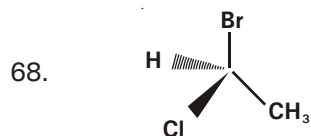
In the above molecule the decreasing order of priority according to CIP rules is
(1)   Cl Br CH_3 H
(2)   Br Cl CH_3 H
(3) CH_3 Br H Cl
(4)   H CH_3 Cl Br

69. $CH_3CH=CH_2 \xrightarrow[CCl_4]{Cl_2}$
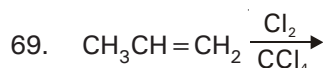
Reaction proceeds via formation of
(1)   Carbocation
(2)   Carbanion
(3)   cyclic chloronium ion
(4)   free radical

70. Rotation of an optically active substance is measured by using
(1)   potentiometer
(2)   mass spectrometer
(3)   polarimeter
(4)   none of these

71. $\overset{1}{H_2}C=\overset{2}{C}=\overset{3}{C}H_2$
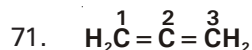
What is the hybridisation of the carbon atoms in the above structure?
(1)   sp
(2) sp^2
(3)   Both (1) & (2)
(4) sp^3

72. Which of the following compounds possesses a chiral centre?

(1)

(2)

(3)

(4)
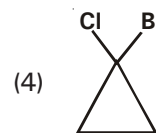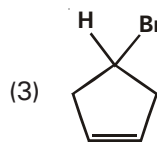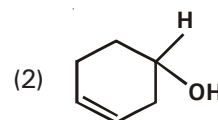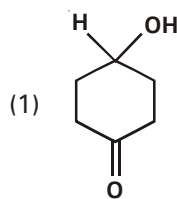
73. Which is most acidic ?
(1) $ClCH_2COOH$
(2) O_2N-CH_2COOH
(3) CH_3COOH
(4) C_2H_5COOH
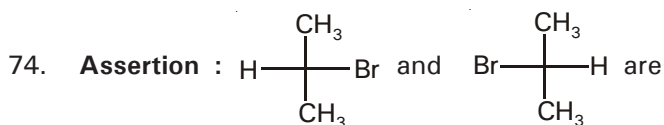
74. **Assertion :** are superimposable mirror images.

Reason : A symmetric molecule always forms superimposable mirror image.
(1)   Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2)   Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3)   Assertion is true statement but Reason is false
(4)   Assertion is false

75.
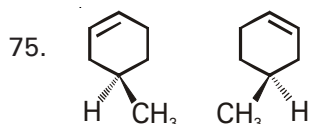
The above pair of compounds are
(1) enantiomers
(2) diastereomers
(3) position isomers
(4) identical

76. Iodoethane reacts with sodium in the presence of dry ether. The product is
(1) Pentane   (2) Propane
(3) Butene   (4) Butane

77. The correct configuration assigned for compound I and II respectively are
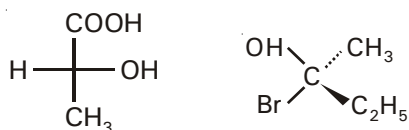
(1) R, R   (2) S, S
(3) R, S   (4) S, R

78. Total number of isomers (including stereoisomers) obtained by monochlorination of methylcyclohexane are
(1) 10   (2) 8
(3) 12   (4) 5

79. Match the intermediates given in column I with their probable structure in column II

Column I		Column II	
i.	Free radical	a.	trigonal planar
ii.	Carbocation	b.	pyramidal
iii.	Carbanion	c.	linear

(1) i-a, ii-c, iii-b   (2) i-a, ii-a, iii-b
(3) i-b, ii-a, iii-c   (4) i-b, ii-a, iii-b

80. Which of these is achiral molecule ?

(1)

(2) $CH_3-CH-COOH$
            $\overset{|}{OH}$

(3)

(4) $CH_3CH=C=C=CHCH_3$
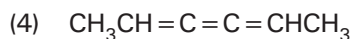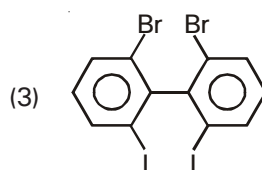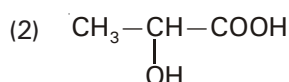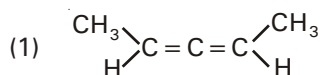
81. Which of the following will not show phenomenon of hyperconjugation?

(1) $\overset{\bullet}{C}H_3$ (2)

(3) $CH_3-\overset{\bullet}{C}H_2$ (4) $CH_3-\overset{CH_3}{\underset{\bullet}{\overset{|}{C}H}}$
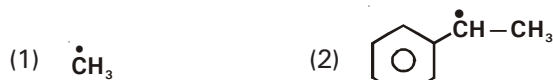
82. Inductive effect involve polarisation of
(1) σ bond   (2) π-bond
(3) σ as well as π (4) all of these

83. Which of the following will be most easily attacked by an electrophile?

(1)   (2)

(3)   (4)
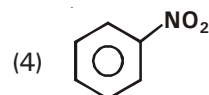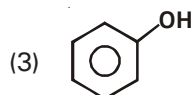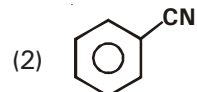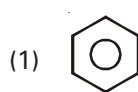
84. In the following monobromination reaction,

$$CH_3-\underset{\overset{|}{CH_3}}{CH}-CH_2-CH_3 + Br_2 \longrightarrow Products$$
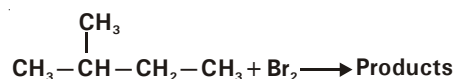
The number of possible products and the percentage yield of major product wouldbe

(1) 4, 90.2%   (2) 3, 98.1%

(3) 4, 89.9%   (4) 3, 85.3%

85. The homolytic fission of C−C bond in ethane produces

(1) Free radicals   (2) Carbocations

(3) Carbenes   (4) Carbanions

CHEMISTRY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

86. $CH_3-CH=CH_2 + X_2 \rightarrow CH_3-\underset{\overset{|}{X}}{CH}-\underset{\overset{|}{X}}{CH_2}$

$X_2 = Cl_2, Br_2, I_2$. The order of reactivity is

(1) $Cl_2 > I_2 > Br_2$ (2) $Br_2 > I_2 > Cl_2$

(3) $I_2 > Br_2 > Cl_2$ (4) $Cl_2 > Br_2 > I_2$

87. Racemic mixture is obtained by mixing

(1) d-glucose and ℓ-galactose

(2) d-glucose and ℓ-mannose

(3) d-2-hydroxy propanoic acid and ℓ-2-hydroxy propanoic acid

(4) D-glucose and L-galactose

88. Which intermediate is formed is the following reaction?
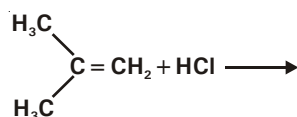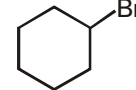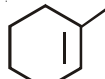
$$\underset{H_3C}{\overset{H_3C}{>}}C=CH_2 + HCl \longrightarrow$$

(1) $\underset{H_3C}{\overset{H_3C}{>}}CH-CH_2^+$

(2) $\underset{H_3C}{\overset{H_3C}{>}}\overset{+}{C}-CH_3$

(3) $\underset{H_2\overset{+}{C}}{\overset{H_3C}{>}}CH-CH_3$

(4) none of these

89. Which is incorrect

(1) geometrical isomers can be regarded as diastereomers

(2) Diasteromers are essentially optically active

(3) Diastereomers differ in their physical properties

(4) All are incorrect

90. $\xrightarrow{Na/ether} A \xrightarrow{Br_2/h\nu} B$
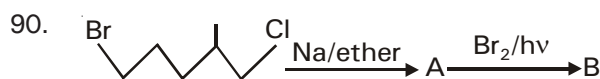
The major product 'B' of above reaction is

(1)   (2)

(3)   (4)

91. Which statement is correct for $CH_3-\overset{\bullet}{CH_2}$?

(1) It is paramagnetic in character

(2) It is a neutral electrophile

(3) Formation takes place by homolytic bond fission

(4) All are correct

92. The configuration of the compound given below is
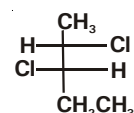
(1) 2S 3R   (2) 2S 3S

(3) 2R 3S   (4) 2R 3R

93. Which of following cannot show electromeric effect?

(1) Alkenes   (2) Ketones

(3) Aldehydes   (4) Ethers

94. Most stable carbocation is

(1) $CH_3-\overset{+}{CH_2}$ (2) $\overset{+}{C}H_2CH-Cl_2$

(3) $\overset{+}{C}H_2CH_2Cl$ (4) $CH_3CH_2NO_2$

95. Consider F, NO_2, H, OR the decreasing order of inductive effect (−I) is

(1) OR, NO_2, F, H   (2) NO_2, F, OR, H

(3) F, NO_2, OR, H   (4) H, F, NO_2, OR

96. Which of the following can rotate the plane of polarised light ?
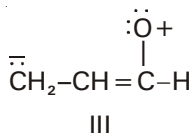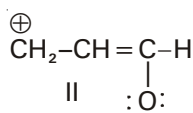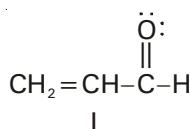
(1)

(2)

(3) $CH_2-CH-CH_2-CH_3$
     |
     Br

(4) $CH_3CH_2CH_2CH_2Br$
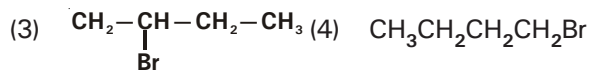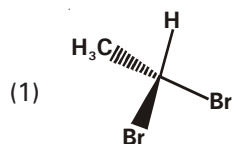
97. The no. of optically active isomers for

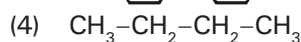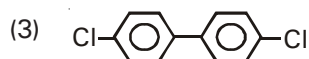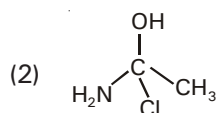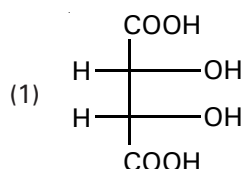$CH_3-CH-CH-CH-CH_2OH$
      | | |
      OH   OH   OH
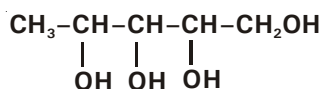
(1) 3   (2) 4
(3) 8   (4) 6

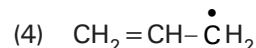98. Arrange the following resonating structures according to decreasing order of stability

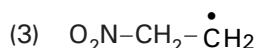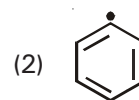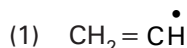(1) I > II > III   (2) II > I > III
(3) III > I > II   (4) III > II > I

99. Which of the following compounds does not contain a plane of symmetry?

(1)

(2)

(3)

(4) $CH_3-CH_2-CH_2-CH_3$

100. Which of the following free radical is most stable

(1) $CH_2=\overset{\bullet}{C}H$ (2)

(3) $O_2N-CH_2-\overset{\bullet}{C}H_2$ (4) $CH_2=CH-\overset{\bullet}{C}H_2$

ZOOLOGY : SECTION-A

All questions are compulsory in section A

101. Which of the following is not associated with AIDS?
(1) Incubation period of six days
(2) Zidovudine
(3) Western blot test
(4) Retrovirus

102. An athlete is showing characters like increased agressiveness, mood swings, depression, decrease sperm production, breast enlargement indicating
(1) addiction for some barbiturates
(2) addiction for some narcotic analgesics and drugs like LSD
(3) misuse of narcotic analgesics to enhance performance
(4) misuse of anabolic steroids to enhance performance

103. Vinblastin is used in
(1) antiretroviral therapy
(2) chemo therapy
(3) radio therapy
(4) immuno therapy

104. Nicotine is
(1) stimulatory and carcinogenic
(2) stimulatory and addictive
(3) depressant and carcinogenic
(4) carcinogen and non addictive

105. 'Don't die of ignorance' has been rightly said for disease that
(1) is a non-communicable dreaded disease
(2) has no cure and spreads due to conscious behaviour
(3) involves the transformation of normal cells into oncogenic cells
(4) can be easily cured

106. What is true about neoplastic cells?
    (1) They grow very rapidly
    (2) Invade and damage the surrounding normal tissue
    (3) Starve the normal cells by competing for vital nutrients
    (4) All of these

107. Which of the following includes cannabinoids only?
    (1) Codeine, heroin, methadone, charas
    (2) Marijuana, hashish, ganja, charas
    (3) Marijuana, hashish, methadone, heroin
    (4) Codeine, hashish, methadone, marijuana

108. Arrange the following steps in correct chronological sequence as they occur in HIV infection
    a. infected cells are directed to produce virus particles
    b. virus enters macrophages
    c. viral DNA integrates with host cell genome
    d. reverse transcriptase helps to form viral DNA
    e. viruses are released into blood.
    (1) a-d-c-b-e   (2) b-d-c-a-e
    (3) e-a-d-c-b   (4) b-c-d-e-a

109. How many of the following are associated with malignancies?
    Contact inhibition, Oncogenes, Metastasis, Neoplastic cells
    (1) 3   (2) 2
    (3) 1   (4) 4

110.

Which of the following is applicable to the product obtained from above plant?
    (1) It has analgesic effect on body
    (2) They are obtained from roots of plant
    (3) It makes person energetic
    (4) All of these

111. What is true about the technique MRI?
    (1) Usually helpful in detecting cancer of the skin or any external part
    (2) Uses X-rays to generate a three dimensional image of the internal part of an organ
    (3) Accurately detect the pathological and physiological changes in the living tissue
    (4) Both (2) and (3)

112. Find the correct statement
    a. α-interferon are biological response modifier which help in destroying the tumor
    b. Common approaches for treatment of cancer are surgery, radiotherapy and immunotherapy
    c. Hair loss and anemia are symptoms of cancer
    (1) a, b & c   (2) a & b
    (3) b & c   (4) a & c

113. What is true about *Atropa belladona* ?
    (1) It's effects are similar to those products which are extracted from poppy plants
    (2) It's extracts stimulate nervous system, increases alertness and focus
    (3) It's products are used as analgesics and antianxiety drugs
    (4) It has hallucinogenic properties like that of Charas

114. Choose a pair of drugs that work as stimulants
    (1) Barbiturates and benzodiazepines
    (2) LSD and charas
    (3) Caffeine and amphetamines
    (4) Opium and heroin

115. A peron may die due to allergic reaction/ anaphylactic shock which is characterized by
    (1) constriction of peripheral blood vessel
    (2) blood capillaries become highly permeable causing loss of fluid from blood
    (3) drastic increase in blood pressure
    (4) all of these

116. Choose the correct pair

	Drug category	Examples	Exception
(1)	Obtained from flower tops, leaves & resins of *Cannabis sativa*	Ganja, Hashish cocaine, LSD	Ganja
(2)	Help to cope with depression and insomnia	Amphetamines, benzodiazepines, heroin, barbiturates	Amphetamines
(3)	Produce sense of euphoria & increased energy	Coke, Cocaine, smack, crack	Smack
(4)	Alters thoughts, feelings & perceptions	LSD, *Datura, Atropa*, barbiturates	Datura

117. Which of the following provide passive immunity?
    (1) Tetanus toxoid
    (2) Anti tetanus serum
    (3) Vaccines from extracted cellular fractions
    (4) Natural contact with the pathogen

118. In cases of snakebites, the injection is given to the patients, contain preformed
    (1) antitoxin or antibodies
    (2) antigen or antibodies
    (3) B-lymphocytes or IgE
    (4) any of these

119. **Assertion :** With time regular drug abusers require higher dose of addictive substance to achieve same level of intoxication.

Reason : With repeated use of drugs the tolerance level of receptors in body increases.
(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Assertion is false

120. In which of the following examples is the person least likely to catch AIDS?
(1) Intravenous drug abuse
(2) Contaminated blood transfusion
(3) Sexual intercourse
(4) Faeco-oral route

121. Classify the following statements as true or false and choose the right option
a. Nicotine stimulates adrenal gland to release adrenaline & nor-adrenaline into blood
b. Brain has receptors of opoids and cannabinoids
c. Alcohol is actually a depressant but it is wrongly interpretted as a stimulant
d. Tranquilisers make a person more wakeful and excited
(1) a-T, b-T, c-T, d-F   (2) a-F, b-T, c-T, d-F
(3) a-T, b-F, c-F, d-T   (4) a-F, b-F, c-T, d-T

122. Patients with SCID
(1) have secondary immunodeficiency
(2) are immune to various infections
(3) are without T-cells and B-cells
(4) all the above

123. Which of the folowing is applicable to coke?
a. It interferes with transport of dopamine
b. Excessive dosage causes hallucinations
c. It is used as a depressant of CNS
d. It is vasoconstrictory
(1) a, b, c   (2) a, b and d
(3) b, c and d   (4) a, c and d

124. Which of the following is correct about the given skeletal structure?
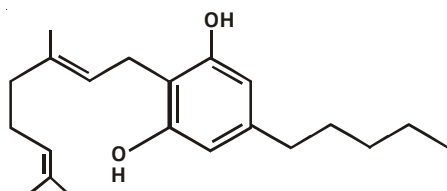
(1) It is a structure of cannabinoid
(2) It interacts with receptors present on brain
(3) It is taken by inhalation and oral ingestion
(4) All of these

125. Find the correct statement
(1) Drug dependance is tendency of body to manifest unpleasant withdrawl syndrome if excessive doses of drug is abruptly discontinued
(2) Nicotine is carcinogen present in the smoke of tobacco
(3) Drug abuse is psychological attachment to effect like euphoria
(4) All of these

126. Drugs that hasten sleep, reduce intermittent awakening & increase total sleep time are
(1) amphetamines   (2) coca alkaloids
(3) pep pills   (4) benzodiazepines

127. **Statement-A :** Early detection of cancer is essential as it allows the disease to be treated successfully in many cases.

Statement-B : Techniques like CT scan uses X-rays to generate 3D image of the internals of an object.
(1) Both statement-A & B are correct
(2) Both statement-A & B are incorrect
(3) Statement-A is correct, Statement-B is incorrect.
(4) Statement-A is incorrect, Statement-B is correct.

128. The target cells of HIV in body are
(1) T−helper cells & T−killer cells
(2) Macrophages & T−killer cells
(3) T−helper cells & B−lymphocytes
(4) T−helper cells & Macrophages

129. What is common between cocaine & nicotine?
a. both are alkaloids derived from plants
b. both are stimulants
c. both increase heart rate & blood pressure
d. both can act as local anaesthetics
(1) a, b and c   (2) a, b and d
(3) b, c and d   (4) a, c and d

130. Which of the following factor can be associated with over consumption of drug and alcohol?
(1) Stress or pressure to excel in academics
(2) Youth feel cool while smoking and using drugs
(3) Unsupportive family structure
(4) All of these

131. Patient becomes immuno deficient after significant reduction in number of
(1) B - lymphocyte   (2) T - killer cell
(3) T - helper cell   (4) antibodies

132. Match the drugs under column-I with their category under column-II

column-I		column-II
a.	Heroin	i. Cannabinoid
b.	Marijuana	ii. Hallucinogen
c.	Amphetamines	iii. Stimulant
d.	LSD	iv. Opioid

(1) a-iv, b-i, c-iii, d-ii   (2) a-i, b-ii, c-iii, d-iv
(3) a-iv, b-iii, c-i, d-ii   (4) a-ii, b-iii, c-iv, d-i

133. Which of the following option is related with the property of cancer cells?
    (1) Less number of lysosome
    (2) More telomerase activity
    (3) Decreased amount of melanin in cells
    (4) All of these

134. Which of the following is not used by sport persons to enhance their performance?
    (1) Narcotic and analgesics
    (2) Anti diuretics
    (3) Anabolic steroids
    (4) All the above can be used

135. Bhang, Cocaine & LSD are obtained from
    (1) *Cannabis sativa, Thea sinensis* and *Claviceps purpurea*
    (2) *Papaver sominiferum, Theobroma coca* and *Claviceps purpurea*
    (3) *Papaver sominiferum, Cannabis sativa* and *Claviceps purpurea*
    (4) *Cannabis sativa, Erythroxylum coca* and *Claviceps purpurea*

ZOOLOGY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

136. An incorrect statement about adolescence is
    (1) It is both a period and a process
    (2) It is a bridge linking childhood and adulthood
    (3) It is the least vulnerable phase of mental and psychological development of an individual
    (4) It is the period between 12-18 years of age

137. Gamma rays are
    (1) non-ionizing and cause DNA damage
    (2) ionizing but does not lead to neoplastic transformation
    (3) non-ionizing but lead to neoplastic transformation
    (4) ionizing and lead to DNA damage

138. Which of the following is a set of allergens?
    (1) pollens, mites in dust, adrenaline
    (2) pollens, mites in dust, animal dander
    (3) gluco-corticoids, animal fur, bee sting
    (4) fabrics, lipsticks, antihistamines

139. Identify the drug correctly matched to the plant part from which it is extracted.
    (1) Morphine   – latex of poppy plant
    (2) Cocaine   – seeds of *Theobroma*
    (3) Charas   – inflorescence of *Datura*
    (4) Heroin   – unripe capsule of hemp

140. Which of the following is not an auto immune disorder?
    (1) Vitiligo   (2) Alzheimer disease
    (3) Psoriasis   (4) All of these

141. Which of the following measures are preventive to control drug or alcohol abuse
    (1) avoid peer pressures
    (2) education and counselling
    (3) seeking professional help
    (4) all of the above

142. How many among the following can be associated with smoking?
    Bronchitis, Gastric ulcer, Emphysema, Lip cancer, Lung cancer, Roundworm, Urinary bladder cancer
    (1) Two   (2) Three
    (3) Six   (4) Seven

143. Identify A, B, C and D in the given diagram of HIV
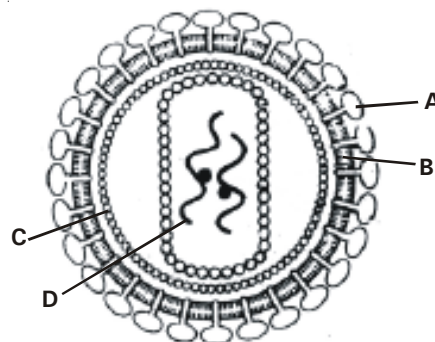
	A	B	C	D
(1)	Lipid bilayer	Glycoprotein spikes	Protein coat	DNA
(2)	Glycoprotein spikes	Lipid Bilayer	Protein coat	RNA
(3)	Glycoprotein spikes	Protein coat	Lipid bilayer	Reverse transcriptase
(4)	Protein coat	Lipid bilayer	Glyco protein spikes	RNA

144. Immunosuppressive drugs may decrease the severity of symptoms of all of the following except
    (1) myaesthenia gravis
    (2) rheumatoid arthritis
    (3) graft-host reaction
    (4) AIDS

145. Which of the following chronic infections are associated with drug abuse
    a. AIDS   b. Hepatitis A
    c. Hepatitis B   d. Genital Warts
    (1) a and b   (2) a and c
    (3) c and d   (4) b and d

146. A correct statement is
    (1) Benign tumours show the property of metastasis
    (2) Patients who have undergone surgery are given cannabinoids to relieve pain
    (3) Heroin accelerates body functions
    (4) X-rays can cause, detect and can be use to treat cancer

147. Two characters each of three drugs are given, one character in each is wrong. Choose the option showing that

a.	Coke	i.	Stimulant
		ii.	Induces sleep
b.	Heroin	i.	Is white, odourless & bitter
		ii.	CNS stimulant
c.	Cannabinoids	i.	Interfere with transport of dopamine
		ii.	Generally taken by inhalation and oral ingestion

(1) a-i, b-ii, c-i (2) a-ii, b-ii, c-i
(3) a-ii, b-i, c-ii (4) a-i, b-ii, c-ii

148. Identify the group of drugs that depress the functioning of CNS.
(1) Morphine, cocaine, heroin
(2) Morphine, amphetamines, cocaine
(3) Morphine, heroin, codein
(4) Amphetamines, cocaine, LSD

149. An incorrect pair of a drug and its description is
(1) Smack - formed by acetylation of morphine
(2) Marijuana-obtained from flowering Erythroxylum
(3) LSD - Hallucinogenic properties
(4) Morphine - Effective sedative & pain killer

150. Vaccines to generate active immunity do not contain
(1) live organisms
(2) heat killed pathogen
(3) cellular fractions containing antigenic determinants
(4) antisera

BOTANY : SECTION-A

All questions are compulsory in section A

151. At a particular locus, frequency of 'A' allele is 0.6 and that of 'a' is 0.4. What would be the frequency of heterozygotes in a random mating population at equilibrium?
(1) 0.16 (2) 0.48
(3) 0.36 (4) 0.24

152. X-chromosomes were for the first time discovered by
(1) Stevens in birds
(2) Henking in insects
(3) Morgan in *Drosophila*
(4) Bridges in *Drosophila*

153. How many autosomal trisomics are possible in human beings?
(1) 23 (2) 24
(3) 22 (4) 48

154. Choose the correct option w.r.t the figure given below

Flat back of head — Broad flat face — Many "loops" on finger tips — Palm crease — Congenital heart disease
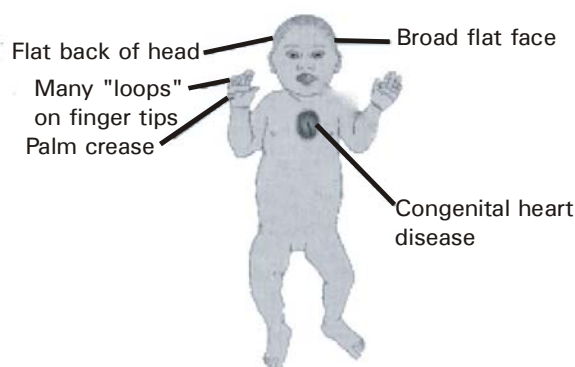
(1) Monosomy of 21st chromosome
(2) Malformed ears and receding chin
(3) Genetic constitution = 2n + 1
(4) Lack of secondary sexual characters

155. In Denver system (of human karyotype) which is the biggest chromosomal group w.r.t. number of chromosomes?
(1) A (2) B
(3) C (4) D

156. Colchicine is obtained from the corm of plant
(1) *Mangifera* (2) *Zea mays*
(3) *Colchicum* (4) *Oenothera*

157. Milk secretion in human females and premature baldness in humans are examples of
(1) sex-influenced trait and sex- limited trait respectively
(2) sex- limited and sex- influenced trait respectively
(3) sex- limited and sex- linked traits respectively
(4) sex- influenced and sex- linked trait respectively

158. **Assertion**: The allele for sickle cell anaemia continues to persist in the human population
Reason: It provides resistance to malaria
(1) Both Assertion and Reason are true and the reason is correct explanation of assertion.
(2) Both Assertion and Reason are true but reason is not correct explanation of assertion.
(3) Assertion is true but Reason is false.
(4) Assertion is false.

159. In the following pedigree the trait under consideration is inherited as
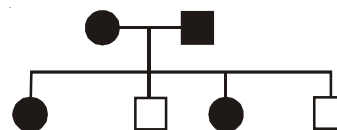

(1) dominant
(2) recessive
(3) may be dominant or recessive
(4) sex-linked recessive trait

160. If both parents are carriers for phenylketonuria, which is an autosomal recessive disorder, what are the chances of pregnancy resulting in an affected child?
(1) 50%   (2) 25%
(3) 100%   (4) 75%

161. Select the incorrect statement w.r.t. Barr body in humans
(1) Females have one Barr body
(2) Formed by complete heterochromatisation of one of X chromosome in female
(3) Either maternal or paternal chromosome can form Barr body
(4) Heterochromatisation starts in the late blastocyst stage at 16th day of embryonic development

162. In a *Drosophila*, the haploid number, number of chromosomes in monosomy and number of chromosomes in trisomy are respectively
(1) 7, 9 and 4   (2) 4, 7 and 9
(3) 4, 9 and 7   (4) 8, 7 and 9

163. The possibility of a female becoming a haemophiliac is extremely rare because
(1) mother should be carrier & father haemophilic
(2) mother normal & father should be haemophilics
(3) both mother & father should be carriers
(4) mother should be carrier & father normal.

164. A somatic cell of male grasshopper has 23 chromosomes. What is the gametic chromosome number of the opposite sex of the individual from which this cell is taken?
(1) 24   (2) 12
(3) 11   (4) 23

165. Match the following
(i) Autoallopolyploid   a. American cotton
(ii) Autopolyploid   b. *Helianthus tuberosus*
(iii) Natural allopolyploid   c. *Raphanobrassica*
(iv) Artifical allopolyploid   d. Rice
(1) (i)−b,(ii)−d,(iii)−a,(iv)−c
(2) (i)−a,(ii)−b,(iii)−c,(iv)−d
(3) (i)−c,(ii)−a,(iii)−b,(iv)−d
(4) (i)−d,(ii)−b,(iii)−c,(iv)−a

166. If a white eyed fruitfly has 3 pairs of autosomes and XXY sex chromosomes, its gender is
(1) male   (2) female
(3) Intersex   (4) super female

167. Usually the recessive character is expressed only when present in a double recessive condition. However single recessive gene can express itself in human beings when the gene is present on
(1) the X chromosome of the female
(2) the X chromosome of the male
(3) any autosome
(4) either an autosome or X chromosome

168. How many barr bodies would be expected in an extreme Klinefelter syndrome with XXXXY condition?
(1) One   (2) Two
(3) Four   (4) Three

169. Human genetics can not be studied like plants and animals because
(1) Controlled selective breeding is possible
(2) Long reproductive span
(3) Large number of offsprings
(4) Short life span

170. If the chromosome number in pollen mother cells of pea is 14, what is the possible types of pollen grains it could produce due to independent assortment of its chromosomes during meiosis?
(1) 2^{14} (2) 128
(3) 14   (4) 7

171. Which human chromosomal group are acrocentric?
(1) A, D   (2) D, G
(3) B, A   (4) G, C

172. If A, B and C represents different types of genomes then which of the following could be an amphidiploid?
(1) AAABB   (2) AABBCC
(3) AACC   (4) BBBCC

173. Hardy-Weinberg law is applicable if
(1) migration occurs in the population
(2) natural selection and mutations occur
(3) population is small
(4) random mating occurs

174. Type of female gamete in fishes are
(1) (A + Z) and (A + W)   (2) (A + Z) only
(3) (A + X) and (A + Y)   (4) (A + Z) and (A + O)

175. **Assertion :** Holandric traits are not inherited by the female child.
Reason : Holandric traits are Y-linked.
(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Assertion is false

176. Allosomes are found in humans in
(1) only ovaries and testes
(2) only liver, heart and kidney cells
(3) all cells
(4) only germ cells

177. The given pedigree may belong to
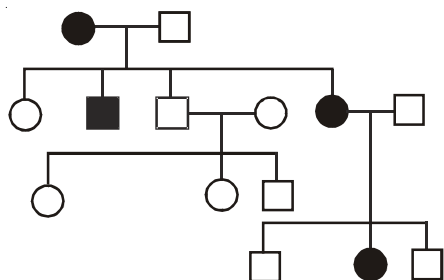
    (1) Colour blindness
    (2) Haemophilia
    (3) Myotonic dystrophy
    (4) Muscular dystrophy

178. Of the following organisms how many show female heterogamety?
    ***Drosophila, Hydrilla, Vallisneria,* Honey bee, Butterfly, Hens, Cockroach**
    (1) two   (2) three
    (3) five   (4) four

179. When a complete homologous pair is lost it is called
    (1) monosomy   (2) trisomy
    (3) nullisomy   (4) tetrasomy

180. In human, the sex is determined by the
    (1) genetic make up of female
    (2) genetic make up of male
    (3) genetic make up of sperm
    (4) genetic make up of ova

181. How many of the following statements are correct?
    a. Chromosome number in Edward's syndrome individuals is 45
    b. Gynaecomastia is a symptom shown by individuals having Klinefelter's syndrome
    c. Albinism is a common example of chromosomal disorder
    d. Drones do not have father but can have grandsons
    (1) Two   (2) Four
    (3) One   (4) Three

182. The cause of DMD (Duchenne's MD) is absence of protein
    (1) dystrophin   (2) dehydrogenase
    (3) AHF   (4) tyrosine

183. Identify the kind of mutation represented

    I J K   L M N O   I K J   L M N O
    (1) duplication   (2) inversion
    (3) translocation   (4) deletion

184. *Brassica juncea* is an allopolyploid between *Brassica campestris* (2n = 18) and *Brassica nigra* (2n = 16). Its chromosome number is
    (1) 68   (2) 17
    (3) 34   (4) 52

185. Which of the following statement is incorrect?
    (1) In Haemophilia a single protein that is a part of cascade of proteins involved in clotting of blood is affected
    (2) Cystic fibrosis is autosomal dominant disease
    (3) In human genetics, pedigree study provides a strong tool.
    (4) Queen Victoria was a carrier of Haemophilia

BOTANY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

186. Alzheimer disease
    (1) occurs because of deposition of amyloid plaques in brain
    (2) is sex–linked disorder
    (3) Commonly develop in patients with Down's syndrome
    (4) Both (1) and (3)

187. If the frequency of dominant phenotype in a randomly mating population is 84%. What will be the %age of recessive allele in the population?
    (1) 14%   (2) 28%
    (3) 40%   (4) 50%

188. Sickle cell anaemia is an autosomal recessive trait. State the genotype of I generation when solid symbol represents the affected individual
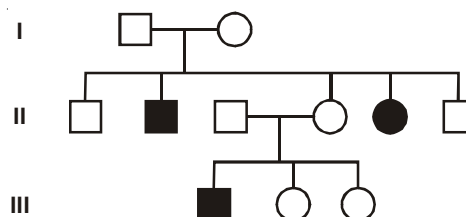
    (1) father is $Hb^s Hb^s$, mother is $Hb^s Hb^s$
    (2) father is $Hb^A Hb^s$, mother is $Hb^A Hb^A$
    (3) father is $Hb^s Hb^s$, mother is $Hb^A Hb^A$
    (4) father is $Hb^A Hb^s$, mother is $Hb^A Hb^s$

189. Which of the following statement is correct?
    (1) Hexaploid wheat is aneuploid
    (2) Translocation occurs between two homologous chromosome
    (3) One chromosome is represented four times in tetrasomy
    (4) Aneuploidy induces gigas effect

190. An aneuploid in which one chromosome is devoid of its homologue is
    (1) Nullisomic   (2) Trisomic
    (3) Tetrasomic   (4) Monosomic

191. The gene for hypertrichosis is
    (1) y-linked   (2) x-y linked
    (3) x-linked   (4) autosomal

192. Match the structures in column-I with column-II where they are present

	Column-I		Column-II
a.	Barr body	i.	Males
b.	Sxl gene	ii.	Bridges
c.	Y-spot	iii.	*Drosophila* Females
d.	X/A ratio	iv.	Xist genes

   (1) a−iv, b−iii, c−ii, d−i
   (2) a−iii, b−iv, c−i, d−ii
   (3) a−iv, b−iii, c−i, d−ii
   (4) a−iv, b−ii, c−i, d−iii

193. XO chromosomal abnormality in humans causes
   (1) Turner's syndrome
   (2) Down's syndrome
   (3) Morphan's syndrome
   (4) Klinefelter's syndrome

194. Select the incorrect statement
   (1) Archibald Garrod is known as Father of human genetics.
   (2) Dominant sex (X) linked trait if present in father will always appear in daughters
   (3) Mendelian disorders are mainly determined by alteration or mutation in the single gene
   (4) Alkaptonuria is an inborn error of metabolism that is inherited as autosomal dominant trait

195. A child is colour-blind but his fraternal twin brother is normal. This is possible if his
   (1) mother is a carrier
   (2) father is not affected and mother is affected
   (3) mother is affected only
   (4) both parents are affected

196. How many statements are true?
   a. Translocation is intrachromosomal mutation
   b. Human karyotype is asymmetric
   c. Male honey bees produce sperms by mitosis.
   d. Plumage in poultry is a sex limited trait
   (1) Four   (2) Two
   (3) Three   (4) One

197. Transfer of traits from male parent to grandson through daughter is called
   (1) diandric   (2) diagynic
   (3) holandric   (4) androgenic

198. Exchange of genes between different linkage groups is called
   (1) Crossing over   (2) Translocation
   (3) Inversion   (4) Delection

199. What will be the number of Y spots in 100 androsperms of a human?
   (1) 50   (2) zero
   (3) 100   (4) 75

200. Select the correct statement
   (1) Thalassaemia is connected to the deletion of the 12th chromosome
   (2) Colourblindness occurs in about 8 percent of females and only 0.4 percent of males
   (3) Chromosomal disorders can be traced in a family by the pedigree analysis
   (4) Sickle cell anaemia is a qualitative problem of synthesising an incorrectly functioning globin

M.L. Syal's Helix Institute

S.C.O. 343-345, Top Floor, Sector 34-A, Chandigarh. Ph : 0172-2623155

XII cum Competition Course for Medical – Test - 6

1.	(1)	51.	(2)	101.	(1)	151.	(2)
2.	(3)	52.	(3)	102.	(4)	152.	(2)
3.	(2)	53.	(3)	103.	(2)	153.	(3)
4.	(4)	54.	(4)	104.	(2)	154.	(3)
5.	(3)	55.	(4)	105.	(2)	155.	(3)
6.	(4)	56.	(1)	106.	(4)	156.	(3)
7.	(4)	57.	(3)	107.	(2)	157.	(2)
8.	(3)	58.	(4)	108.	(2)	158.	(1)
9.	(2)	59.	(2)	109.	(1)	159.	(1)
10.	(2)	60.	(1)	110.	(1)	160.	(2)
11.	(2)	61.	(1)	111.	(3)	161.	(2)
12.	(3)	62.	(2)	112.	(2)	162.	(2)
13.	(3)	63.	(2)	113.	(4)	163.	(1)
14.	(4)	64.	(4)	114.	(3)	164.	(2)
15.	(1)	65.	(3)	115.	(2)	165.	(1)
16.	(3)	66.	(2)	116.	(3)	166.	(2)
17.	(3)	67.	(3)	117.	(2)	167.	(2)
18.	(2)	68.	(2)	118.	(1)	168.	(4)
19.	(2)	69.	(3)	119.	(1)	169.	(2)
20.	(4)	70.	(3)	120.	(4)	170.	(2)
21.	(3)	71.	(3)	121.	(1)	171.	(2)
22.	(3)	72.	(2)	122.	(3)	172.	(3)
23.	(1)	73.	(2)	123.	(2)	173.	(4)
24.	(2)	74.	(1)	124.	(4)	174.	(1)
25.	(2)	75.	(1)	125.	(1)	175.	(1)
26.	(3)	76.	(4)	126.	(4)	176.	(3)
27.	(2)	77.	(1)	127.	(1)	177.	(3)
28.	(3)	78.	(3)	128.	(4)	178.	(1)
29.	(1)	79.	(2)	129.	(1)	179.	(3)
30.	(2)	80.	(4)	130.	(4)	180.	(3)
31.	(4)	81.	(1)	131.	(3)	181.	(1)
32.	(2)	82.	(1)	132.	(1)	182.	(1)
33.	(1)	83.	(3)	133.	(2)	183.	(2)
34.	(3)	**84.**	**(1)**	134.	(2)	184.	(3)
35.	(2)	85.	(1)	135.	(4)	185.	(2)
36.	(4)	86.	(4)	136.	(3)	186.	(4)
37.	(1)	87.	(3)	137.	(4)	187.	(3)
38.	(3)	88.	(2)	138.	(2)	188.	(4)
39.	(3)	89.	(2)	139.	(1)	189.	(3)
40.	(2)	90.	(2)	140.	(2)	190.	(4)
41.	(2)	91.	(4)	141.	(4)	191.	(1)
42.	(1)	92.	(2)	142.	(3)	192.	(3)
43.	(3)	93.	(4)	143.	(2)	193.	(1)
44.	(2)	94.	(1)	144.	(4)	194.	(4)
45.	(2)	95.	(2)	145.	(2)	195.	(1)
46.	(4)	96.	(3)	146.	(4)	196.	(3)
47.	(3)	97.	(3)	147.	(2)	197.	(2)
48.	(3)	98.	(1)	148.	(3)	198.	(2)
49.	(2)	99.	(2)	149.	(2)	199.	(3)
50.	(4)	100.	(4)	150.	(4)	200.	(4)

M.L. Syal's Helix Institute
S.C.O. 343-345, Top Floor, Sector 34-A, Chandigarh. Ph : 0172-2623155

Test Booklet Code

A

Name of Candidate : …………………………

Signature ……………

Roll No. : ……………………………………

Batch : ………………

MM : 720

XII cum Competition Course for Medical
Test - 7

Time : 3 hrs.

PHYSICS   : MAGNETISM
CHEMISTRY : ALKYL HALIDES
ZOOLOGY   : MICROBES IN HUMAN WELFARE
BOTANY   : MOLECULAR BASIS OF INHERITANCE-I (UPTO REPLICATION)

PHYSICS : SECTION-A

All questions are compulsory in section A

1. The universal property of all substances is
    (1) diamagnetism
    (2) paramagnetism
    (3) ferromagnetism
    (4) all of these

2. If a bar magnet is cut into two equal pieces transverse to its length, then magnetic moment of each piece becomes half because
    (1) magnetic pole strength reduces to half
    (2) magnetic pole strength becomes double
    (3) magnetic length reduces to half
    (4) only one pole remains

3. A solid cylindrical magnet of length 10 cm and diameter 2 cm has a uniform magnetisation of 5000A/m. Its magnetic dipole moment is
    (1) 0.157 J/T   (2) 3.14 J/T
    (3) 0.314 J/T   (4) 1.57 J/T

4. At a certain place on surface of earth, both magnetic dip and declination is zero. This place
    (1) lies on a magnetic pole of earth
    (2) lies on magnetic equator of earth
    (3) lies at a latitude of 45°
    (4) does not exist

5. **Assertion :** When a ferromagnetic material goes through hysterisis loop, the magnetic susceptibility may be zero, infinite or negative.
    Reason : Ferromagnetic substances have unpaired electrons also.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

6. Magnetic field induction at P, which is equidistant from centres of four short magnetic dipoles is
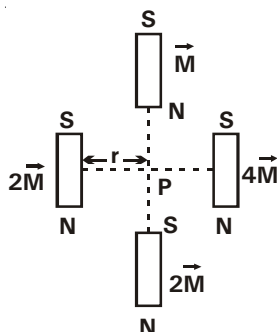
(1) $\dfrac{\mu_0}{4\pi}\cdot\dfrac{3M}{r^3}$ (2) $\dfrac{\mu_0}{4\pi}\,\dfrac{M}{r^3}$

(3) $\dfrac{\mu_0}{4\pi}\cdot\dfrac{2M}{r^3}$ (4) Zero

7. Calculate the true angle of dip at a place, where the tangent of angle of dip in a plane inclined at an angle $37°$ to magnetic meridian is 0.721.
   (1) $0°$ (2) $30°$
   (3) $45°$ (4) $37°$

8. A dip needle in a plane perpendicular to magnetic meridian will remain
   (1) vertical
   (2) horizontal
   (3) in any direction
   (4) at angle of dip to the horizontal

9. A compass needle of magnetic moment 60 Am^2, pointing geographical north at a certain place, experiences a torque 1.2×10^{-3} Nm. If horizontal component of earth's magnetic field at that place is 40 μWb/m^2, declination at that place is
   (1) $30°$ (2) $45°$
   (3) $60°$ (4) $25°$

10. Two cylindrical bar magnets have magnetisation in the ratio 1 : 2, radii in the ratio 2 : 1 and lengths in the ratio 2 : 1. Ratio of their dipole moments is
    (1) 2 : 1   (2) 4 : 1
    (3) 8 : 1   (4) 1 : 2

11. A magnetic dipole of magnetic moment 'M' is rotated through $180°$ in a uniform magnetic field B, the work done may be
    a. zero   b. 3MB
    c. -2MB   d. 0.75MB
    (1) both a & d   (2) a, b & c
    (3) a, c & d   (4) b, c & d

12. In B-H hystersis curve

    Statement -1 : Retentivity is value of magnetic field in the material when magnetizing field becomes zero.

    Statement-2 : Coercivity is value of reverse magnetizing field to make magnetic field in the material zero.

    (1) Both statements are correct
    (2) Both statements are incorrect
    (3) Statement-1 is correct and 2 is incorrect
    (4) Statement-1 is incorrect and 2 is correct

13. A boat is moving due east (according to the magnetic compass in the boat) at a place where declination is $10°$ west. What is the true direction of motion of the boat?
    (1) $10°$ north of east
    (2) $10°$ north of west
    (3) $10°$ east of north
    (4) $10°$ south of east

14. Which is correct w.r.t. magnetic declination?
    a. Angle between true geographic north & north shown by a compass needle is declination.
    b. The declination is greater at higher latitudes.
    c. The declination is smaller near the equator.
    (1) both a & b   (2) both b & c
    (3) a, b & c   (4) a only

15.
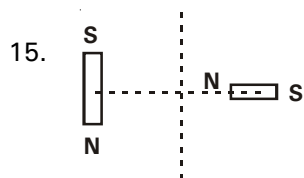
In the above arrangement, magnet on the right experiences

(1) a net upward force and an anticlockwise torque

(2) a net downward force and an anticlockwise torque

(3) a net downward force and a clockwise torque

(4) a net upward force and a clockwise torque

16. In magnetic maps, "Isogonic lines" are the lines

(1) joining same inclination places

(2) joining same declination places

(3) joining zero declination places

(4) joining zero inclination places

17. Match the physical quatities in column-I with the dimensions in column II

Column I	Column II
(i) Magnetic permeability	a. $[MT^{-2}A^{-1}]$
(ii) Magnetic flux	b. $[ML^2T^{-2}A^{-1}]$
(iii) Magnetic induction	c. $[MLT^{-2}A^{-2}]$

(1) (i)−c; (ii)−b; (iii)−a (2) (i)−a; (ii)−b; (iii)−c

(3) (i)−b; (ii)−c; (iii)−a (4) (i)−b; (ii)−a; (iii)−c

18. A solenoid has a core of a material with relative permeability 400. The windings of the solenoid are insulated from the core and carry a current of 2A. If the number of turns is 1000 per metre, magnetisation is approximately.

(1) $\cong 8 \times 10^5$ A/m (2) $\cong 4 \times 10^7$ A/m

(3) $\cong 4 \times 10^5$ A/m (4) $\cong 8 \times 10^7$ A/m

19. A sensitive magnetic instrument can be shielded very effectively from outside magnetic fields by placing it inside a box of

(1) teak wood

(2) plastic material

(3) soft iron

(4) any metal of high conductivity

20. A magnetic needle of length 10 cm with dipole moment M is bent to form an arc of a circle. If perimeter of circle is 60 cm, the new dipole moment is

(1) $\dfrac{3\sqrt{2}}{\pi} M$ (2) $\dfrac{\sqrt{3}}{\pi} M$

(3) $\dfrac{3}{\pi} M$ (4) $\dfrac{\sqrt{2}}{\pi} M$

21. In sum and difference method of comparing magnetic moments of two magnets P and Q in a vibration magnetometer, let 3s and 6s be the time periods of oscillation respectively. The ratio of magnetic diplole moment of P to that of Q is

(1) 1.33 (2) 2.33

(3) 1.5 (4) 1.67

22. The magnetic field lines due to a bar magnet are correctly shown in
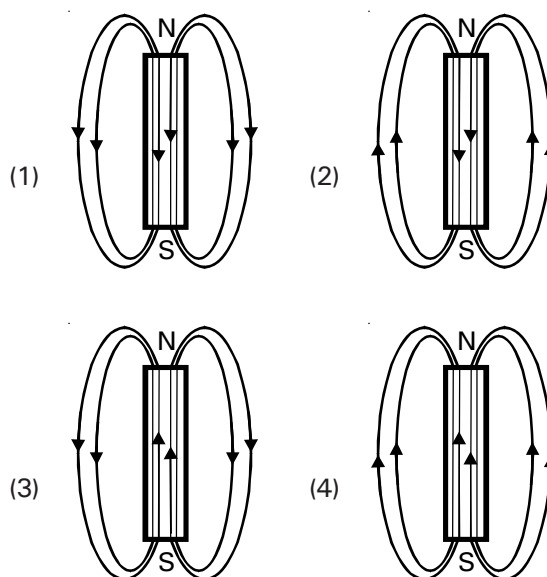
23. A bar magnet is oscillating in a vibration magnetometer where earth's magnetic field is 0.2 G and angle of dip is 53°. If its moment of inertia is 100 gram-cm² and it is found to make 30 oscillations per minute, its magnetic moment is
    (1) 8.33 A-m²   (2) 7.5 A-m²
    (3) 6.67 A-m²   (4) 10 A-m²

24. A vibration magnetometer consists of two identical bar magnets placed one over the other such that they are perpendicular and bisect each other. The time period of oscillation in a horizontal magnetic field is $2^{5/4}$ seconds. One of the magnets is removed and if the other magnet oscillates in the same field, then the time period in seconds is
    (1) $2^{1/4}$ (2) $2^{1/2}$
    (3) 2   (4) $2^{3/4}$

25. If a diamagnetic solution is poured into a U-tube and one arm of this U-tube placed between the poles of a strong magnet with the meniscus in a line with the field, then level of the solution in this arm will
    (1) rise   (2) fall
    (3) oscillate slowly (4) remain as such

26. As we go from equator towards a pole, the value of horizontal component of earth's magnetic field and angle of dip respectively
    (1) increases, decreases
    (2) decreases, increases
    (3) increases, increases
    (4) decreases, decreases

27. **Statement-1:** As temperature rises, the alignment of molecular magnets gradually decreases.
    Statement-2: The magnet can be completely demagnetized by heating it slightly.
    (1) Both statements are correct
    (2) Both statements are incorrect
    (3) Statement 1 is correct and 2 is incorrect
    (4) Statement 2 is correct and 1 is incorrect

28. If magnetising field is kept constant, the ratio of intensity of magnetisation in a paramagnetic substance at 27°C and 327°C is
    (1) 2 : 1   (2) 1 : 2
    (3) 1 : 1   (4) None of these

29. A short bar magnet is placed with its north pole along north-east direction. The neutral points will be obtained on a line making an angle θ with the axis of the magnet where $\tan\theta =$
    (1) $\dfrac{\sqrt{17}-1}{2}$ (2) $\dfrac{\sqrt{17}-3}{2}$
    (3) $\dfrac{\sqrt{15}-3}{2}$ (4) $\dfrac{\sqrt{15}-1}{2}$

30. A magnetic dipole $(\vec{M})$ is placed in uniform magnetic field $(\vec{B})$ and rotated from stable to unstable equilibrium position. Torque, workdone and potential energy in final position are respectively
    (1) 0, 0 and –MB   (2) MB, MB and 0
    (3) 0, 2MB and MB   (4) 0, 2MB and 0

31. Let apparent dip angles of two mutually perpendicular vertical planes be 30° and 45° as given by a dip circle. If true angle of dip is δ, then
    (1) $\tan\delta = 0.5$ (2) $\tan\delta = 1$
    (3) $\tan\delta = 2$ (4) $\tan\delta = 3$

32. The mass of a specimen of a ferromagnetic material is 0.6 kg and the density is 7.8×10^3 kg/m³. If the area of hysteresis loop of alternating magnetising field of frequency 50 Hz is 0.722 MKS units, then hysteresis loss per second will be
    (1) 27.7×10^{-5} J   (2) 2.77×10^{-5} J
    (3) 27.7×10^{-4} J   (4) 2.77×10^{-4} J

33. Which of the following statements is true?
    (1) If a hole is made at the centre of a bar magnet, then its magnetic moment remains same.
    (2) For a perfectly diamagnetic substance permeability is always one.
    (3) For making permanent magnets, steel is preferred over soft iron because coercivity of steel is larger.
    (4) When the N-pole of a bar magnet points towards the south and S-pole towards the north, the null points are on equatorial line of magnet.

34.
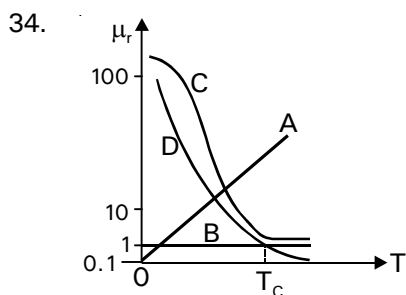
For a ferromagnetic material, variation of relative permeability with absolute temperature is best represented by

(1) A (2) B
(3) C (4) D

35. A short bar magnet placed with its axis at 37° with an external field of 500G experiences a torque of 0.06Nm. We want a solenoid of cross-sectional area 10^{-4}m^2 and 1000 turns, but of the same magnetic moment as the bar magnet. Then current flowing through the solenoid is

(1) 18 A (2) 16 A
(3) 10 A (4) 20 A

PHYSICS : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

36. Time period in vibration magnetometer will be infinity at

(1) magnetic equator (2) magnetic poles
(3) equator (4) at all places

37. Which is false for a ferromagnetic material?

(1) Above curie temperature, a ferromagnetic material behaves as a paramagnetic
(2) Ferromagnetism arises due to spin-orbit interaction
(3) Area of hysteresis curve is a measure of energy dissipated per cycle per unit volume of the specimen
(4) Atoms may or may not have permanent dipole moment

38. A bar magnet is placed vertically on a table. The number of neutral points on the table is/are

(1) 2 (2) 0
(3) 1 (4) 4

39. Variation of magnetic susceptibility (χ) with temperature for a diamagnetic substance is best represented by

(1)

(2)

(3)

(4)
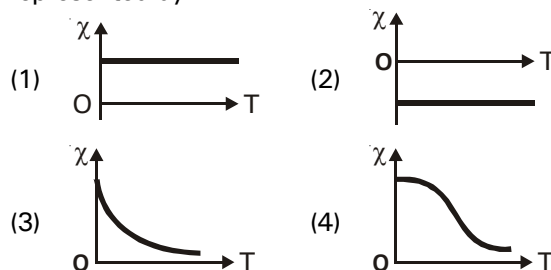
40. Points A and B are situated along the extended axis of bar magnet of length 2x at a distance 2x and 3x respectively from the pole nearer to the points. The ratio of the magnetic field at A and B will be approximately

(1) 224 : 15 (2) 128 : 9
(3) 324 : 72 (4) 675 : 256

41. **Statement-1:** Magnetic induction is a scalar quantity.
Statement-2 : Magnetic dipole moment is a vector quantity.

(1) Both statements are correct
(2) Both statements are incorrect
(3) Statement-1 is correct and 2 is incorrect
(4) Statement-2 is correct and 1 is incorrect

42. A compass needle gets deflected by 30° from magnetic meridian when a short magnet is placed in E-W direction to the east of the needle at a distance of 1m. Distance of the magnet from the needle so that its deflection from meridian becomes 60° will be

(1) $\dfrac{1}{3}$ m (2) $\dfrac{1}{\sqrt{3}}$ m

(3) $< \dfrac{1}{\sqrt{3}}$ m (4) $> \dfrac{1}{\sqrt{3}}$ m

43.
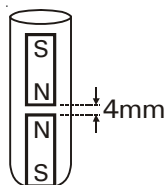
Two identical bar magnets of length 5 cm and mass 25 gm each are arranged in a glass tube as shown such that a upper magnet hangs in air in equilibrium. Pole strength of each magnet is

(1) 2 A-m
(2) $\sqrt{2}$ A-m
(3) $\sqrt{10}$ A-m
(4) $\sqrt{40}$ A-m

44. Match diagrams in column-I entries in column-II

Column I   **Column II**
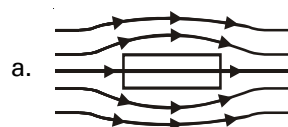
a.   p. paramagnetic
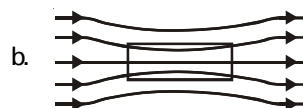
b.   q. diamagnetic
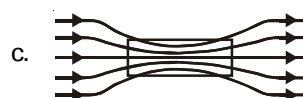
c.   r. ferromagnetic

(1) a-r, b-p, c-q
(2) a-p, b-q, c-r
(3) a-q, b-r, c-p
(4) a-q, b-p, c-r

45. Let the horizontal component of earth's magnetic field at a place be 0.25 gauss. If a small magnet is placed in the magnetic meridian with its north pole pointing south, the null point is obtained 20 cm away from the centre of the magnet. The magnetic moment of the magnet is

(1) 10 A-m^2
(2) 1 A-m^2
(3) 0.2 A-m^2
(4) 0.1 A-m^2

46. **Assertion :** The poles of magnet cannot be separated by breaking into two pieces.
Reason : Magnetic moment will be reduced to half when a magnet is broken into two equal pieces.
(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Assertion is false

47. A magnetic needle lying parallel to a magnetic field requires W units of work to turn it through 53°. The torque required to maintain the needle in this position will be
(1) 1.5 W
(2) W
(3) $\dfrac{\sqrt{3}}{2}$ W
(4) 2 W

48. A thin rectangular magnet suspended freely in a uniform magnetic field has a period of oscillation 4s. If the magnet is cut into two equal pieces parallel to its length and one of them is made to oscillate in the same field then its period is
(1) 16 s
(2) 4 s
(3) 8 s
(4) 1 s

49. A magnet is suspended in the magnetic meridian with an untwisted wire. The upper end of wire is rotated through 180° to deflect the magnet by 30° from magnetic meridian. When this magnet is replaced by another magnet, the upper end of wire is rotated through 270° to deflect the magnet 30° from magnetic meridian. The ratio of magnetic moments of magnets is
(1) 1 : 5
(2) 1 : 8
(3) 5 : 8
(4) 8 : 5

50. Which of the following statement is correct?

 a. In most of the northern hemisphere, the dip is positive

 b. At earth 's poles magnetic field lines are converging or diverging vertically so that the horizontal component is negligible

 c. At earth's poles, if needle is only capable of moving in a horizontal plane, it can point along any direction rendering it useless

 (1) both a & b (2) both b & c

 (3) a, b & c (4) a only

CHEMISTRY : SECTION-A

All questions are compulsory in section A

51. In S_N^1 reaction, first step involves the formation of

 (1) free radical (2) carbanion

 (3) carbocation (4) final product

52. Which of the following pair is correctly matched?

Reaction	Major Product
I. $R-X+AgCN$	$R-NC$
II. $R-X+KCN$	$R-CN$
III. $R-X+KNO_2$	$R-NO_2$
IV. $R-X+AgNO_2$	$R-O-N=O$

 (1) I alone (2) I and II

 (3) III and IV (4) I, II, III and IV

53. Which reagent will you use for the following reaction?

$CH_3CH_2CH_2CH_3 \rightarrow CH_3CH_2CH_2CH_2Cl + CH_3CH_2CHClCH_3$
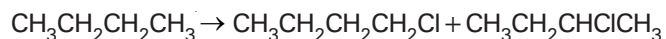
 (1) Cl_2/UV light

 (2) $NaCl + H_2SO_4$

 (3) Cl_2 gas in dark

 (4) Cl_2 gas in the presence of iron in dark

54. Racemic mixture is not obtained when

 (1)

  Me
  H————I is treated with NaI, acetone
  Et

 (2)

  Me
  H————Cl is treated with anhydrous
  Et

  $AlCl_3$

 (3)

  Me
  H————Cl is treated with KCN, DMF
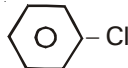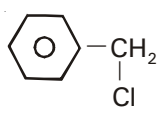 Et
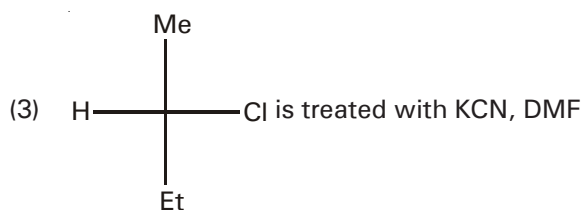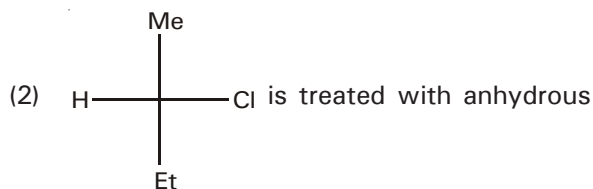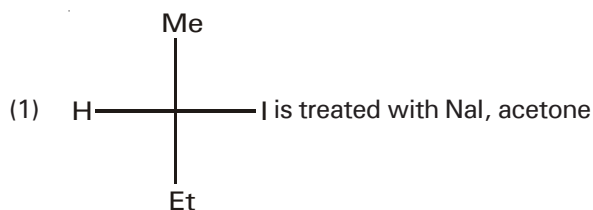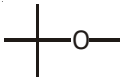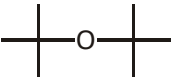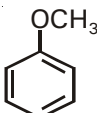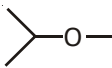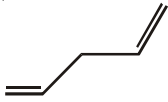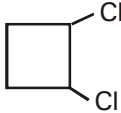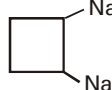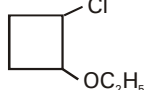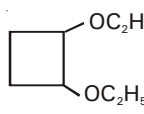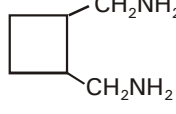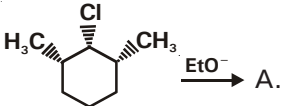
 (4) Both (2) & (3)

55. **Assertion**: In the transition state of SN_2 reactions of alkyl halide, the alpha carbon is sp^2 hybridised

 Reason: In the transition state, alpha carbon is surrounded by five atom

 (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion

 (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion

 (3) Assertion is true statement but Reason is false

 (4) Assertion is false

56. The maximum dipole-moment among the following is for
    (1) CH_3Br
    (2) CH_3I
    (3) CH_3Cl
    (4) CH_3F

57. The increasing order of nucleophicity of X^- is
    (1) $I^- < Br^- < Cl^- < F^-$
    (2) $I^- < Br^- < F^- < Cl^-$
    (3) $F^- < Cl^- < I^- < Br^-$
    (4) $F^- < Cl^- < Br^- < I^-$

58. Which one of the following is commonly used as a lewis acid in groove's process.
    (1) NaI
    (2) BF_3
    (3) Ag^+
    (4) $ZnCl_2$

59. The correct order of reactivity towards SN_1 reaction for following compounds is
    i. $CH_3CH_2CH_2CH_2Br$
    ii. $CH_3 - CH - CH_2Br$
          $|$
          CH_3
    iii. $CH_3 CHCH_2CH_3$
              $|$
              Br
    iv. $(CH_3)_3C-Br$
    (1) iv > iii > ii > i
    (2) iv > ii > iii > i
    (3) i > iii > ii > iv
    (4) iii > iv > i > ii

60. Which of these can be formed as a major product during Williamson's synthesis ?
    a. [structure with O]
    b. [structure with O]
    c. [benzene ring with OCH_3]
    d. $CH_2 = CH - O - CH = CH_2$
    e. [structure with O]
    (1) a, c, d
    (2) a and e
    (3) a, c, e
    (4) a, d, e

61. The most reactive towards both S_{N1} and S_{N2} is
    (1) R-F
    (2) R-I
    (3) R-Cl
    (4) R-Br

62. **Assertion**: E_2 reaction fails in case of neo-pentyl bromide
    Reason: Br^- is a poor leaving group.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

63. Which of these will give elimination product as the major product ?
    (1) [structure] $Br + NH_3$
    (2) [structure] $Br + $ alc. KOH
    (3) [structure] $Br + $ aq. KOH
    (4) [structure] $Br + C_2H_5OH$

64. [structure] $\xrightarrow{NBS}$ major product 'P'

    The product 'P' in the above reaction is
    (1) 3-Bromopenta-1, 4–diene
    (2) 1,2–Dibromopent–4–ene
    (3) 5–Bromopenta–1, 3–diene
    (4) 3–Chloropenta–1, 4–diene

65. [cyclobutane with Cl, Cl] $\xrightarrow{KCN}$ A, $\xrightarrow[\text{reduction}]{\text{Na, ethanol}}$ X. X is
    (1) [cyclobutane with Na, Na]
    (2) [cyclobutane with Cl, OC_2H_5]
    (3) [cyclobutane with OC_2H_5, OC_2H_5]
    (4) [cyclobutane with CH_2NH_2, CH_2NH_2]

66. What is not true for S_{N2} reactions?
   (1) It is a concerted mechanism
   (2) Rate increases as the concentration of Nu^- increases
   (3) Its rate is independent of concentration of RX
   (4) 1° R–X are good substrates

67. When ethyl alcohol (C_2H_5OH) reacts with thionyl chloride, in the presence of pyridine, the product obtained is
   (1) $CH_3CH_2Cl + HCl$
   (2) $C_2H_5Cl + HCl + SO_3$
   (3) $CH_3CH_2Cl + H_2O + SO_2$
   (4) $CH_3CH_2Cl + HCl + SO_2$

68. Alkyl fluorides are synthesised by heating an alkyl chloride/bromide in Swart's reaction in presence of
   (1) Hg_2F_2 (2) F_2
   (3) HF   (4) All of these

69. The correct order of increasing density is
   (1) $CH_3Cl < CH_2Cl_2 < CHCl_3 < CCl_4$
   (2) $C_2H_5Cl < C_2H_5Br < C_2H_5I$
   (3) $CH_3CH_2CH_2Cl < CH_3CH_2Cl < CH_3Cl$
   (4) All of these

70. If the dehydrohalogenation of 2-Fluorobutane gives $CH_3CH_2CH=CH_2$. The product is
   (1) Hofmann product
   (2) Saytzeff product
   (3) Hoffmann-Saytzeff product
   (4) Markownikoff product

71.

   The major product of this reaction is
   (1) An ether   (2) An alkene
   (3) An alcohol   (4) An ester

72. The intermediate during the addition of HCl to propene in the presence of organic peroxide is
   (1) $CH_3\overset{\bullet}{C}HCH_3$ (2) $CH_3\overset{\oplus}{C}HCH_3$
   (3) $CH_3CH_2\overset{\bullet}{C}H_2$ (4) $CH_3CH_2\overset{\oplus}{C}H_2$

73. When excess C_2H_5Br is treated with alc. NH_3, the major product obtained is
   (1) Ethylamine
   (2) Diethylamine
   (3) Triethylamine
   (4) Tetraethylammonium bromide

74. Which reactions are used to prepare monohalide?
   Darzen process   Groove's process
   (I)   (II)
   Hunsdiecker's reaction
   (III)
   (1) I & II only   (2) I & III only
   (3) I, II & III   (4) II & III only

75. Identify the final product X of following reaction

   $CH_3CH_2Br \xrightarrow[\text{NaOH}]{\text{Ni–Al/}}$

   (1) CH_3CH_2OH (2) CH_3CH_2ONa
   (3) $(CH_3CH_2)_2Ni$ (4) CH_3CH_3

76. $CH_3-CH_2-CH=CH_2 + Cl_2 \xrightarrow[\text{CCl}_4]{\text{dark}} A$

   $A \xrightarrow{\text{moist silver oxide}} B$
   What is B?

   (1) $CH_3-CH=CH-\overset{\overset{\text{Cl}}{|}}{C}H_2$

   (2) $CH_3-CH_2-\overset{\overset{\text{Cl}}{|}}{C}H-\overset{\overset{\text{Cl}}{|}}{C}H_2$

   (3) $CH_3-CH_2-\overset{\overset{\text{OH}}{|}}{C}H-\overset{\overset{\text{OH}}{|}}{C}H_2$

   (4) None of these

77. The reaction of 2-chlorobutane with aq.KOH produces
   (1) Butan-2-ol
   (2) Butan-1-ol
   (3) 2-Methyl propan-2-ol
   (4) 2-Methyl propan-1-ol

78. 1-chloro-1-methylcyclohexane is reacted with sodium fluoride in a polar aprotic solvent. The major product is then treated with HBr, peroxide to form 'X' (major). What is/are true regarding 'X'?
   a. It has 1 chiral carbon
   b. It has 4 stereomeric forms
   c. It is a tertiary alkyl halide
   d. It can show geometrical isomerism
   (1) a & c only   (2) c only
   (3) b & d only   (4) b, c, d only

79. Conc. H_2SO_4 is not used during the reaction of alcohols with KI as H_2SO_4.
   (1) oxidises I^- to I_2
   (2) is an weak dibasic acid
   (3) is an effective drying agent.
   (4) converts KI to HIO_3

80. **Statement I**: 2-bromo-2-methyl propane has the lowest boiling point among isomers of C_4H_9Br.
   Statement II: The reaction between 2-bromo-2-methyl propane and aqueous hydroxide ion follows first order kinetics
   (1) Statement I is correct and Statement II is incorrect
   (2) Statement I is incorrect and Statement II is correct
   (3) Both Statements are correct
   (4) Both Statements are incorrect

81. Reaction of t-butyl bromide with sodium methoxide produces
   (1) Isobutane   (2) Isobutylene
   (3) Sodium t-butoxide (4) t-butyl methyl ether

82. $\xrightarrow{\text{Na}}$ 'P' The product 'P' can be
   (1)   (2)
   (3)   (4) All of these

83. When alkyl halide is heated with dry Ag_2O, it produces
   (1) Ester   (2) Ether
   (3) Ketone   (4) Alcohol

84. Match the species in column I with correct properties in column II.

Column-I	Column-II
a. – Cl	p. Aryl halide
b. $CH_3CH=CHCl$	q. Inert halogen
c. –CH$_2$ Cl	r. Allyl halide
d. CH_3Cl	s. Labile halogen

   (1) a-p,q; b-q; c-s; d-s
   (2) a-p,q; b-r, s; c-p,q; d-q
   (3) a-p,q; b-s, r; c-q,p; d-q
   (4) a-r,s; b-q, s; c-p,q; d-r

85. The correct set of reagents (in order) to convert 1-propanol to butanoic acid is
   (1) KCN (alc.); dil. acid (H^+)
   (2) Mg/ether ; H_3O^+ ; KOH (aq.)
   (3) $SOCl_2$; KCN (alc.) dil acid
   (4) $SOCl_2$; AgCN (alc.) ; dil acid

CHEMISTRY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

86. Which of the following is mismatch ?

    (1) $RO^- > \overset{-}{O}H$ (nucleophilicity)

    (2) $RO^- > \overset{-}{O}H$ (basicity)

    (3) $RCOO^- > RO^-$ (basicity)

    (4) $\overset{-}{O}H > RCOO^-$ (nucleophilicity)

87. Choose the incorrect statement regarding reaction of ROH with HX.
    (1) The reactions of 1° alcohols with HX require the presence of a catalyst anhyd. $ZnCl_2$.
    (2) With 3° alcohols the reaction is conducted by simply shaking conc. HCl at room temperature
    (3) Constant boiling with HBr (48%) is used for preparing alkyl bromide.
    (4) The order of reactivity of alcohols with a given haloacid is 1° > 2° > 3°.

88. But-2-ene $\xrightarrow{Br_2/CCl_4}$ (Y) $\xrightarrow{\text{Fractional distillation}}$ (Z)
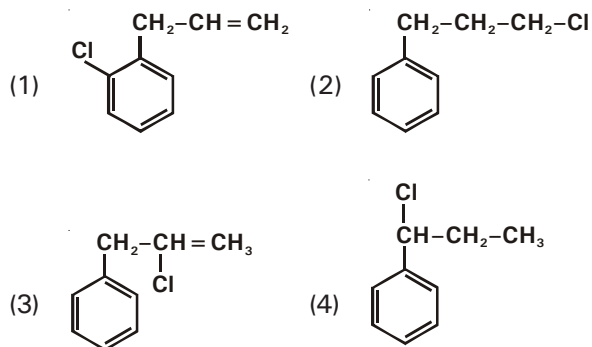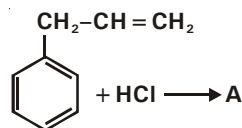
    Y + Z (Y are no. of possible products including stereomers and Z is no. of fractions) is
    (1) 5   (2) 4
    (3) 3   (4) 7

89. Which of the following is the most reactive towards S_N1 ?

    (1)   (2)

    (3)   (4)
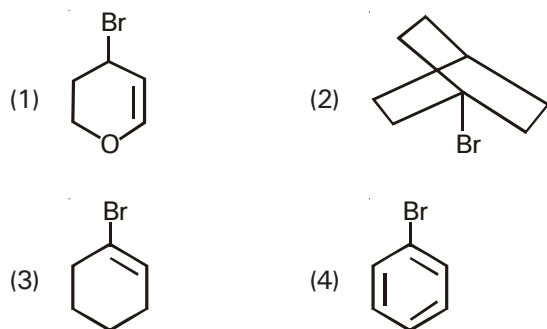
90. What is 'A' in the following reaction?

    (1)   (2)

    (3)   (4)

91. **Assertion**: Cyanide ion posesses two nucleophilic centres and is thus called an ambident nucleophile
    Reason: Cyanide ion is a hybrid of two contributing structures & can act as nucleophile in two different ways
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false
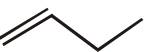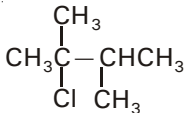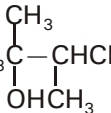
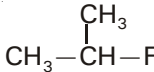92. Which is false when ethylene reacts with bromine?
    (1) The reaction occurs via cyclic three membered transition state
    (2) Vicinal dihalide is the final product
    (3) 1, 1-dihalide is the major product
    (4) Trans-addition occurs across the double bond

93. Which of the following statement is true?
    (1) Increased temperature favours elimination reactions over substitutions
    (2) Increased temperature favours substitution reactions over eliminations
    (3) Increased temperature favours both substitution reactions as well as eliminations reactions to the same extent
    (4) Increased temperature has no effect on the rate of substitution/elimination reactions

94. Which of the following will give $AgNO_3$ test after boiling with KOH ?
    (1) C_6H_5Cl (2) $CH_2 = CHCl$
    (3) $CH_2 = CHCH_2Cl$ (4) All of these

95. Following compounds can be prepared by using suitable reagents. Identify the mismatch

Compounds	Reagents

    (1) [CH_2=CH-CH_2-CH_2-Br] — [CH_2=CH-CH_2-CH_3] + NBS

    (2) $CH_3\overset{CH_3}{\underset{Cl}{\underset{|}{\overset{|}{C}}}}-CHCH_3$ — $CH_3\overset{CH_3}{\underset{OHCH_3}{\underset{|}{\overset{|}{C}}}}-CHCH_3 + HCl$

    (3) CH_3CH_2Br — CH_3CH_2OH and PBr_3

    (4) $CH_3\overset{CH_3}{\underset{|}{\overset{|}{C}}H}-F$ — $CH_3\overset{CH_3}{\underset{|}{\overset{|}{C}}H}-Cl$ and AgF

96. Consider the following reaction.

    i. $(CH_3)_3CBr \xrightarrow[EtOH]{EtO^-Na^+}$

    ii. $(CH_3)_3CBr \xrightarrow{Pure\ EtOH}$

    Which of the following statements is true regarding these reactions?
    (1) both give the same major product
    (2) the products in both are isomers of each other
    (3) major product in (i) is formed by SN reaction
    (4) the major product in (ii) is an ether

97. When the concentration of alkyl halide is tripled and concentration of OH^- is reduced to half, the rate of SN_1 reaction increased by
    (1) 3 times   (2) 2.5 times
    (3) 2 times   (4) 6 times

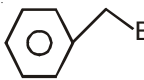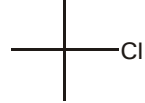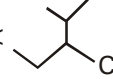98. 1-phenyl 2-chloropropane on reaction with alc. KOH gives mainly
    (1) 1-phenyl propene
    (2) 3-phenyl propene
    (3) 1-phenyl propanol-2
    (4) 1-phenyl propanol-1

99. **Statement I** : In Finkelstein reaction, the reagent used is NaI/acetone and it is SN_1 reaction.
    Statement II: The byproducts NaCl or NaBr formed are highly soluble in acetone and so it is a reversible reaction
    (1) Statement I is correct and Statement II is incorrect
    (2) Statement I is incorrect and Statement II is correct
    (3) Both Statements are correct
    (4) Both Statements are incorrect

100. Match the Column-I with Column II

Column I	Column II
a. $CH_3-Br > CH_3-Cl$	i. E–I
b. [benzyl-Br] > [Br-CH_2CH_3]	ii. SN_1
c. [CH_3-CO-CH_2-Cl] < [(CH_3)_3C-Cl]	iii. SN_2
d. [(CH_3)_3C-CH_2-Cl] < [(CH_3)_2CH-CH(CH_3)-Cl]	iv. E-2

    (1) a–(ii),(iii); b–(ii),(iv);c–(i),(ii),(iii); d–(i),(ii),(iii), (iv)
    (2) a–(iii); b–(ii); c–(i), (ii),(iv); d–(ii), (iii)
    (3) a–(ii), (iii); b–(ii),(iii); c–(i),(ii),(iv); d–(i),(ii),(iii),(iv)
    (4) a–(iii), (iv); b–(ii),(iii); c–(iv); d–(ii),(iv)

ZOOLOGY : SECTION-A

All questions are compulsory in section A

101. Conversion of milk to curd improves its nutritional value by increasing the amount of
    (1) Vitamin D   (2) Vitamin A
    (3) Vitamin E   (4) Vitamin B_{12}

102. How many of the following are benefits of using biogas?

    Manure, lighting, cooking, storable form of energy, chances of spread of pathogens
    (1) Four   (2) Three
    (3) Two   (4) One

103. Read the following statements and choose the set of correct statements
    a. Biochemical oxygen demand is direct measure of organic matter present in water
    b. Activated sludge contains large number of anaerobes settled down in setting tank
    c. The effluent from primary treatment plant is generally released into natural water bodies
    d. Anaerobes digest bacteria and fungi present in activated sludge
    e. BOD of water is directly propotional to polluting potential of water
    (1) a,b, and c only   (2) d and e only
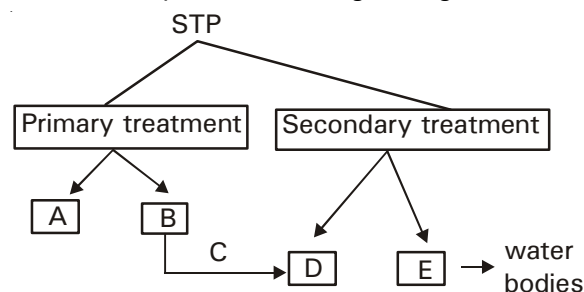   (3) a, d and e only   (4) c and e only

104. Fill in the blanks and choose the correct option
    Alexander Fleming while working on _____ observed a _____ growing in one of his _____ culture plates
    (1) *Streptococcus*, fungi, unwashed
    (2) *Staphylococcus*, mould, unwashed
    (3) *Pencillium*, penicillin, washed
    (4) *Staphylococcus*, fungi, washed

105. The most common substrate used in distilleries for the production of ethanol is
    (1) Molasses   (2) Corn meal
    (3) Soya meal   (4) Ground gram

106. If A, B, D and E are tanks related to STP. Identify the correct option related to given figure

    ```
                    STP
                   /    \
        Primary treatment   Secondary treatment
           /    \              /        \
         [A]   [B]          [D]        [E] → water
                 \___C___→                    bodies
    ```
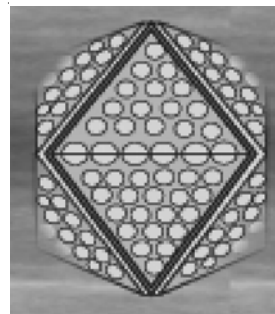
    (1) B = removal of floating debris
    (2) C = primary sludge passes from tank B to D
    (3) D = air is constantly pumped
    (4) E = formation of flocs

107. Methanogens are present in
    (1) Anaerobic sludge
    (2) Rumen of cattle
    (3) Cow dung
    (4) All of these

108. Choose a correct statement about the organism shown below :

    (1) It is a bacteriophage that can be used as a cloning vector
    (2) it is *Adenovirus*
    (3) It causes respiratory infections
    (4) Both (2) &(3)

109. **Statement-A** : For more than a hundred years, microbes are being used to treat waste water by process of activated sludge formation & this helps in recycling of water in nature

    Statement-B : Microbes play important role in treating millions of gallons of waste water everyday across the globe
    (1) Both statements A & B are correct
    (2) Both statements A & B are incorrect
    (3) Only statement A is correct
    (4) Only statement B is correct

110. Biochemical oxygen demand (BOD) may not be a good index for pollution for water bodies receiving effluents from
    (1) sugar industry   (2) domestic sewage
    (3) dairy industry   (4) petroleum industry

111. Read the statements carefully & identify them as true (T) or false (F)
    a. Large amount of CO_2 released by *Propionibacterium* is responsible for large holes present in swiss cheese
    b. Lipases are used to remove oily stains from the laundary
    c. Cyclosporin A, an Immunosuppressive agent is obtained from Fungus
   (1) a-T, b-F, c-T   (2) a-F, b-T, c-F
    (3) a-T, b-T, c-F   (4) a-T, b-T, c-T

112. **Statement-I** Availability of oxygen is must for formation and maintenance of flocs
Statement-II Anoxic conditions will lead to breaking of flocs and death of aerobic microbes
(1) Both statements I & II are correct
(2) Both statements I & II are incorrect
(3) Statements I is correct but statement II is incorrect
(4) Statements I is incorrect but statement II is correct

113. Choose the incorrect pair:

	Product	Source / Character
(1)	Curd	*Lactobacillus*
(2)	Swiss cheese	*Saccharomyces cerevisae*
(3)	Toddy	**Fermentation product from palm sap**
(4)	Roquefort cheese	**Ripened by a specific fungi**

114. Biological control of pests is aimed at
a. preserving variety in a landscape for higher sustainability
b. reducing the dependence on toxic chemicals & pesticides
c. complete eradication of predatory insects from the agricultural field
d. keeping insect population at a manageable level by a complex system of checks & balances within a living & vibrant ecosystem
(1) a, b, c & d   (2) a, b & c
(3) a, b & d   (4) b & c

115. Which of the following statement is incorrect ?
(1) Microbes are used to ferment fish, soyabean & bamboo shoots
(2) Bottled fruit juices are clarified by the use of pectinases & proteases
(3) Statins are produced by *Monascus purpureus* bacteria to lower blood chloesterol
(4) Cyclosporin A can be given to the patients of kidney transplantation

116. Which one of the following alcoholic drinks is produced without distillation?
(1) Wine   (2) Whisky
(3) Rum   (4) Brandy

117. Read following statements regarding STP
a. Involves physical removal of particles large and small from sewage
b. Primary effluent is constantly agitated mechanically and air is pumped into it
Statements above are related to
(1) a−1° treatment, b−cause breakage of flocs
(2) a−2° treatment, b−causes breakage of flocs
(3) a−1° treatment, b−causes formation of flocs
(4) a−2° treatment, b−causes formation of flocs

118. How many of the folloiwng statements are correct?
a. In fermentation of dough, cheese making and in production of beverages, the main gas produced is CO_2
b. Biogas produced by microbes is used as a source of energy
c. Biogas is a mixture of different gases produced by breakdown of organic matter in the presence of oxygen
d. The technoglogy of biogas production was developed in India mainly by efforts of Indian Army Research Institute and Khadi & Village Industries commission
e. The biogas plant consists of a concrete tank in which bio-wastes are collected and a slurry of dung is fed.
(1) One   (2) Two
(3) Three   (4) Four

119. How many of the following household products can be produced by fermentative activity of microbes?
Idli, Cheese, Dosa, Toddy, Antibiotics, Curd, Bread
(1) Four   (2) Three
(3) Five   (4) Six

120. Which of the following statements are applicable to mycorrhizae?
(1) Algae form symbiotic association with roots of higher plants
(2) Fungal symbiont in these associations absorb only calcium from soil and passes it to plants
(3) Many members of genus *Glomus* form this association
(4) This association reduces resistance to root borne pathogens

121. Acid producing bacteria among the following are
a. *Acetobacter aceti*
b. *Lactobacillus*
c. *Saccharomyces cerevisae*
d. *Aspergillus niger*
e. *Clostridium butylicum*
(1) a, b, d, e   (2) c, d
(3) a, b, e   (4) d only

122. What are A-D respectively in the given diagram?
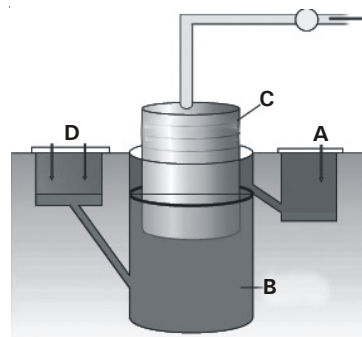
(1) sludge, digester, gas holder, dung & water
(2) digester, sludge, gas holder, dung & water
(3) dung & water, digester, sludge, gas holder
(4) gas holder, digester, sludge, dung & water

123. How many of the following products are obtained from fungi?

Ethanol, Butyric acid, Statins, Citric acid, Toddy, Penicillin, Streptokinase, Cyclosporin A

(1) 4   (2) 5
(3) 6   (4) 7

124. **Statement-A** : Farmers use commercially available biofertilizers to replenish soil nutrients

Statement-B : Main source of microbial biofertilizers belong to kingdoms Monera, Fungi & Protista

(1) Both statements A & B are correct

(2) Both statements A & B are incorrect

(3) Only statement A is correct

(4) Only statement B is correct

125. Which of the following is false statement?

(1) BOD refers to the amount of the oxygen that would be consumed if all the organic matter in 1 litre of water were oxidised by bacteria

(2) Flocs are masses of bacteria associated with fungal filaments to form mesh like structures

(3) Floating debris is removed by sequential filteration whereas soil and pebbles are removed by sedimentation

(4) Biogas is a mixture of CH_4, O_2, H_2 and H_2S.

126.
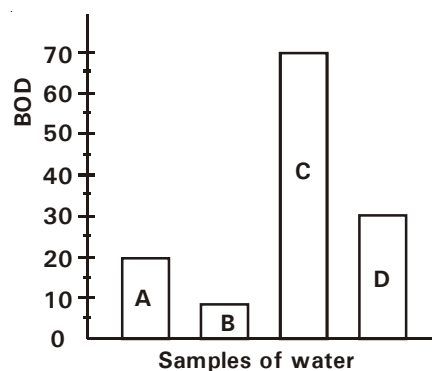
BOD of four water samples is taken. The samples were labelled A, B, C and D. What according to you is the most polluted sample of water and which sample of water is safest to discharge into river?

(1) A & B respectively
(2) C & D respectively
(3) B & C respectively
(4) C & B respectively

127. Which of the folloiwng statement is not true regarding antibiotics?

(1) Fleming, Chain and Florey were awarded Noble prize in 1945 w.r.t antibiotic penicillin

(2) Antibiotics should be harmless to the natural microflora in alimentary canal

(3) Antibiotics are greatly effective to control diseases like galghotu, chicken pox and pneumonia

(4) Antibiotics are pro life for humans and against life in context to microbes

128. Which of the following is not true about biocontrol of pests?

(1) Dragonflies are useful to get rid of aphids and mosquitoes

(2) *Trichoderma* are free living fungi that are common in the shoot ecosystems

(3) Baculoviruses have narrow spectrum insecticidal applications

(4) Both (1) and (2)

129. Which one single organisms or the pair of organisms is correctly assigned to its or their named taxonomic group?

(1) *Nostoc* and *Anabaena* are examples of protista

(2) *Penicillium* belongs to the same kingdom as that of *Paramecium* and *Plasmodium*

(3) *Rhizobium*, *Azotobacter* and *Oscillatoria* are examples of free living cyanobacteria

(4) Yeast used in making bread and beer belongs to same kingdom as that of *Trichoderma*

130. Which of the following statement is incorrect?

(1) Depending on the type of raw material used for fermentation and the type of processing, different types of alcoholic drinks are obtained

(2) Statins lower blood cholesterol by competitive inhibition

(3) Ganga Action Plan and Yamuna Action Plan were initiated by Ministry of Environment and forests

(4) Super bug is a genetically modified insect having multiple plasmids and is used for clearing oil spills

131. During fermentation process, there is frequent addition of fresh medium that is exactly balanced by removal of used up medium. Which are the correct features of this process?

a. It is a batch process
b. Population is maintained in log phase
c. It is a continuous process
d. It is a fed batch process
e. Population is maintained in lag phase

(1) a and e   (2) b and c
(3) b and d   (4) c and e

132. Match List-I with List-II

	List-I		List-II
a.	Swiss cheese	(i)	*Saccharomyces cerevisiae*
b.	Curdling of milk	(ii)	*Penicillium*
c.	Brewer's yeast	(iii)	*Propionibacterium sharmani*
d.	Camembert cheese	(iv)	Fruit extract of *Withania coagulans*

Choose the correct answer from the options given below

(1) a–(iv),b–(iii),c–(i),d–(ii)
(2) a–(iii),b–(iv),c–(ii),d–(i)
(3) a–(ii),b–(iii),c–(iv),d–(i)
(4) a–(iii),b–(iv),c–(i),d–(ii)

133. Amongst the following, what would be the 3rd event used during sewage treatment ?
(1) Activated sludge formed
(2) Sludge is taken to anaerobic sludge digester
(3) Primary effluent is transferred to next tank for secondary treatment
(4) Methane formation

134. Which of the following set of microbes play a role in biocontrol agents ?
(1) *Bacillus thuringiensis* and Dragonfly
(2) *Cactoblastis* and *Nucleopolyhedrovirus*
(3) *Bacillus thuringiensis* and Baculovirus
(4) All of above

135. **Assertion**: Yeast cannot reproduce when the concentration of alcohol level is high.
Reason: Yeast poison themselves to death when the concentration of substrate reaches about 13 percent.
(1) Assertion is false
(2) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(3) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(4) Assertion is true statement but Reason is false

ZOOLOGY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

136. Which of the following is incorrect regarding microbes?
(1) They are present even at sites where no other life-form could possibly exist
(2) Many fungi can be grown on nutritive media to form colonies, that can not be seen with naked eye
(3) Microbes are major components of biological system on this earth
(4) All the microbes are not harmful

137. Study the following illustration of biogas from cowdung & correctly identify A, B & C respectively
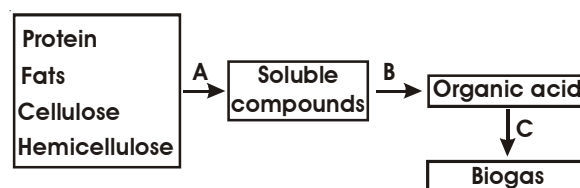
(1) Methanogenic bacteria, decomposer microbes & fermentative microbes
(2) Methanogenic bacteria, fermentative microbes & decomposer microbes
(3) Fermentative mibrobes, decomposer microbes & methanogenic microbes
(4) Decomposer microbes, fermentative microbes, methanogenic bacteria

138. Given below are the steps taken to make sewage less polluting. Arrange them in sequence as they occur in STPs.
a. Formation of flocs
b. Sequential filteration
c. sedimentation
d. Anaerobic digestion
e. Aerobic digestion.

(1) b–c–a–d–e   (2) b–c–a–e–d
(3) c–b–d–a–e   (4) a–b–c–d–e

139. How many of the following statement(s) is/ are incorrect?
a. Biocontrol helps in ecosystem stabilization
b. Baculoviruses are pathogens which attack insect & other arthropods
c. Narrow spectrum biocontrol agents can be recommended to treat an ecologically sensitive areas
d. Bt plants are resistant to attack by insect pests
e. In biocontrol measures only microbes are used to control plant diseases and pests

(1) One   (2) Three
(3) Four   (4) Five

140. Cyanobacteria are
    a. aerobic microbes
    b. anaerobic microbes
    c. heterotrophic microbes
    d. autotrophic microbes
    (1) a & b   (2) a & c
    (3) b & c   (4) a & d

141. Blue green algae are not popular as biofertilisers because they
    (1) are very slow acting
    (2) produce copious mucilage making fields slippery
    (3) are anaerobic
    (4) change water holding capaicty of soil

142. Yeast used for fermenting malted cereals & fruit juices to obtain ethanol is
    (1) Brewer's yeast
    (2) *Monascus purpureus*
    (3) *Trichoderma*
    (4) *Aspergillus*

143. Which statement is not correct?
    (1) Cyanobacteria are widely distributed in aquatic and terrestrial environment.
    (2) In paddy fields, cyanobacteria serve as an important biofertilizer.
    (3) BGA add organic matter to soil and increase its fertility
    (4) Biofertilizers are regularly used by farmers but these are not commercially available in market

144. Which of the following is put into anaerobic sludge digester for further sewage treatment?
    (1) Floating debris
    (2) Effluents of primary treatment
    (3) Activated sludge
    (4) Primary sludge

145. When large amount of sewage is drained into a river, mortality of fishes and other aquatic creatures increases due to
    (1) slight decrease in BOD
    (2) sharp decline in dissolved oxygen
    (3) slight increase in dissolved CO_2
    (4) decrease in aerobic heterotrophic microbes

146. Which among the following is incorrect matching set?
    (1) Prions– infectious proteinaceous structures
    (2) LAB – produce acids which completely digest milk protein during curd formation
    (3) Viruses – inert crystalline structures
    (4) Dosa and Idli– fermented by bacteria

147. Read the statements and mark the correct answer
    (a) More the diversity of plants a landscape shows more sustainable it is
    (b) IPM uses broad spectrum insecticidal application to increase sustainability of agriculture
    (1) a is correct, b is incorrect
    (2) a is incorrect, b is correct
    (3) both a and b are correct
    (4) both a and b are incorrect

148. Biofertilizers are organisms that enrich the nutrient quality of the soil. Match the source of biofertilizer with its examples
	Column-I		Column-II
a.	Symbiotic bacteria	i.	*Azospirillium*
b.	Free living bacteria	ii.	*Rhizobium*
c.	Fungi	iii.	*Nostoc*
d.	Cyanobacteria	iv.	*Glomus*
    (1) a–ii, b–i, c–iv, d–iii (2) a–i, b–ii, c–iii, d–iv
    (3) a–ii, b–iv, c–iii, d–i (4) a–ii, b–iv, c–i, d–iii

149. **Assertion**: Streptokinase produced by *Streptococcus* bacteria and modified by Genetic Engineering is used as a clot buster.
    Reason: Streptokinase can be given to the patients of myocardial infarction.
    (1) Assertion is true statement but Reason is false
    (2) Assertion is false
    (3) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (4) Both Assertion and Reason are true and the reason is the correct explanation of the assertion

150. Select the correct group of biocontrol agents.
    (1) *Bacillus thuringiensis,* Tobacco mosaic virus, Aphids
    (2) *Trichoderma, Baculovirus, Bacillus thuringiensis*
    (3) *Oscillatoria, Rhizobium, Trichoderma*
    (4) *Nostoc, Azospirillium, Nucleopolyhedrovirus*

BOTANY : SECTION-A

All questions are compulsory in section A

151. A virus can be made radioactive by
    (1) culturing the viruses in a medium of P^{32}
    (2) culturing the viruses on a medium of potato, dextrose and P^{32}
    (3) providing P^{32} to viruses when they are about to attack the bacteria
    (4) providing P^{32} to a bacterium which has been infected by virus

152. If the length of a DNA molecule is 2.2 metres, what will be the approximate number of nucleosomes ?
    (1) 3.3×10^7 (2) 6.6×10^9
    (3) 3.3×10^6 (4) 6.6×10^7

153. What chemical groups are at the end of polynucleotide chain?
    (1) 3' OH (hydroxyl) at one end and 5'–P at other end
    (2) Sugar at one end and PO_4 at other end
    (3) A at one end and G at other end
    (4) There is a great variation in the arrangement

154. **Statement 1**: In *E.coli*, the DNA in nucleoid is organised in large loops held by proteins
    Statement 2: There is a set of positively charged proteins called histones present in *E.coli*.
    (1) Statement I is correct and Statement II is incorrect
    (2) Statement I is incorrect and Statement II is correct
    (3) Both Statements are correct
    (4) Both Statements are incorrect

155. How many base pairs of DNA nucleotides are present in a nucleosome?
    (1) 300   (2) 150
    (3) 200   (4) 350

156. Ten *E.coli* cells with ^{15}N–dsDNA are incubated in medium containing ^{14}N nucleotide. After 60 minutes, how many *E.coli* cells will have DNA totally free from ^{15}N ?
    (1) 20 cells   (2) 40 cells
    (3) 60 cells   (4) 80 cells

157. If the sequence of nitrogen bases in one strand of DNA is 5' - ATGAATG - 3' then the sequence of bases in its complementary strand would be
    (1) 5' - ATCTTAC - 3'   (2) 3' - AUGAAUG - 5'
    (3) 3' - TACTTAC - 5'   (4) 5' - TACTTAC - 3'

158. Match Column I with Column II & Choose correct option.

Column I		Column II	
a.	Griffith experiment	(i)	1933-44
b.	Watson & Crick's DNA model	(ii)	1928
c.	Meselson & Stahl experiment	(iii)	1953
d.	Avery, Mcleod, McCarty experiment	(iv)	1958

    (1) (a)–ii; (b)–iii; (c)–iv; (d)–i
    (2) (a)–i; (b)–iii; (c)–iv; (d)-ii
    (3) (a)–iv; (b)–iii; (c)–ii; (d)–i
    (4) (a)–ii; (b)–i; (c)–iii; (d)-iv

159. How many statements are correct?
    a. RNA digesting enzyme did not affect transformation
    b. S-strain of *Streptococcus* bacteria does not have mucous coat
    c. R-strain of *Streptococcus* bacteria do not develop pneumonia in mice
    d. Radioactive phosphorus and radioactive nitrogen are used in Hershey and Chase experiment
    (1) two   (2) three
    (3) four   (4) one

160. The number of 3'–5' phosphodiester linkages & phosphoester bonds respectively in a ds DNA molecule having 200 base pairs is
    (1) 200, 400   (2) 400, 400
    (3) 398, 400   (4) 400, 398

161. Four samples of ds DNA are analysed and the following information is obtained
    (i)   sample 1   :   35% thymine
    (ii) sample 2   :   15% guanine
    (iii) sample 3   :   30% adenine
    (iv) sample 4   :   40% cytosine
    Which of these samples represent DNA from the same source?
    (1) i and ii   (2) ii and iii
    (3) iii and iv   (4) i and iv

162. If *E.coli* with heavy DNA was allowed to grow in light nitrogen for 100 minutes then what would be the proportions of light and hybrid densities of DNA molecules?
    (1) 7:1   (2) 1:1
    (3) 15:1   (4) 31:1

163. The number of hydrogen bonds in the DNA molecule of 150 base pairs having 50 AT pairs would be
    (1) 300   (2) 150
    (3) 390   (4) 400

164. If a DNA sample has 48% adenine 12% guanine, 30% cytosine & 10% thymine, it could belong to
    (1) a diploid cell
    (2) a haploid cell
    (3) a virus such as lambda phage
    (4) a virus such as coliphage $\phi \times 174$

165. The distance between the two strands is almost constant because
    (1) purine of one strand is opposite the pyrimidine of the other strand
    (2) pairing is always between double ringed purines and single ringed pyrimidines
    (3) the two strands are coiled in a right handed fashion
    (4) both (1) and (2)

166. In a DNA segment of 1000 base pairs of *E.coli*, number of glycosidic bonds, spirals and nucleosomes present will be respectively
    (1) 999, 100, 5
    (2) 2000, 100, 0
    (3) 2000, 200, 20
    (4) 500, 10, 200

167. Read the following statements and choose the set of incorrect statement
    a. Euchromatin is loosely packed chromatin
    b. Heterochromatin is transcriptionally active
    c. Histone octamer is wrapped by negatively charged DNA in nucleosome
    d. Histones are rich in lysine and arginine
    e. A typical nucleosome contains 400 bp of DNA helix
    (1) (b), (d), (e) Only
    (2) (a), (c), (d) Only
    (3) (b), (e) Only
    (4) (a), (c), (e) Only

168. In a DNA molecule, the nitrogenous base is linked to the pentose sugar through .... linkage and a phosphate group is linked to its own sugar through .... linkage.
    (1) peptide and phosphodiester
    (2) N-glycosidic and phospodiester
    (3) N-glycosidic and phosphoester
    (4) ester and phosphoester

169. What will be the number of nucleotides if DNA has 5.4×10^7 base pairs?
    (1) 5.4×10^8
    (2) 2.7×10^7
    (3) 10.8×10^7
    (4) 5400

170. DNA is a polymer of nucleotides which are linked to each other by 3'-5' phosphodiester bond. To prevent polymerisation of nucleotides, which of the following modifications would you choose?
    (1) Replace purine with pyrimidines
    (2) Remove/Replace 3' OH group in deoxy ribose
    (3) Remove/Replace 2' OH group with some other group in deoxy ribose
    (4) Both (2) and (3)

171. The net charge on DNA and histones respectively is
    (1) both positive
    (2) both negative
   (3) negative and positive
    (4) positive and negative

172. Who did not contribute in the development of the double helix model for structure of DNA?
    (1) Rosalind Franklin
    (2) Maurice Wilkins
    (3) Erwin Chargaff
    (4) Meselson

173. Which of the following statement is correct w.r.t double helical structure of DNA ?
    (1) DNA is made up of 2 polynucleotide chains
    (2) Pitch of B– DNA molecule is 20 A°
    (3) Width of DNA is 34 A°
    (4) Backbone of molecule is made of projecting nitrogeneous bases

174. Study the following diagram carefully and label a, b, c, d and e respectively
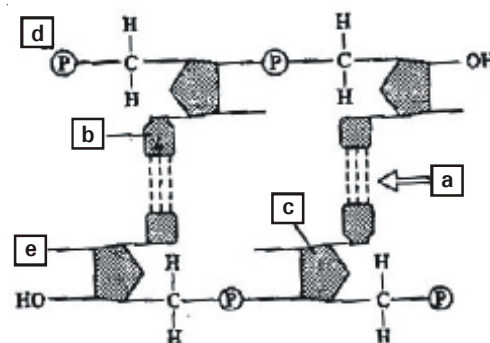
    (1) Glycosidic bond, N-base, ribose sugar, 5'-P, 3'-OH group
    (2) Hydrogen bond, N–base, deoxyribose sugar, 5'-P, 3'-OH group
    (3) Hydrogen bond, N–base, ribose sugar, 5'-P, 2'-OH group
    (4) Hydrogen bond, N–base, deoxyribose sugar, 5'-P, 2'-H group

175. **Statement I**: RNA being a catalyst was reactive and hence unstable.
    Statement II: DNA has evolved from RNA with chemical modifications that make it more stable.
    (1) Statement I is correct and Statement II is incorrect
    (2) Statement I is incorrect and Statement II is correct
   (3) Both Statements are correct
    (4) Both Statements are incorrect

176. Ratio that is constant for a species is
    (1) $\dfrac{A + T}{G + C}$
    (2) $\dfrac{A + G}{T + C}$
    (3) $\dfrac{A + C}{G + T}$
    (4) Both (1) and (3)

177. What is correct w.r.t. the melting temperature (Tm) of DNA segment 'a' and 'b'?

A A T T T C G A C T   A A C C C C G A C T

T T A A A G C T G A   T T G G G G C T G A

      (a)   (b)
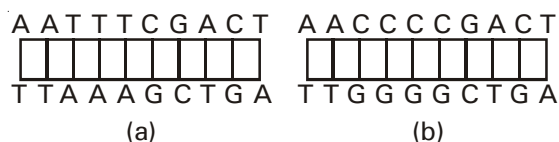
(1) segment 'a' will have high Tm
(2) segment 'b' will have high Tm
(3) segment 'b' will have low Tm
(4) both have same Tm

178. Which property of DNA plays a role in its replication?
(1) Complementary nature of two strands
(2) Antiparallal nature of two strands
(3) Easy denaturation & renaturation
(4) High degree of stability due to presence of thymine & deoxyribose sugar

179. Refer the given figure of nucleosome and select the option that correctly identifies the parts A, B, C
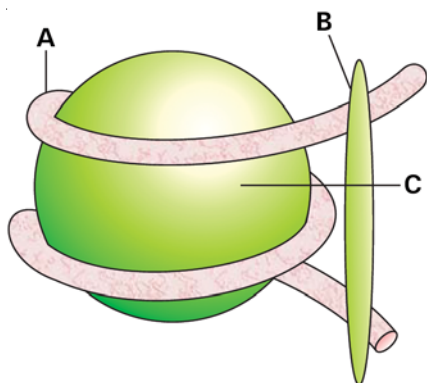
(1) A–Histone octamer,B–DNA, C–H_1 histone
(2) A–DNA, B–Histone octamer, C–H_1 histone
(3) A–Histone octamer, B–H_1 histone, C–DNA
(4) A–DNA, B–H_1 histone, C–Histone octamer

180. What is the correct sequence of packaging in a plant cell ?
(1) Nucleosome $\rightarrow$ chromosome $\rightarrow$ solenoid $\rightarrow$ chromatin fibre
(2) Nucleosome $\rightarrow$ solenoid $\rightarrow$ chromatin fibre $\rightarrow$ chromosome
(3) Solenoid $\rightarrow$ nucleosome $\rightarrow$ chromosome $\rightarrow$ chromatin fibre
(4) Nucleosome $\rightarrow$ chromatin fibre $\rightarrow$ solenoid $\rightarrow$ chromosome

181. In Solenoid fibre how many nucleosomes will be present in three turns ?
(1) 18   (2) 6
(3) 12   (4) 24

182. Though "nuclein" was isolated by Meischer in 1869, yet elucidation of structure of DNA remained elusive for almost a century
(1) as DNA was a very complex molecule
(2) because there was technical limitation in its intact isolation
(3) as X-ray diffraction technique was not yet developed
(4) because DNA is located inside nucleus & cannot be extracted without an electron microscope

183. 'Beads on string' appearance of DNA can be observed after
(1) first level of coiling
(2) second level of coiling
(3) third level of coiling
(4) fourth level of coiling

184. Which statement is not according to Watson and Crick model?
(1) Adenine pairs with thymine and guanine pairs with cytosine
(2) The double helix is 2 nm in diameter
(3) The plane of one base pair stacks over the other
(4) If the sequence of bases in one strand is known then the sequence in other strand can not be predicted

185. DNA is more stable as compared to RNA because of
a. its double stranded nature
b. presence of thymine instead of uracil
c. 3' OH ribose sugar
(1) a, b and c   (2) a and b
(3) a and c   (4) b and c

BOTANY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

186. If the percentage of A in human sperm DNA is 40%, what is percentage of T in a kidney cell?
(1) 20%   (2) 80%
(3) 40%   (4) 30%

187. **Statement I**: Biochemical characterisation of genetic material was done by Griffith
Statement II: Thermostable nature of genetic material became clear in Hershey & Chase experiment
(1) Statement I is correct but statement II si wrong
(2) Statement I is incorrect but statement II is correct
(3) Both Statement I & II are correct
(4) Both statement I & II are incorrect

188. **Assertion** : Watson & Crick suggested that base paring between two strands and complementary nature of DNA strands has possible role in copying mechanism of DNA

    Reason: Semi conservative mode of DNA replication was proved by Meselson & Stahl

    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion

    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion

    (3) Assertion is true statement but Reason is false

    (4) Assertion is false

189. RNA is genetic material in

    (1) *E. Coli*

    (2) QB bacteriophage

    (3) Tobacco mosaic virus

    (4) Both (2) & (3)

190. The pitch of DNA helix and distance between base pair respectively is

    (1) 3.4 nm, 0.034 nm
    (2) 34 $\overset{o}{A}$, 0.34 $\overset{o}{A}$
    (3) 34 $\overset{o}{A}$, 0.34 nm
    (4) 3.4 nm, 0.4 $\overset{o}{A}$

191. Which of the following is not involved in formation of a deoxyribonucleotide chain ?

    (1) N-glycosidic bond
    (2) Phosphoester bond
    (3) H-bond
    (4) All are involved

192. **Assertion** : Corona virus have a shorter life span, it mutate and evolve faster.

    Reason : Genetic material of Corona virus is RNA

    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion

    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion

    (3) Assertion is true statement but Reason is false

    (4) Assertion is false

193. Thymine is also known as

    (1) 5-methyl uracil
    (2) 3-methyl uracil
    (3) uracil
    (4) 5-methyl cytosine

194. If *E. coli* has 4.6×10^6 bp in DNA molecule, then what will be the length of DNA?

    (1) 1.1 mm
    (2) 1.56 mm
    (3) 2.2 mm
    (4) 1.36 m

195. How many of the following statements are correct?

    a. Thymine is common for both DNA and RNA and Cytosine is present only in DNA.

    b. The packaging of chromatin at higher level requires additional set of proteins that are collectively are referred to as NHC proteins

    c. The biochemical nature of genetic material was defined from transformation experiment

    d. DNA can express itself in the form of Mendalian characters

    e. In HIV , RNA is genetic material and DNA perform additional functions like messenger, structural and catalytic role

    (1) a, b and c
    (2) b and d
    (3) a, b, c and d
    (4) b , d and e

196. Steps involved in Experiment performed by Hershey and Chase in sequence were

    (1) Infection - Blending - Centrifugation
    (2) Blending - Infection - Centrifugation
    (3) Centrifugation - Infection - Blending
    (4) Blending - Centrifugation - Infection

197. If *Streptococcus penumoniae* is grown in the culture medium and produce shiny colonies it means it is

    (1) S-type
    (2) Having polysaccharide coat (capsule)
    (3) R-type
    (4) Both (1) & (2)

198. Which of the following is not characteristic of the genetic material?

    (1) Able to generate its replica
    (2) Chemically and structurally stable
    (3) Able to express itself
    (4) Scope for fast changes

199. Which of the following is incorrectly matched?

    (1) Meischer–Nuclein
    (2) Altman –Nucleic acid
    (3) Wilkins–X-ray diffraction studies on DNA
    (4) Griffith–Transduction experiment

200. A DNA molecule in *E. coli* is heavy and labelled with N^{15}. It is allowed to replicate in a medium containing N^{14}. After one generation of replication, the two daughter molecules

    (1) will be similar in density but differ from that of parent DNA

    (2) differ in density from each other, as well as from that of the parent DNA

    (3) same density as that of parent DNA

    (4) differ in density but resemble the parent DNA

Dated : 23-07-2022

M.L. Syal's Helix Institute
S.C.O. 343-345, Top Floor, Sector 34-A, Chandigarh. Ph : 0172-2623155

Code-A

XII cum Competition Course for Medical – Test - 7

1.	(1)	51.	(3)	101.	(4)	151.	(4)
2.	(3)	52.	(2)	102.	(2)	152.	(1)
3.	(1)	53.	(1)	103.	(2)	153.	(1)
4.	(2)	54.	(3)	104.	(2)	154.	(1)
5.	(2)	55.	(2)	105.	(1)	155.	(3)
6.	(4)	56.	(3)	106.	(3)	156.	(3)
7.	(2)	57.	(4)	107.	(4)	157.	(3)
8.	(1)	58.	(4)	108.	(4)	158.	(1)
9.	(1)	59.	(1)	109.	(1)	159.	(1)
10.	(2)	60.	(3)	110.	(4)	160.	(3)
11.	(3)	61.	(2)	111.	(4)	161.	(1)
12.	(1)	62.	(3)	112.	(1)	162.	(3)
13.	(1)	63.	(2)	113.	(2)	163.	(4)
14.	(3)	64.	(3)	114.	(3)	164.	(4)
15.	(4)	65.	(4)	115.	(3)	165.	(4)
16.	(2)	66.	(3)	116.	(1)	166.	(2)
17.	(1)	67.	(4)	117.	(3)	167.	(3)
18.	(1)	68.	(1)	118.	(3)	168.	(3)
19.	(3)	69.	(4)	119.	(4)	169.	(3)
20.	(3)	70.	(1)	120.	(3)	170.	(2)
21.	(4)	71.	(2)	121.	(3)	171.	(3)
22.	(3)	72.	(2)	122.	(1)	172.	(4)
23.	(1)	73.	(4)	**123. (3)g**		173.	(1)
24.	(3)	74.	(3)	124.	(3)	174.	(4)
25.	(2)	75.	(4)	125.	(4)	175.	(3)
26.	(2)	76.	(3)	126.	(4)	176.	(1)
27.	(3)	77.	(1)	127.	(3)	177.	(2)
28.	(1)	78.	(3)	128.	(4)	178.	(1)
29.	(2)	79.	(1)	129.	(4)	179.	(4)
30.	(3)	80.	(3)	130.	(4)	**180. (4)g**	
31.	(1)	81.	(2)	131.	(2)	181.	(1)
32.	(3)	82.	(2)	132.	(4)	182.	(2)
33.	(3)	83.	(2)	133.	(2)	183.	(1)
34.	(3)	84.	(1)	134.	(3)	184.	(4)
35.	(4)	85.	(3)	135.	(4)	185.	(2)
36.	(2)	86.	(3)	136.	(2)	186.	(3)
37.	(4)	87.	(4)	137.	(4)	187.	(4)
38.	(3)	88.	(1)	138.	(2)	188.	(2)
39.	(2)	89.	(1)	139.	(1)	189.	(4)
40.	(4)	90.	(4)	140.	(4)	190.	(3)
41.	(4)	91.	(1)	141.	(2)	191.	(3)
42.	(4)	92.	(3)	142.	(1)	192.	(1)
43.	(4)	93.	(1)	143.	(4)	193.	(1)
44.	(4)	94.	(3)	144.	(3)	194.	(2)
45.	(2)	95.	(1)	145.	(2)	195.	(2)
46.	(2)	96.	(4)	146.	(2)	196.	(1)
47.	(4)	97.	(1)	147.	(1)	197.	(4)
48.	(2)	98.	(1)	148.	(1)	198.	(4)
49.	(3)	99.	(4)	149.	(3)	199.	(4)
50.	(3)	100.	(3)	150.	(2)	200.	(1)

M.L. Syal's Helix Institute

S.C.O. 343-345, Top Floor, Sector 34-A, Chandigarh. Ph : 0172-2623155

XII cum Competition Course for Medical

MM : 720   **Test - 8**   **Time : 3 hrs. 20 minutes**

PHYSICS	:	EMI, AC CIRCUITS AND DEVICES-I
CHEMISTRY	:	ARYL HALIDES, ALCOHOLS AND ETHER
ZOOLOGY	:	ORIGIN OF LIFE, EVIDENCE OF EVOLUTION(I/C PLANT EVOLUTION)
BOTANY	:	MOLECULAR OF BASIS OF INHERTITANCE-II(UPTO TRANSLATION)

PHYSICS : SECTION-A

All questions are compulsory in section A

1. A magnetic field of 1×10^{-2} tesla acts at right angle to a coil of area 100 cm^2 with 200 turns. The average emf induced in the coil is 0.05 V when it is removed from the field in time t. The value of t is
    (1)   0.1 s   (2)   0.3 s
    (3)   0.2 s   (4)   0.4 s

2. A metal rod AB is rotated in a plane normal to the horizontal component of earth's magnetic field at a place about an axis through end A. O is the mid point of the wire. If the induced emf between points A and O of the rod is 2V, induced emf between points O and B is
    (1)   4 V   (2)   6 V
    (3)   12 V   (4)   8 V

3. Eddy currents are produced when
    (1)   a metal is kept in varying magnetic field
    (2)   a metal is kept in a steady magnetic field
    (3)   a circular coil is placed in a magnetic field
    (4)   current is passed through a circular coil

4. What is the emf developed between two rails separated by 1 metre when a train travels with a speed of 180 km/hr along the track. Given that the vertical component of earth's magnetic field is 0.2×10^{-4} weber/m^2.
    (1) 10^{-2} volt   (2) 10^{-4} volt
    (3) 10^{-3} volt   (4)   1 volt

5. Induced emf between point P and Q as shown in figure is
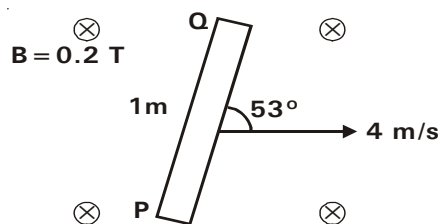
    (1)   0.16 V   (2)   0.64 V
    (3)   0.32 V   (4)   zero

6. A circuit can contain light bulbs B$_1$ and B$_2$ in three different configurations as shown. Assume that the magnetic field shown decreases uniformly with time at the same rate in each case. Rank the circuits for the brightness of the bulb labelled B$_1$ from brightest to dimmest.
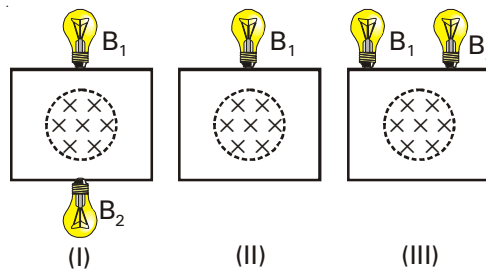
    (1)   III > II > I   (2)   I > II > III
    (3)   II > I = III   (4)   I = III > II

7. The network shown in the figure is part of a complete circuit. If at a certain instant, the current $I = 8A$ and it is decreasing at a rate of 3×10^3 As^{-1} then $V_A - V_B$ equals

A •→──1Ω──ˌwˌwˌ──|⊢──$5\,mH$──ˌooooˌ── • B
   I $+$
           $15\,V$
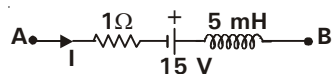
   (1) -22 V   (2) -16 V
   (3) 24 V   (4) -20 V

8. A wire of fixed length is wound on a cylinder of length 'ℓ' and radius 'r'. Its self inductance is found to be L. Now if same wire is wound on a solenoid of length 0.5ℓ and radius 0.5r, then the self inductance will be
   (1) 2L   (2) L
   (3) 4L   (4) 8L

9. Induced electric field is
   (1) conservative
   (2) non-conservative
   (3) produced by static magnetic field
   (4) produced by non-uniform magnetic field

10. What is the coefficient of mutual inductance if the magnetic flux changes by 2×10^{-2} Wb in secondary circuit when change in current in primary circuit is 0.01 A
    (1) 2 henry   (2) 3 henry
    (3) 0.5 henry   (4) Zero

11. Current in a circuit varies with time as $I = 3t$. Then the rms value of the current for the interval $t = 2$ to $t = 4$ s is
    (1) $\sqrt{73}$ A   (2) $\sqrt{84}$ A
    (3) 7 A   (4) 8 A

12.
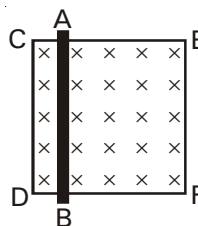
A resistanceless conductor AB moves in a uniform magnetic field on a uniform rectangular loop of resistance R with constant velocity. In moving from CD to EF, current through conductor AB
   (1) first increases & then decreases
   (2) first decreases & then increases
   (3) remains constant
   (4) decreases continuously

13. Which one of the following curves represents the variation of impedance (Z) with frequency (f) in series LCR circuit
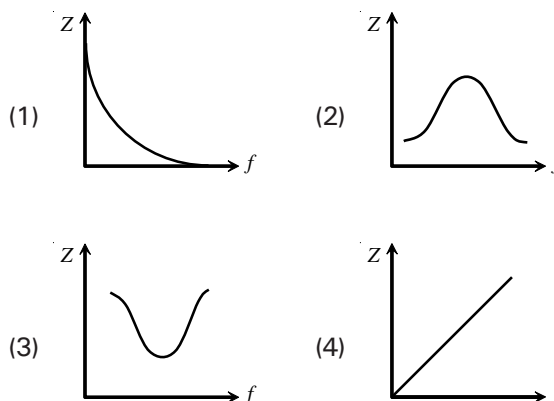
14. **Statement -1 :** Root mean square value of the alternating current is always equal to $\frac{1}{\sqrt{2}}$ times the peak value of current.

Statement-2 : Root mean square value of the alternating current for same peak value depends on frequency of AC.

(1) Both statements are correct

(2) Both statements are incorrect

(3) Statement-1 is correct and 2 is incorrect

(4) Statement-1 is incorrect and 2 is correct

15.
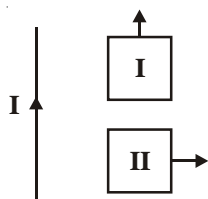
Two loops I and II are placed in a plane close to a infinitely long conductor as shown. Direction of induced current in loop I and II respectively are

(1) no current ; clockwise

(2) anticlockwise ; no current

(3) clockwise ; anticlockwise

(4) anticlockwise ; clockwise

16.
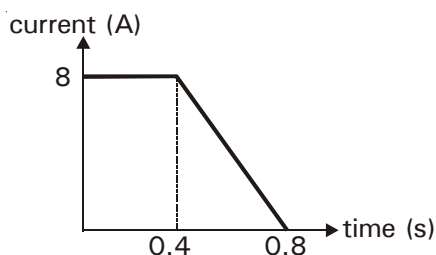
The above figure shows the induced current flowing through a circuit with resistance $10\,\Omega$. The change in flux responsible for this current is

(1) 62 webers   (2) 48 webers

(3) 36 webers   (4) 32 webers

17. An ac source is connected to a resistive circuits. Which of the following is true

(1) Current leads the voltage

(2) Current lags behind the voltage

(3) Current and voltage are in same phase

(4) Any of the above may be true depending upon the value of resistance

18. The resonant frequency of a series LCR circuit with $L = 2$ H, $C = 32\ \mu$F and $R = 10\ \Omega$ is

(1) 150 rad/s   (2) 75 rad/s

(3) 250 rad/s   (4) 125 rad/s

19.
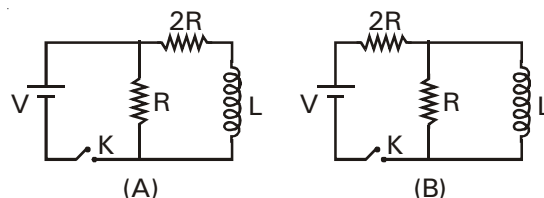
The currents in circuit A and B respectively a long time after closing key K are

(1) $\dfrac{V}{2R}$, $\dfrac{3V}{2R}$ (2) $\dfrac{3V}{2R}$, $\dfrac{V}{3R}$

(3) $\dfrac{3V}{2R}$, $\dfrac{V}{2R}$ (4) 0, 0

20. The current 'i' in an inductance coil varies with time 't' according to following graph
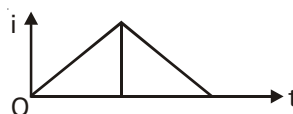
Which one of the following plots shows the variations of voltage in the coil
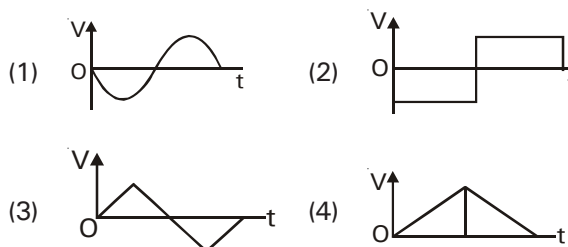
21.
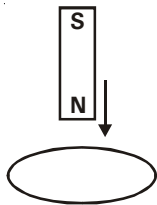
A magnet is dropped above a conducting horizontal fixed ring. As it falls and passes through the ring, induced current in the ring
(1) keeps increasing
(2) keeps decreasing
(3) first increases and then decreases
(4) first increases, then decreases, then increases again and then decreases

22. An inductor with inductance 0.2 henry and resistance $2\,\Omega$ is connected with a 12 volt battery and a $4\,\Omega$ resistor in series. Energy stored in the inductor in steady state is
(1) 0.4 joule
(2) 0.8 joule
(3) 0.2 joule
(4) zero

23.
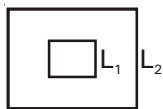
Coefficient of mutual inductance between two given square coils of side L_1 and L_2 as shown is proportional to $(L_2 \gg L_1)$
(1) L_1 / L_2
(2) L_1^2 / L_2
(3) L_1 / L_2^2
(4) $L_1 L_2$

24.
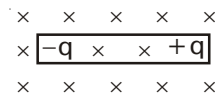
A wire moves through a magnetic field directed into the page. The wire experiences an induced charge separation as shown. Which way is the wire moving?
(1) To the right
(2) Out of the page
(3) Toward the top of the page
(4) Toward the bottom of the page

25. Current in ampere in an ac circuit is given as $I = (8 + 6 \sin \omega t)$. The rms value of this current is
(1) 10 ampere
(2) $3\sqrt{2}$ ampere
(3) $\sqrt{82}$ ampere
(4) $5\sqrt{2}$ ampere
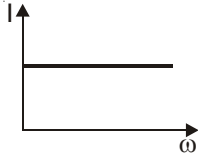
26. An alternating voltage is connected in series with a resistance R and an inductance L. If the potential drop across the resistance is 50 volt and across the inductance is 120 volt, the applied voltage is
(1) 170 volt
(2) 150 volt
(3) 130 volt
(4) 70 volt
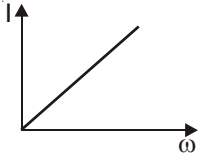
27. A $10\,\Omega$ resistance in an ac circuit in series with an inductance of 0.2 H is connected with an ac supply given by $e = 50 \sin 50t$. The phase difference between current and applied e.m.f. is
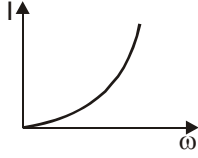(1) $\dfrac{\pi}{2}$
(2) $\dfrac{\pi}{6}$
(3) $\dfrac{\pi}{4}$
(4) 0

28. **Assertion** : Mutual inductance between two coils cannot be greater than self inductances of any of two coils.

    Reason : Coefficient of coupling cannot be greater than one.

    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion

    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion

    (3) Assertion is true statement but Reason is false

    (4) Assertion is false

29. An alternating current produces twice as much heat in a resistor as is produced by a direct current of 4 amperes. The peak value of alternating current is

    (1) 6 ampere (2) 4 ampere

    (3) 8 ampere (4) 16 ampere

30. Consider a series LCR circuit connected to an AC source. Across L, C and R, the

    (1) $V_{instantaneous}$ are added algebraically

    (2) V_{rms} are added vectorially

    (3) $V_{instantaneous}$ and V_{rms} are added algebraically

    (4) both (1) and (2)

31. Which of the following statements is true?

    (1) A bulb is connected first with dc and then ac of same rms voltage then it will shine more brightly with AC.

    (2) If an ac main supply is given to be 220 V, the average e.m.f. during a positive half cycle is 198 V.

    (3) Current in an AC series circuit becomes maximum when $\omega L = \omega C$

    (4) Impedance of LCR series circuit at resonance is zero.

32. A variable frequency ac source with fixed peak value is connected across a capacitor. The variation of current in the capacitor with applied frequency is
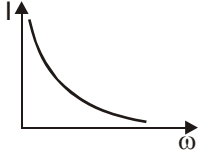

33. In LCR series circuit suppose ω_r is the resonance frequency them match the following table

Coumn I		Column II
(a)	If $\omega > \omega_r$	(i) current will lead the voltage
(b)	If $\omega = \omega_r$	(ii) voltage will lead the current
(c)	If $\omega = 2\omega_r$	(iii) $X_L = 4X_C$
(d)	If $\omega < \omega_r$	(iv) current and voltage are in phase

    (1) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)

    (2) (a)-(ii), (b)-(iv), (c)-(ii) and (iii), (d)-(i)

    (3) (a)-(i), (b)-(ii) and (iv), (c)-(iii), (d)-(ii)

    (4) (a)-(iv), (b)-(iii), (c)-(i) and (iii), (d)-(ii)

34. **Statement -I :** SI unit of magnetic flux is weber.

    Statement-II : Dimensions of magnetic flux are $ML^2T^{-2}A$.

    (1) Both statements are correct

    (2) Both statements are incorrect

    (3) Statement-I is correct and II is incorrect

    (4) Statement-I is incorrect and II is correct

35. A wheel with 10 metallic spokes each 0.5 m long is rotated with a speed of 120 rev/min in a plane normal to the horizontal component of earth's magnetic field H_E at a place. If $H_E = 0.4$ G at the space, what is the induced emf between the axle and the rim of the wheel? (1 G $= 10^{-4}$ T)
(1) 9.42×10^{-4} V
(2) 3.14×10^{-6} V
(3) 6.28×10^{-5} V
(4) None of these

PHYSICS : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

36. A, B are two conducting circular loops with their planes parallel and a magnet is moved in between them. Then
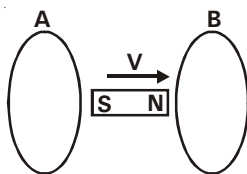
(1) The loops will experience no force upon each other
(2) The loops will repel each other
(3) The loops will attract each other
(4) Both the loops move toward left with same velocity

37. **Statement -I :** Two coils are placed close to each other. The mutual inductance of the pair of coils depends upon relative position and orientation of the two coils.

Statement-II : Two circular coils have their centres at the same point. The mutual inductance between them will be maximum when their axes are perpendicular to each other.

(1) Both statements are correct
(2) Both statements are incorrect
(3) Statement-I is correct and II is incorrect
(4) Statement-I is incorrect and II is correct

38.
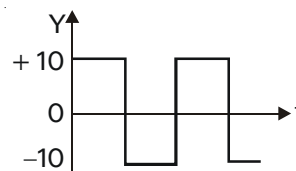
The r.m.s. voltage of the wave form shown is
(1) 10 V
(2) 7 V
(3) 6.37 V
(4) 5 V

39. **Assertion :** In a series LCR circuit the voltages across capacitor and inductor are $180°$ out of phase at resonance.

Reason : In a series LCR circuit, the impedence is equal to resistance at resonance

(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Assertion is false

40. An AC voltmeter measures the potential difference across resistance, inductance and capacitance of a series LCR circuit as $V_R = 8.8$ V, $V_L = 2.6$ V, and $V_C = 7.4$ V. For a measurement of the combined potential difference across the inductor and capacitor, the result will be
(1) -4.8 V
(2) 7.8 V
(3) 7.4 V
(4) 4.8 V

41. If the equation of an alternating current is $i = (50\sqrt{2} \sin 400 \, \pi t)$ ampere, then the frequency and the root mean square value of the current are respectively
(1) 200 Hz, 50 A
(2) 400 Hz, $50\sqrt{2}$ A
(3) 200 Hz, $50\sqrt{2}$ A
(4) 50 Hz, 200 A

42. The magnetic flux linked with closed loop is given by ϕ (in Wb) $= 4t^2 - 3t - 8$, where time 't' is in seconds. The magnitude of induced e.m.f. in the loop at an instant $t = 2$ second will be
    (1) 19 V
    (2) 5 V
    (3) 8 V
    (4) 13 V

43.
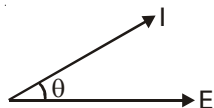
The phasor diagram of current and voltage for a circuit is shown above. The possible combination of components are
    a. LC   b. CR
    c. LR   d. LCR
    (1) b & d   (2) a & b
    (3) c & d   (4) a & d

44. Which of the following statements is true?
    (1) Lenz's law is consequence of the law of conservation of momentum.
    (2) A cylindrical bar magnet is kept along the axis of a circular coil. If the magnet is rotated about its axis, then a current will be induced in a coil.
    (3) In electromagnetic induction, the induced charge in a coil is independent of time.
    (4) When the number of turns in a coil is doubled without any change in the length of the coil, its self inductance becomes doubled.

45. Match the situations in column I with the direction of induced current in column II.

Column I   Column II
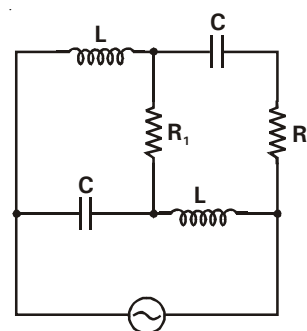

a.   p. along yzx

b.   q. along prq, along xzy

c.   r. along qrpq

   key just pressed

    (1) a-p, b-q, c-r   (2) a-r, b-p, c-q
    (3) a-r, b-q, c-p   (4) a-q, b-p, c-r

46. In the circuit shown, the current becomes four times as much at very low frequencies than it is at very high frequencies. The ratio $\dfrac{R_2}{R_1}$ of the resistance


    (1) 3   (2) $\dfrac{1}{3}$
    (3) 2   (4) 1

47. A $1 \mu F$ capacitor has a capacitive reactance of $80\,\Omega$. The approximate frequency of a.c. is
   - (1) 1.5 kHz
   - (2) 2.5 kHz
   - (3) 3 kHz
   - (4) 2 kHz

48.
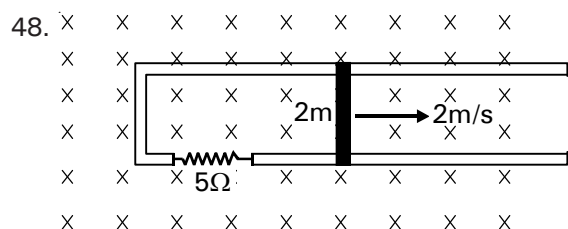
A wire of length 2 m is moving on a fixed conducting rail as shown in a uniform magnetic field of 0.2 T. Force required to keep the wire moving at constant speed is
   - (1) 0.025 N
   - (2) 0.064 N
   - (3) 0.32 N
   - (4) 0.128 N

49. The circuit shown is in a uniform magnetic field that is into the page and is decreasing in magnitude at the rate of 100 tesla/second. The ideal ammeter reads
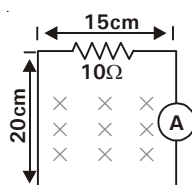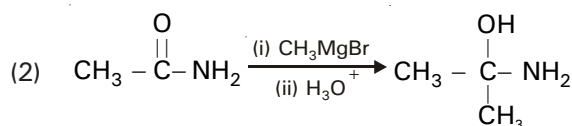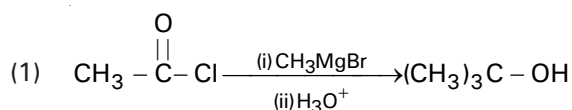

   - (1) 0.15 A
   - (2) 0.3 A
   - (3) 0.25 A
   - (4) 0.4 A

50. A coil of 20 cm × 20 cm having 30 turns is making 30 r.p.s. in a magnetic field of induction 1 tesla. The peak value of the induced e.m.f. is approximately
   - (1) 452 volt
   - (2) 226 volt
   - (3) 113 volt
   - (4) 339 volt

CHEMISTRY : SECTION-A

All questions are compulsory in section A

51. When chloroform is exposed to air and sunlight, it gives
   - (1) Carbon tetrachloride
   - (2) Carbonyl chloride (Phosgene)
   - (3) Mustard gas
   - (4) Lewsite

52. The dehydrating agent used in Fischer Speier esterification is
   - (1) dry HCl
   - (2) anhyd. $CaCl_2$
   - (3) conc. H_2SO_4
   - (4) all of these

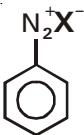53. Identify the incorrect match regarding the major product formed.

(1) $CH_3 - \overset{\overset{\displaystyle O}{||}}{C} - Cl \xrightarrow[\text{(ii)}\,H_3O^+]{\text{(i)}\,CH_3MgBr} (CH_3)_3 C - OH$

(2) $CH_3 - \overset{\overset{\displaystyle O}{||}}{C} - NH_2 \xrightarrow[\text{(ii)}\,H_3O^+]{\text{(i)}\,CH_3MgBr} CH_3 - \underset{\underset{\displaystyle CH_3}{|}}{\overset{\overset{\displaystyle OH}{|}}{C}} - NH_2$

(3) $CH_3 - C \equiv CH \xrightarrow{PhMgBr} C_6H_6$

(4) $(CH_3)_3 COH \xrightarrow{CH_3CH_2MgBr} CH_3CH_3$
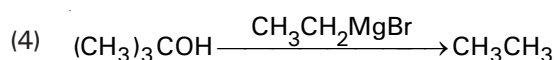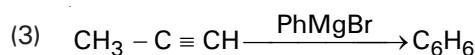
54. In Victor-Meyer test, red colouration is shown by
   - (1) 1° alcohol
   - (2) 2° alcohol
   - (3) 3° alcohol
   - (4) phenol

55. Order of reactivity of alcohols towards sodium metal is
   - (1) 3° > 2° > 1°
   - (2) 1° > 2° > 3°
   - (3) 2° > 3° > 1°
   - (4) 3° < 2° > 1°
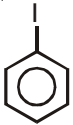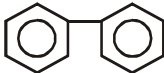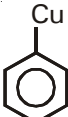
56. $CH_3CH = CH - COCH_3$ can be oxidised to $CH_3CH = CH - COOH$ by
(1) MnO_2
(2) Cl_2, NaOH
(3) $MnO_4^-/\bar{O}H$
(4) CrO_2Cl_2

57. $A \xrightarrow[573]{Cu}$ Ketone, A will be a/an
(1) Aldehyde
(2) Primary alcohol
(3) Secondary alcohol
(4) Tertiary alcohol

58.

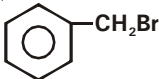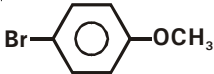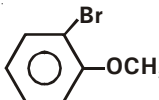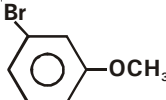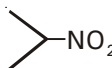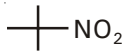$\xrightarrow[\Delta]{KI}$ A What is A?

(1)
(2)
(3)
(4)
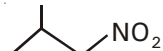
59. Reduction of acetic acid with $LiAlH_4$ yields
(1) ethanal
(2) methanal
(3) ethane
(4) ethanol
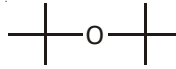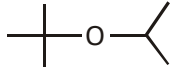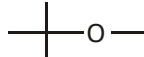
60. The major product formed when anisole reacts with bromine in ethanoic acid is

(1)
(2)
(3)
(4)

61. Which of the following does not react with nitrous acid?

(1)
(2)
(3)
(4)

62. Which of the following ether can not be prepared in good yield using Williamson's synthesis ?
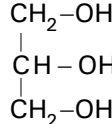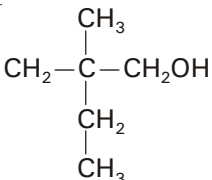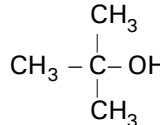
(1)
(2)
(3)
(4) Both (1) and (2)

63. $CH_3C \equiv CH \xrightarrow[\text{(ii) aq. KOH}]{\text{(i) HCl(excess)}} A \xrightarrow{LAH} B$

What is correct regarding B?
(1) It can show optical isomerism
(2) It gives positive iodoform test
(3) It is called rubbing alcohol
(4) Both (2) and (3)

64. Which of the following is tertiary alcohol

(1) $\begin{matrix} CH_2-OH \\ | \\ CH-OH \\ | \\ CH_2-OH \end{matrix}$

(2) $CH_2-\underset{\underset{CH_2}{\overset{\overset{CH_3}{|}}{|}}}{\overset{}{C}}-CH_2OH$ with CH_2 and CH_3 below

(3) $CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-OH$

(4) CH_3-CH_2-OH
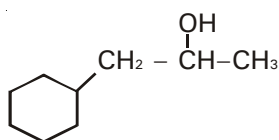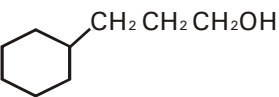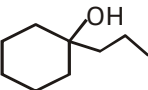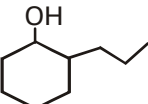
65. The acidic hydrolysis of methyl benzoate gives
    (1) CH_3OH and C_6H_5COOH
    (2) CH_3OH and C_6H_5OH
    (3) CH_3COOH and C_6H_5OH
    (4) CH_3OH and CH_3COOH

66. **Statement A** : In ether ROR bond angle is more than normal tetrahedral angle (109.5°).
    Statement B : O in ROR has sp^3 hybridisation.
    (1) Both statement A & B are correct
    (2) Both statement A & B are incorrect
    (3) Statement A is correct, B is incorrect
    (4) Statement A is incorrect, B is correct

67. The alcohol that produces turbidity immediately with $ZnCl_2$ + conc. HCl at room temperature
    (1) 1-butanol
    (2) 2-butanol
    (3) 2-methyl propane-2-ol
    (4) 2-methyl propane-1-ol

68. A liquid was mixed with ethanol and a drop of concentration H_2SO_4 was added. A compound with fruity smell (ester)was formed. The liquid added was
    (1) HCHO
    (2) CH_3COCH_3
    (3) CH_3COOH
    (4) CH_3OH

69.
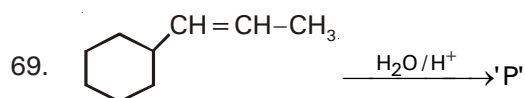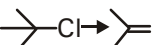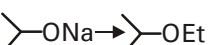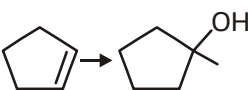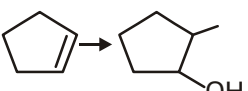
The major product 'P' is
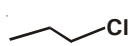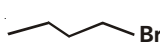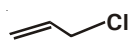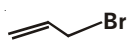
70. An ether is more volatile than an alcohol having the same molecular formula. This is due to
    (1) dipolar character of ethers
    (2) alcohols have resonating structure
    (3) intra molecular hydrogen bonding in alcohol
    (4) inter molecular hydrogen bonding in alcohol

71. Place the following alcohols in decreasing order of boiling point

(A)	(B)	(C)
(1-Pentanol)	(2-Methyl-Butanol)	(3-Methyl-2butanol)
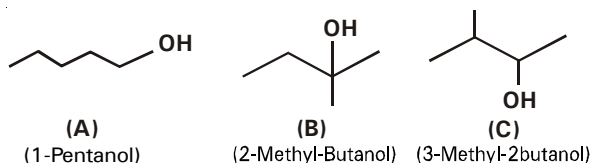
    (1) A > C > B
    (2) C > B > A
    (3) B > C > A
    (4) A > C = B

72. Match the chemical conversions in List-I with the appropriate reagents in List-II

List–I		List-II
a.		p. $Hg(OAc)_2$; $NaBH_4$
b.		q. NaOEt
c.		r. Et-Br
d.		s. B_2H_6; $H_2O_2/NaOH$

    (1) a–q ; b–r ; c–p ; d–s
    (2) a–r ; b–q ; c–p ; d–s
    (3) a–s ; b–r ; c–q ; d–p
    (4) a–q ; b–r ; c–s ; d–p

73. The most reactive towards Williamson's synthesis is

74. Absolute alcohol is
    (1) 100% pure ethanol
    (2) 95% alcohol + 5% H_2O
    (3) Ethanol + water + phenol
    (4) 95% ethanol + 5% methanol

75. Propene, $CH_3-CH=CH_2$ can be converted to 1-propanol by oxidation. Which set of reagents among following is ideal to effect the conversion
    (1) Alkaline $KMnO_4$
    (2) B_2H_6 & alkaline H_2O_2
    (3) O_3 / Zn dust
    (4) OsO_4 / CH_4,Cl_2

76. Maximum number of moles of HI required to react

    with 1mole of
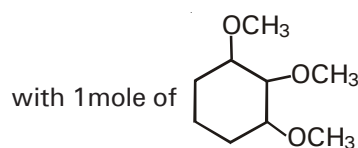
    (1) 3
    (2) 6
    (3) 9
    (4) 5

77. $CH_2=CH-CH_2OH \rightarrow CH_2=CH-CHO$
    The reagent(s) which can be used for the above conversion is/are
    (1) PCC
    (2) Collins reagent
    (3) MnO_2
    (4) All of these

78.
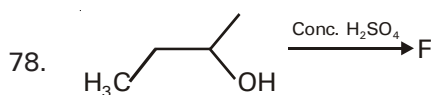
    How many structures of 'F' are possible?
    (1) 2
    (2) 5
    (3) 6
    (4) 3

79. Which one(s) of the following is/are factor for lesser reactivity of haloarenes ?
    (1) Resonance effect
    (2) Stability of carbocation
    (3) Bond strength of C–X bond
    (4) All of these

80. Match the starting materials given in Column I with the products formed by these (Column II) in the reaction with aqueous HI.

Column I

(i) CH_3-O-CH_3

(ii) $\begin{matrix} CH_3 \\ CH_3 \end{matrix}>CH-O-CH_3$

(iii) $H_3C-\overset{CH_3}{\underset{CH_3}{\overset{|}{\underset{|}{C}}}}-O-CH_3$

(iv)

Column II

(a)
 $+ CH_3I$

(b) $CH_3-\overset{CH_3}{\underset{CH_3}{\overset{|}{\underset{|}{CH}}}}-I + CH_3OH$

(c)
 $+ CH_3OH$

(d) $CH_3-OH + CH_3-I$

(e) $\begin{matrix} CH_3 \\ CH_3 \end{matrix}>CH-OH + CH_3I$

(f) $\begin{matrix} CH_3 \\ CH_3 \end{matrix}>CH-I + CH_3OH$

(g) $CH_3-\overset{CH_3}{\underset{CH_3}{\overset{|}{\underset{|}{C}}}}-OH + CH_3I$

(1) i–d, ii–e, iii–b, iv–a
(2) i–e, ii–f, iii–c, iv–b
(3) i–a, ii–g, iii–c, iv–b
(4) i–b, ii–d, iii–c, iv–a

81. Which one of following alcohol shall not yield a ketone as a final product on oxidation by $Cr_2O_7^{-2}$ in H_2SO_4

(1)   OH

(2) OH

(3) $(C_6H_5)_2CHOH$

(4) OH
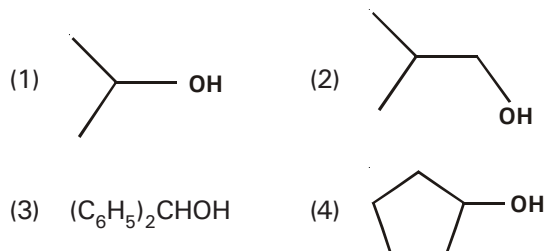
82. The correct order of reacting in $S_{N^2}Ar$ (through addition elimination mechanism) is
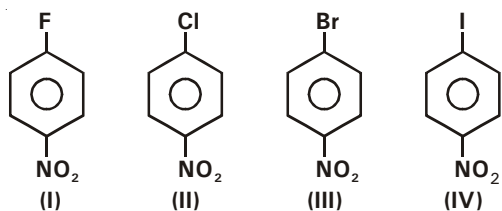
(I)   (II)   (III)   (IV)

(1) I < II < III < IV
(2) I > II > III > IV
(3) IV > II > III > I
(4) III > II > IV > I

83. **Assertion** : Dehydration of alcohols can be carried out with conc. H_2SO_4 but not with conc. HCl.

Reason : Cl^- is a better nucleophile than SO_4^{2-} ion and will cause substitution of OH^- group rather than its elimination.

(1) If both Assertion and Reason are true and the reason is the correct explanation of the assertion.
(2) If both Assertion and Reason are true but the reason is not the correct explanation of the assertion.
(3) If Assertion is true statement but Reason is false.
(4) If the Assertion is false.

84. Which of these compounds show positive iodoform test?

(a) $CH_3 - \overset{O}{\overset{||}{C}} - I$

(b) $CH_3 - \overset{O}{\overset{||}{C}} - \overset{O}{\overset{||}{C}} - OH$

(c)

(d) $CH_3 - \overset{Cl}{\underset{Cl}{\overset{|}{\underset{|}{C}}}} - CH_3$
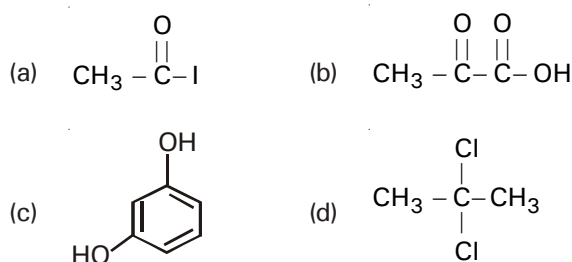
(e) Trimethyl carbinol

(1) a, b, d
(2) b, d, e
(3) b, c, d
(4) a, b, e

85. The major product in the reaction is,

$$CH_3 - \overset{CH_3}{\overset{|}{CH}} - CH_2 - NH_2 \xrightarrow{NaNO_2(aq) + HCl}$$

(1) $CH_3 - \overset{CH_3}{\overset{|}{CH}} - CH_2OH$

(2) $CH_3 - \overset{CH_3}{\underset{CH_3}{\overset{|}{\underset{|}{C}}}} - OH$

(3) $CH_3 - \overset{CH_3}{\overset{|}{CH}} - CH_2Cl$

(4) none of these

CHEMISTRY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

86. Which of the following will not form a yellow precipitate on heating with an alkaline solution of iodine?

(1) $CH_3CH_2CH(OH)CH_3$
(2) CH_3OH
(3) CH_3CH_2OH
(4) $CH_3CH(OH)CH_3$

87. For the given substrates in Column-I, match the number of CH_3MgX required under Column-II.

Column- I		Column- II	
a.	$CH_3COOC_2H_5$	p.	1
b.	CH_3COCl	q.	2

c.

r. 3
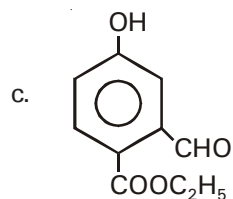
d. $HOCH_2COOC_2H_5$ s.   4

(1) a-p, b-q, c-s, d-r
(2) a-q, b-p, c-s, d-r
(3) a-q, b-q, c-s, d-r
(4) a-p, b-q, c-s, d-s

88.

+ one equivalent of HI $\xrightarrow{\Delta}$ Product

The main organic product in above reaction is

(1)

(2)

(3)

(4)
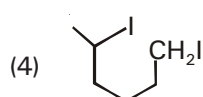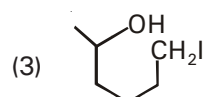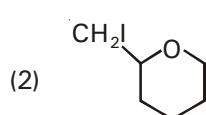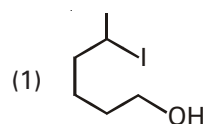
89. Which of the following products is formed on the reaction of diethyl ether with chlorine in the presence of direct sunlight?

(1) $CCl_3CH_2 - O - CH_2 - CCl_3$
(2) $ClCH_2 - CH_2 - O - CH_2 - CH_2Cl$
(3) $CCl_3 - CCl_2 - O - CCl_2 - CCl_3$
(4) $(CH_3 - CH - Cl)_2O$

90. The number of moles of sodium used for reacting with the final products (A) and (B) respectively are

$(A) \xleftarrow{NaBH_4} \quad \xrightarrow{LiAlH_4} (B)$
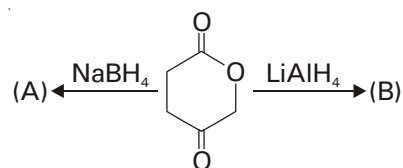
(1) 3, 3
(2) 1, 3
(3) 3, 1
(4) 1, 1

91. Out of following which one is Raschig process ?

(1)

(2) 2 $+ 2HCl + O_2 \xrightarrow{CuCl_2} 2$ $+ 2H_2O$

(3)

$+ PCl_5 \longrightarrow$ $+ HCl + POCl_3$

(4)

$\xrightarrow{\Delta}$ $+ N_2 + BF_3$
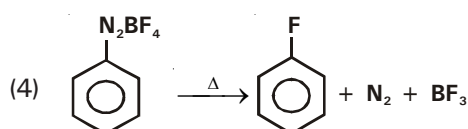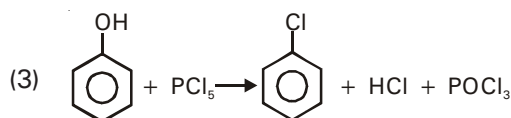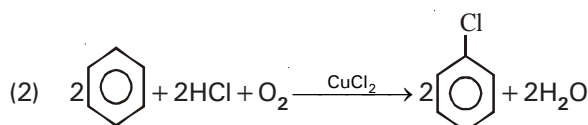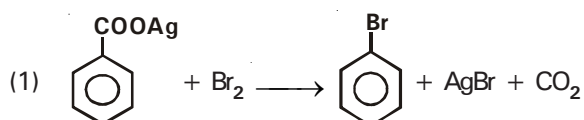
92. The product of given reaction is

$\xrightarrow[\text{excess}]{HBr}$

(1)

(2)

(3)

(4)
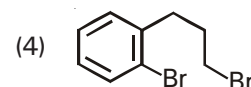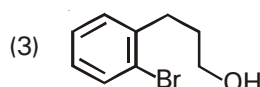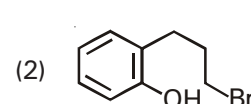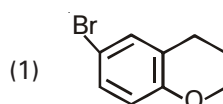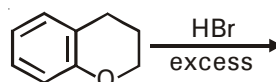
93. Which of the following is correct regarding DDT?
    (1) It was the first chlorinated organic insecticide prepared
    (2) It is also called as lindane
    (3) It is a monochlorinated compound
    (4) It is non toxic towards fish

94. C_2H_5ONa reacts with X to form simple ether. X and name of the reaction is
    (1) CH_3Cl, Kolbe's synthesis
    (2) C_2H_5Cl, Wurtz's synthesis
    (3) C_2H_5Cl, Williamson's synthesis
    (4) $(CH_3)_2SO_4$, Williamson's synthesis

95. **Statement A** : Among the isomeric dichlorobenzene, o-dichlorobenzene has the highest melting point.
    Statement B : o-Dichlorobenzene is most polar among the isomeric dichlorobenzene.
    (1) Both statement A & B are correct
    (2) Both statement A & B are incorrect
    (3) Statement A is correct, B is incorrect
    (4) Statement A is incorrect, B is correct

96.
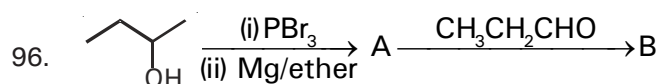
    The correct structure for the compound B will be

    (1)   (2)

    (3)   (4)
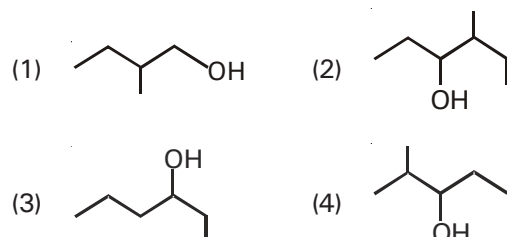
97. Which has lowest solubility in water?
    (1) $CH_3CH_2CH_2CH_2OH$ (2) $(CH_3)_2CHOH$
    (3) $HO\,H_2C-CH_3$ (4) $C_6H_5\,CH_2\,CH_2\,OH$

98. Acetic acid reacts separately with the following alcohols. The rate of esterification is highest for
    (1) CH_3OH (2) C_2H_5OH
    (3) $(CH_3)_2CHOH$ (4) $(CH_3)_3COH$

99. **Assertion:** A mixture of an alkyl halide and aryl halide gives an alkylarene when treated with sodium in dry ether.
    Reason : The reaction in called Fittig reaction.
    (1) Both Assertion and Reason are true & reason is correct explanation of assertion.
    (2) Both Assertion and Reason are true but reason is not correct explanation of assertion.
    (3) Assertion is true but Reason is false.
    (4) Assertion is false.

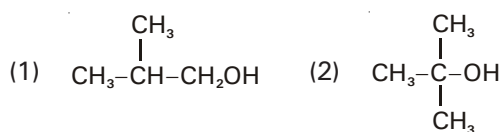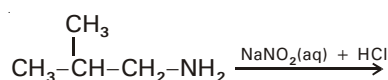100. Replacement of Cl of chlorobenzene to give phenol requires drastic conditions but chlorine of 2,4-dinitrochlorobenzene is readily replaced because
    (1) NO_2 make ring electron rich at ortho and para
    (2) NO_2 withdraws e⁻ from meta position
    (3) denotes e⁻ at meta position
    (4) NO_2 withdraws e⁻ from ortho/para positions

ZOOLOGY : SECTION-A

All questions are compulsory in section A

101. Which of the following is most acceptable theory of origin of life ?
    (1) Theory of Panspermia
    (2) Theory of Spontaneous generation
    (3) Cosmozoic theory
    (4) Naturalistic theory

102. As Spotted cuscus : Lemur, similarily Numbat : A Identify A
    (1) Bobcat
    (2) Wolf
    (3) Flying phalanger
    (4) Anteater

103. Era representing Age of Reptiles is
    (1) Jurassic (2) Mesozoic
    (3) Cenozoic (4) Carboniferous

104. Miller synthesized simple amino acids from one of the following mixture in his experiment
    (1) H_2, O_2, N_2 and water vapour
    (2) CH_4, NH_3, H_2 and water vapour
    (3) H_2, O_2, CH_4 and water vapour
    (4) CH_4, NH_3, HCN and water vapour

105. Due to continental drift
    (1) North American fauna was overridden by South American fauna
    (2) South American fauna was overridden by North American fauna
    (3) South African fauna was overridden by North African fauna
    (4) North African fauna was overridden by South African fauna

106.

Turtles   Lizards   Snakes Tuataras

A

B — **Mammals**

Early reptile
(extinct)
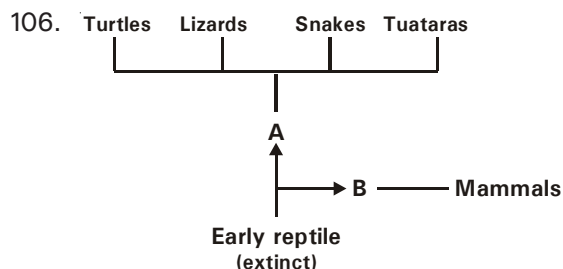
The ancestral reptiles giving rise to reptiles and mammals representing at A and B respectively are
    (1) Therapsids and sauropsids
    (2) Synapsids and therapsids
    (3) Sauropsids and synapsids
    (4) Therapsids and pelycosaurids

107. Continental drift theory was given by
    (1) Darwin   (2) Spencer
    (3) Lamarck   (4) Wagner

108. The small black birds noticed by Darwin on Galapagos Islands were originally
    (1) seed eating   (2) insectivorous
    (3) piscivorous   (4) herbivorous

109. The simulation condition not used in Miller and Urey experiment was
    (1) high temperature
    (2) $CH_4:H_2:NH_3 - 2:1:2$
    (3) electrodes with high voltage
    (4) raining and evaporation

110. The similarity of bone structure in the forelimbs of many vertebrates is an example of
    (1) Homology
    (2) Analogy
    (3) Adaptive radiation
    (4) Convergent evolution

111. Coacervates were formed in the laboratory by
    (1) Sydeney fox   (2) Haldane
    (3) Oparin   (4) Miller

112. **Statement I** : After reptiles came down, mammals dominated earth.
    Statement II : First mammals were shrew like and their fossils were small sized.
    (1) Both statement I and statement II are correct
    (2) Both statement I and statement II are incorrect
    (3) Statement I is correct but statement II is incorrect
    (4) Statement I is incorrect but statement II is correct

113. How many of the following are sauropsids?
    Crocodile, Mammals, Tuataras, Lizards, Dinosaurs, Turtles, Pteranodon, Archaeopteryx, Snakes, Parrot
    (1) 9   (2) 8
    (3) 6   (4) 7

114.

    (A)   (B)   (C)
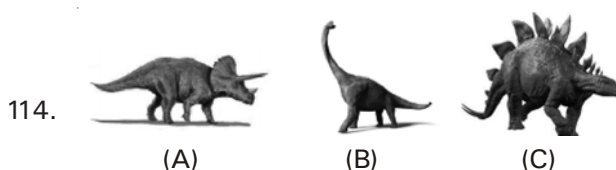
Animals given in the above figure are

	A	B	C
(1)	Stegosaurus	Brachiosaurus	Triceratops
(2)	Pteranodon	Stegosaurus	Archeopteryx
(3)	Archeopteryx	Tyranosaurus	Brachiosaurus
(4)	Triceratops	Brachiosaurus	Stegosaurus

115. **Statement I** : Primitive atmosphere contained well developed ozone layer & today ozone layer is depleting .
    Statement II : Conditions like reducing atmosphere and high temperature contributed to the origin of life.
    (1) Both statement I and statement II are correct
    (2) Both statement I and statement II are incorrect
    (3) Statement I is incorrect but statement II is correct
    (4) Statement I is correct but statement II is incorrect

116. The convergent evolution of two species is usually associated with
    (1) analogous organs   (2) atavism
    (3) common ancestor   (4) homologous organs

117. Identify the correct statement
    (1) Latimeria is connecting link between fishes and amphibians
    (2) Some land reptiles evolved into fish like reptiles arround 200 mya were *Tyrannosaurus*
    (3) Jawless fish evolved about 320 mya
    (4) None of these

118. **Assertion**:Fossils provide one of the most dependable evidences in support of evolution.
    Reason: Fossils are dead remains of the animal and plants buried in earth crust.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the as sertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

119. Connecting links occur between reptiles & birds and also between reptiles & mammals. This indicates
    (1) evolution of mammals from birds
    (2) evolution of reptiles from birds
    (3) evolution of reptiles from mammals
    (4) common ancestory of reptiles, birds & mammals

120. If the periods of Paleozoic era are arranged in descending order beginning from most recent, which period will be at 4th position?
    (1) Devonian   (2) Silurian
    (3) Ordovician   (4) Carboniferous

121. The cretaceous period of mesozoic era when dinosaurs became extinct occured approximately
    (1) 800 million yrs ago   (2) 280 million yrs ago
    (3) 65 million yrs ago   (4) 550 million yrs ago

122. The feature applicable to Darwin Finches present on Galapagos islands is
   (1) evolved from original seed eating finches
    (2) different from each other w.r.t. type of beak
    (3) small black birds representing adaptive divergence
    (4) all of these

123. Which of the following is supposed to be biggest known fossils of reptiles?
    (1) *Stegosaurus*   (2) *Tyrannosaurus*
    (3) *Pteranodon*   (4) *Brachiosaurus*

124. Specimen of Coelacanth fish was caught in ____X____ , from ____Y____ . X and Y are respectively
    (1) 1938, South Africa
    (2) 1838, South America
    (3) 1938, South America
    (4) 1949, South Africa

125. Which of the following statements are true for palaentological evidences?
    a. These are evidences gathered from fossils
    b. New forms of life have arisen at different geological time period
    c. Life forms varied over the time
    d. Rocks of different age contain fossils of different life forms
    (1) a, b, c & d   (2) a, b & c
    (3) b, c & d   (4) a, b & d

126. Which of the following evidence is better to understand the process of organic evolution?
    (1) Homologous and analogous organs
    (2) Homologous and vestigeal organs
    (3) Atavism and analogous organs
    (4) Connecting links and analogous organs

127. What can we infer about the structures shown in figure?
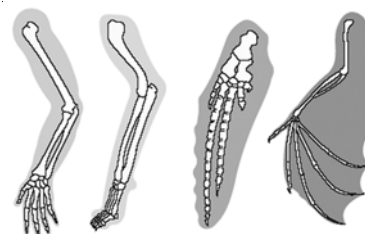
    (1) These structures are anatomically similar
    (2) The structures perform similar functions though their origin may or may not be similar
    (3) Convergent evolution is exhibited by them
    (4) Both (1) & (3)

128. Transformation of early reducing atmosphere of the earth into an oxidizing atmosphere was mainly due to
    (1) Anaerobic chemoheterotrophs
    (2) Aerobic photosynthesizers
    (3) Anaerobic photoautotrophs
    (4) Aerobic heterotrophs

129. What is not true about connotations of special creation theory?
    (1) All living beings are created as such
    (2) No change in present and past forms
    (3) Earth is 4000 years old
    (4) Based on scientific proofs

130. Plants of the Galapagos islands show resemblance most closely to the plants of
    (1) Asia   (2) Australia
    (3) North America (4) South America

131. Which of the following was there in primitive earth?
    (1) Ammonia and oxygen
    (2) Well developed ozone layer
    (3) Molecular oxygen
    (4) Hydrogen and methane

132. Life came out of decaying & rotting matter like straw, mud etc is the basis of
    (1) theory of spontaneous generation
    (2) idea of panspermia
    (3) version of biogenesis
    (4) chemical evolution

133. **Assertion**: The first photosynthetic reaction to have taken place on early earth was anoxygenic.
    Reason: The early cyanobacteria did not use water as a raw material in photosynthesis.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

134. Which of the following are true statements that indicate shared ancestory among organisms?
    (1) Similarity in blood proteins of crocodiles and birds
    (2) Amino acid sequence for protein cytochrome (C) is same in man and chimpanzee
    (3) 98.2% homology in DNA of man and chimpanzee
    (4) All of these

135. When more than one adaptive radiation appeared to have occured in an isolated geographical area representing different habitat, it is called
    (1) convergent evolution
    (2) adaptive radiation
    (3) natural selection
    (4) saltation

ZOOLOGY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

136. Ancestors of mammals appear to have diverged from the common reptilian ancestor (for all reptiles, birds and mammals) around which period
    (1) Carboniferous   (2) Tertiary
    (3) Triassic   (4) Jurassic

137. **Assertion**: Analogy is based on convergent evolution.
    Reason: Different structures evolved for different functions in similar environment.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

138. An incorrect difference between natural and artificial selection is

	Natural selection	Artificial selection
(1)	Selection is carried out by nature	Slection is done by human being
(2)	Slow process	Fast process
(3)	Traits having adaptive value are selected	Traits are selected according to economic value
(4)	Cannot create new breeds	Can create new breeds

139. Which of the following is the correct sequence of events in the origin of life?
    I. Formation of protobionts.
    II. Synthesis of organic monomers.
    III. Synthesis of organic polymers.
    IV. Formation of DNA-based genetic systems.
    (1) I, II, III, IV   (3) I, III, II, IV
    (3) II, III, I, IV   (4) II, III, IV, I

140. Taxonomic position of a certain animal could only be determined through its larva as the adult showed highly simplified structure. The animal is showing
    (1) progressive metamorphosis
    (2) retrogressive metamorphosis
    (3) disruptive selection
    (4) both (1) and (3)

141. Eyes of Octopus and mammals are examples of:
    (1) Convergent evolution
    (2) Industrial melanism
    (3) Natural selection
    (4) Adaptive radiation

142. Select the incorrect match of event

	Event	Time span of occurrence
(1)	Invertebrates formed and became active	500 mya
(2)	Origin of universe	20 mya
(3)	Miller's experiment	1953
(4)	Sea weeds	320 mya

143. Closest living reptilian relative of mammals is
    (1) *Archaeopteryx*
    (2) Spiny ant eater
    (3) *Crocodilus*
    (4) *Tyrannosaurus*

144. Match the column-I and column-II and choose the correct option.

	Column-I		Column-II
a.	Pre-biotic soup	i.	Oparin
b.	Origin of life	ii.	Spallanzani
c.	Proteinoids	iii.	Haldane
d.	Biogenesis	iv.	S.W. Fox

    (1) a–iv, b–iii, c–i, d–ii   (2) a–iii, b–iv, c–ii, d–i
    (3) a–iii, b–i, c–iv, d–ii   (4) a–i, b–iv, c–ii, d–iii

145. In family tree of reptiles, A and B are respectively

(1) *Stegosaurus, Tyrannosaurus*
(2) *Tyrannosaurus, Icthyosaurus*
(3) *Stegosaurus, Pelycosaur*
(4) *Stegosaurus, Icthyosaurus*

146. Given below is a series of steps during evolution of vertebrates. Identify the correct chronological sequence in which they occur
   a. early reptiles gave rise to sauropsids
   b. dinosaurs developed from thecodonts
   c. turtles evolved from sauropsids
   (1) a-b-c (2) a-c-b
   (3) c-b-a (4) b-a-c

147. Find the odd one w.r.t. their origin
   (1) Tasmanian wolf (2) Bobcat
   (3) Spotted cuscus (4) Banded anteater

148. **Statement I :** The most accurate method to calculate the age of fossils is Electron Spin Resonance method

   Statement II : *Archaeopteryx* and *Coelacanth* are examples of missing links

   (1) Both statement I and statement II are correct
   (2) Both statement I and statement II are incorrect
   (3) Statement I is correct but statement II is incorrect
   (4) Statement I is incorrect but statement II is correct

149. Which of the following organisms have thecodont as their common ancestor?
   (1) Lizard, Crocodile, *Tryannasaurus*
   (2) *Stegosaurus*, *Pteranodon*, *Corvus*
   (3) Tautara, Dinosaurs, Therapsid
   (4) *Brachiosaurus*, Dolphin, Lobefin fish

150. Which is a correct difference between homologous & analogous organs?

	Character	Homologous	Analogous
(1)	internal organisation	different	same
(2)	Function	same	different
(3)	Origin	similar	dissimilar
(4)	evolution	convergent	divergent

BOTANY : SECTION-A

All questions are compulsory in section A

151. Pick the incorrect match from the following
   (1) Beadle and Tatum – one gene one enzyme hypothesis
   (2) Yanofsky – one gene one polypeptide hypothesis
   (3) Holley – Central dogma
   (4) Temin and Baltimore– reverse transcription

152. How many GTPs and ATPs will be required to incorporate 20 amino acids in a polypeptide chain respectively?
   (1) 40, 20 (2) 20, 40
   (3) 20, 20 (4) 40, 40

153. Which factor help in termination of transcription?
   (1) α (2) ρ
   (3) σ (4) ω

154. How many statements are true?
   (a) Nirenberg cell free system for proteins synthesis finally helped the code to be deciphered
   (b) Genetic code is different for plants and animals
   (c) Amino acid gets attached to 5' end of tRNA
   (d) tRNA looks like inverted L
   (e) Small cytoplasmic RNA helps in splicing
   (1) Two (2) Four
   (3) Three (4) All

155. If the base sequence of mRNA in bacteria is UAU CGU ACG then the base sequence in template strand of DNA will be
   (1) ATA GCA TGC (2) AUA GCA UGC
   (3) TAT CGT ACG (4) UAU CGT ACG

156. Which of the following statement is incorrect?
   (1) There is definite region in *E.coli* DNA where replication originate
   (2) Deoxyribonucleoside triphosphate act as substrate for DNA replication
   (3) A failure in cell division after DNA replication results into chromosome anomaly
   (4) The promoter is said to be located towards 5' end (downstream) of structural gene

157. Introns are
   (1) Reminiscent of antiquity
   (2) Coding sequences
   (3) Present in the functional transcript
   (4) Both (1) and (3)

158. What is false with respect to tRNA?
   (1) It is about 15% of RNA of the cell
   (2) It is an adapter molecules
   (3) It resembles clover leaf in 2D or secondary structure
   (4) It occurs in Ribosomes

159.

GAGCU GAGUUAA
a |||||||||||| a'
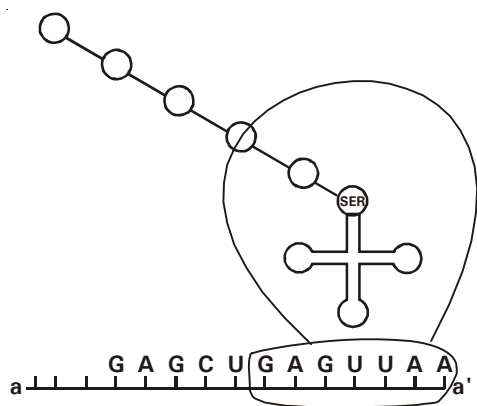
a. Identify the polarity from a to a', in the diagram
b. Mention how many more amino acids are expected to be added to this polypeptide chain.
(1) a = 5'-3', b = 0   (2) a = 3'-5', b = 0
(3) a = 5'-3', b = 6   (4) a = 3'-5', b = 6

160. If the number of okazaki fragments in a discontinuous strand are 7, then the number of primers attached with them, will be
(1) 7   (2) 10
(3) 14   (4) 1

161. **Assertion**: The code is degenerate.
Reason: The total number of codons is much greater than the number of amino acids participating.
(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Assertion is false

162. RNA polymerase (core enzyme) has _____ polypeptide chains
(1) Four   (2) Five
(3) Three   (4) Two

163. Genetic RNA is found in
(1) Some viruses
(2) All viruses
(3) All viruses, plants and animals
(4) Some Viruses and Bacteria

164. Which of the following is a salient feature of genetic code?
a. Code is triplet
b. Code is non-ambiguous
c. Code is nearly universal
d. AUG has dual function
(1) a, b and d   (2) b, c and d
(3) a, b, c and d   (4) only d

165. **Statement I** : The DNA sequence which signals the initiation of transcription is called promoter.
Statement II : Rho factor can recognise the promoter and bind to it directly.
(1) Both statement I and statement II are correct
(2) Both statement I and statement II are incorrect
(3) Statement I is correct but statement II is incorrect
(4) Statement I is incorrect but statement II is correct

166. Which of the following statment is correct?
(1) In bacteria transcription and translation are coupled
(2) In eukaryotes one RNA polymerase is present for transcription of all type of rRNA's
(3) mRNA plays structural and catalytic role during translation
(4) 7 methyl guanosine triphosphate is an unusual nucleotide which acts as a tail of mRNA

167. Unusual bases like DHU and pseudouridine are seen in
(1) m-RNA   (2) t-RNA
(3) r-RNA   (4) All RNAs

168. Select the incorrect statement regarding translation
(1) Methionine is non-formylated in eukaryotes but formylated in case of prokaryotes
(2) Linking of activated amino acids to their cognate (related) t-RNA is called charging of t-RNA
(3) $-CO-NH-$(peptide bond) is formed between carboxyl group of amino acid at A site and NH2 group of amino acid at P-site.
(4) Incorporation of an amino acid in polypeptide chain requires one ATP and 2GTP

169. Amino acid binding site in t-RNA is
(1) CCA 3' end   (2) DHU loop
(3) 5' end   (4) Anticodon loop

170. Which of the following set of rRNAs occur in the large ribosomal subunit of eukaryotes?
(1) 28 S, 18 S, 5.8 S   (2) 28 S, 5.8 S, 5 S
(3) 28 S, 5 S, 23 S   (4) 18 S, 5.8 S, 5 S

171. Which of the following enzyme facilitates opening of helix and continue elongation in transcription?
(1) RNA polymarese
(2) Helicase
(3) Reverse transcriptase
(4) Ligase

172. Capping, tailing and splicing are _____ events which occur in _____ of _____ cells
(1) Pre-transcriptional, nucleus, all
(2) Post transcriptional, nucleus, prokaryotic cells
(3) Post transcriptional, cytoplasm, eukaryotic cells
(4) Post transcriptional, nucleus, eukaryotic cells

173. Which of the following statement is false?
    (1) Replication in bacteria takes place after fission
    (2) Principle of complementarity governs the process of transcription
    (3) The first genetic material was RNA
    (4) In eukaryotes multiple replicons are present

174. Which of the following is the pribnow box?
    (1) 5'TAATTA 3'   (2) 5'TATAAT 3'
    (3) 5' ATATTA 3'   (4) 5' AATAAT 3'

175. If there were 10 nitrogen bases instead of 4 that have to code for 70 amino acids instead of 20, the genetic code could be
    (1) singlet   (2) doublet
    (3) triplet   (4) quadriplet

176. RNA polymerase III is responsible for transcription of
    (1) 5s rRNA   (2) hnRNA
    (3) 18s rRNA   (4) 5.8 sRNA

177. Which of the following shows exonuclease activity in 5'−3' direction during DNA replication?
    (1) DNA polymerase-I
    (2) DNA polymerase-II
    (3) DNA polymerase-III
    (4) All of the above

178. Which of the following is called opal?
    (1) AUG   (2) UAA
    (3) UAG   (4) UGA

179. Untranslated regions (UTRs) present in mRNA are located towards
    (1) 3' end before stop codon
    (2) 5' end after start codon
    (3) 5' end before start codon
    (4) 3' end before start codon

180. The antibiotic which inhibits translation is eukaryotes is
    (1) Tetracycline   (2) Neomycin
    (3) Chloramphenicol   (4) Puromycin

181. Find the incorrect match w.r.t. the scientist and their contribution.
    (1) George Gamow   – Cell-free system for protein synthesis
    (2) Severo Ochoa   – Polynucleotide phosphorylase
    (3) Hargobind Khorana – Homopolymers and copolymers
    (4) both (1) & (2)

182. Sn RNA is absent in
    (1) all plants   (2) all animals
    (3) fungi   (4) prokaryotes

183. **Assertion** : Polypeptide synthesis stops when a termination codon appear at A-site.
    Reason: When release factor binds to the stop codon, it terminates translation and releases the polypeptide from ribosome.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

184. Which of the sequence listed below best describes the order in which the following enzymes participate in the replication of DNA in bacteria?
    a. DNA polymerase I
    b. Primase
    c. DNA polymerase-III
    d. DNA ligase
    (1) b, c, a, d   (2) d, a, b, c
    (3) d, c, b, a   (4) c, b, a, d

185. During elongation of polypeptide chain, tRNA carrying the amino acid enters ribosome from which site?
    (1) 'A' site   (2) 'P' site
    (3) Anticodon site   (4) Recognition site

BOTANY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

186. In case of mitochondrial genetic code, UGA codes for _____ amino acid
    (1) Tryptophan   (2) Arginine
    (3) Proline   (4) Stop codon

187. Reverse transcriptase is
    (1) RNA dependent DNA polymerase
    (2) RNA dependent RNA polymerase
    (3) DNA dependent RNA polymerase
    (4) DNA dependent DNA polymerase

188. Choose the correct match
    (1) DNA poly α -DNA repair
    (2) DNA poly γ −mitochondrial polymerase
    (3) DNA poly δ -synthesis of lagging strand
    (4) DNA poly ε −synthesis of leading strand

189. A geneticist extracted DNA from a eukaryotic cell. She also extracted mRNA from same cell. She found that mRNA is 100 bases shorter than DNA. What could be the possible reason?
    (1) She has extracted wrong mRNA
    (2) mRNA is formed after splicing
    (3) DNA is always smaller than mRNA
    (4) mRNA has not undergone processing

190. **Assertion**: DNA replication occurs within a small opening of DNA helix refered to as replication fork.
Reason: For long DNA molecules, two strands cannot be separated in its entire length, due to high energy requirement.
   (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
   (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
   (3) Assertion is true statement but Reason is false
   (4) Assertion is false

191. Which of the following will result in the synthesis of a complete polypeptide chain?
   i.   AUG UGA UUA AAG AAA
   ii.   AUG UUA UAA AAG AAU
   iii. AUG UAC AGU AAC UAG
   iv.   AGU UCC AGA CUC UAA
   (1) i, ii   (2) i, ii, iii
   (3) iv, iii   (4) iii only

192. Which is the correct representation of transcription?

Direction of transcription

(1)

3'   5' }DNA
5'   5' 3'

3'
Nascent RNA

(2)

Nascent RNA
          5'
5'   5' }DNA
3' 3'   3'

(3)

5'   3' }DNA
3'   3' 5'

5'
Nascent RNA

(4)

3'   5' }DNA
5'   3' 3'

5'
Nascent RNA
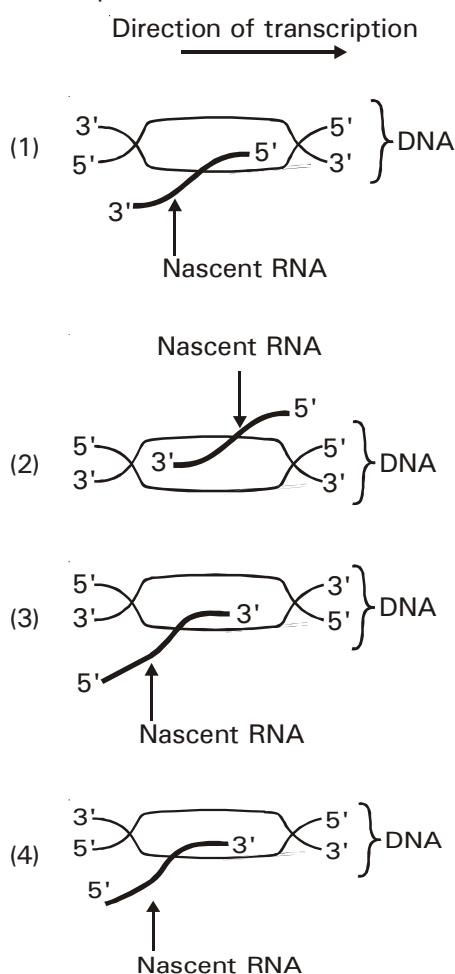
193. If the sequence of nucleotides in mRNA is known, the sequence of amino acids can be predicted, but if the sequence of amino acids is known, the exact sequence of nucleotides in its mRNA cannot be predicted. It is because the genetic code is
   (1) ambiguous   (2) degenerate
   (3) specific   (4) triplet

194. Match the following
   i.   Promoter   a. Termination
   ii.   Rho factor   b. Initiation
   iii. RNA polymerase II c. hn RNA
   iv.   Splicing   d. σ factor
                           e. m RNA
                           f. introns
                           g. prokaryotes
   (1) i-b, d ; ii-a, g ; iii-c, e; iv-f
   (2) i-b, a ; ii-d, g ; iii-c, e; iv-f
   (3) i-a, d ; ii-b ; iii-c, e ; iv-f
   (4) i-b, a ; ii-f,e ; iii-c, d ; iv-f

195. Select the incorrect statement w.r.t. transcription
   (1) RNA polymerase uses ribonuceloside triphosphate as substrate and polymerises in a template dependent fashion
   (2) A long stretch of RNA remains bound to the RNA polymerase enzyme during the process
   (3) RNA polymerase somehow facilitates opening of the helix and continues elongation
   (4) Presence of a promoter in a transcription unit defines the template and coding strands

196. Pick the incorrect statement
   (1) Watson, Crick and Khorana got Nobel prize for interpretation of genetic code
   (2) Genetic code is non-overlapping
   (3) Crick proposed Wobble hypothesis
   (4) Magnesium is essential for union of two sub units of ribosome

197. How many statements are true?
   a. Translation occurs in nucleus of prokaryotes
   b. Ribosome consists of structural RNAs and about 80 different proteins
   c. 18 s rRNA in small subunit of prokaryotes recognises 5'– 7mG cap
   d. During translation, ribosome moves from codon to codon along the DNA
   (1) 1   (2) 3
   (3) 2   (4) all are correct

198. **Statement I** :Splicing involves removal of introns and joining of exons.
Statement II : In tailing, polyadenylate residues are added in template independent manner.
(1) Both statement I and statement II are correct
(2) Both statement I and statement II are incorrect
(3) Statement I is correct but statement II is incorrect
(4) Statement I is incorrect but statement II is correct

199. Leading strand of DNA is synthesised in
(1) 5'−3' direction, away from ori site
(2) 3'−5' direction, away from ori site
(3) 5'−3' direction, towards ori site
(4) 3'−5' direction, towards ori site

200. Which of the following enzyme associates transiently with initiation (sigma) factor ?
(1) Helicase
(2) DNA polymerase
(3) RNA polymerase
(4) Ligase

M.L. Syal's Helix Institute

S.C.O. 343-345, Top Floor, Sector 34-A, Chandigarh. Ph : 0172-2623155

XII cum Competition Course for Medical – Test - 8

1.	(4)	51.	(2)	101.	(4)	151.	(3)
2.	(2)	52.	(1)	102.	(4)	152.	(1)
3.	(1)	53.	(2)	103.	(2)	153.	(2)
4.	(3)	54.	(1)	104.	(2)	154.	(1)
5.	(2)	55.	(2)	105.	(2)	155.	(1)
6.	(3)	56.	(2)	106.	(3)	156.	(4)
7.	(1)	57.	(3)	107.	(4)	157.	(1)
8.	(1)	58.	(1)	108.	(1)	158.	(4)
9.	(2)	59.	(4)	109.	(2)	159.	(1)
10.	(1)	60.	(2)	110.	(1)	160.	(1)
11.	(2)	61.	(2)	111.	(3)	161.	(1)
12.	(2)	62.	(4)	112.	(1)	**162. (2)g**
13.	(3)	63.	(4)	113.	(1)	163.	(1)
14.	(2)	64.	(3)	114.	(4)	164.	(3)
15.	(1)	65.	(1)	115.	(3)	165.	(3)
16.	(2)	66.	(1)	116.	(1)	166.	(1)
17.	(3)	67.	(3)	117.	(1)	167.	(2)
18.	(4)	68.	(3)	**118. (1)**		168.	(3)
19.	(3)	**69. (3)g**		119.	(4)	169.	(1)
20.	(2)	70.	(4)	120.	(2)	170.	(2)
21.	(4)	71.	(1)	121.	(3)	171.	(1)
22.	(1)	**72. (1)g**		122.	(4)	172.	(4)
23.	(2)	73.	(4)	123.	(2)	173.	(1)
24.	(4)	74.	(1)	124.	(1)	174.	(2)
25.	(3)	75.	(2)	125.	(1)	175.	(2)
26.	(3)	76.	(2)	126.	(2)	176.	(1)
27.	(3)	77.	(4)	127.	(1)	177.	(1)
28.	(4)	78.	(4)	128.	(2)	178.	(4)
29.	(3)	79.	(4)	129.	(4)	179.	(3)
30.	(4)	80.	(1)	130.	(4)	180.	(4)
31.	(2)	81.	(2)	131.	(4)	181.	(1)
32.	(2)	82.	(2)	132.	(1)	182.	(4)
33.	(2)	83.	(1)	133.	(3)	183.	(2)
34.	(3)	84.	(3)	134.	(4)	184.	(1)
35.	(3)	85.	(2)	135.	(1)	185.	(1)
36.	(2)	86.	(2)	136.	(1)	186.	(1)
37.	(3)	87.	(3)	137.	(3)	187.	(1)
38.	(1)	88.	(3)	138.	(4)	188.	(2)
39.	(2)	89.	(3)	139.	(3)	189.	(2)
40.	(4)	90.	(2)	140.	(2)	190.	(1)
41.	(1)	91.	(2)	141.	(1)	191.	(4)
42.	(4)	92.	(2)	142.	(2)	192.	(4)
43.	(1)	93.	(1)	143.	(3)	193.	(2)
44.	(3)	94.	(3)	144.	(3)	194.	(1)
45.	(3)	95.	(4)	145.	(1)	195.	(2)
46.	(1)	96.	(2)	146.	(2)	196.	(1)
47.	(4)	97.	(4)	147.	(2)	197.	(1)
48.	(2)	98.	(1)	148.	(3)	**198. (1)**
49.	(2)	99.	(3)	149.	(2)	199.	(1)
50.	(2)	100.	(4)	150.	(3)	200.	(3)

XII cum Competition Course for Medical
Test - 9

MM : 720

Time : 3 hrs. 20 minutes

Physics	: Current electricity, Magnetic effect of current, Magnetism, EMI, A.C. circuit & divices-I
Chemistry	: Extraction, Electrochemistry, Alkyl & Aryl halides (i/c optical isomerism), Alcohols & Ether
Zoology	: Human health & diseases, Immune System, Microbes in human welfare, Origin of life, Evidence of evoluiton (i/c Plant evolution)
Botany	: Non-Mendelian inheritance, Chromosomal basis of inheritance, Molecular basis of inheritance (upto translation)

PHYSICS : SECTION-A

All questions are compulsory in section A

1. Resistances of 6 ohm each are connected in the manner shown in figure. With the current 0.5 ampere, the potential difference $V_P - V_Q$ is
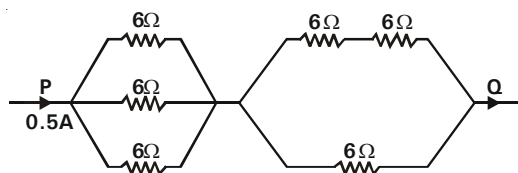
   (1) 3.6 V   (2) 6 V
   (3) 3 V   (4) 7.2 V

2.
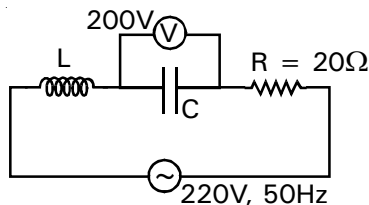
   In the above circuit, rms current is 11 A. The potential difference across the inductor is
   (1) 220 V   (2) 300 V
   (3) 200 V   (4) 0 V

3. Two straight parallel current carrying wires carrying current I_1 & I_2 ($I_1 < I_2$) in same direction are separated by distance 'd'. The distance from conductor carrying current I_1 at which magnetic induction zero is
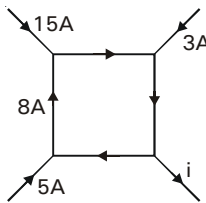
   (1) $\dfrac{dI_1}{I_1 + I_2}$

   (2) $\dfrac{dI_2}{I_1 + I_2}$

   (3) $\dfrac{dI_1I_2}{I_1 + I_2}$

   (4) $\dfrac{dI_1}{I_1 - I_2}$

4. The emf of a battery is 1.5 V and its internal resistance is 0.75 Ω. The maximum power which it can deliver to any external circuit will be
   (1) 1.5 W   (2) 0.75 W
   (3) 2 W   (4) 1 W

5. A metallic circular loop of radius 'r' is placed in uniform magnetic field B acting perpendicular to the plane of the loop. After sometime the loop is changed into an ellipse of major and minor radius 'a' and 'b'. If total resistance of loop is R, charge flowing through loop during this process is

   (1) $\dfrac{B(\pi ab)}{R}$

   (2) $\dfrac{B(\pi ab - \pi r^2)}{R}$

   (3) $\dfrac{B\pi r^2}{R}$

   (4) $\dfrac{B\pi br}{R}$

6. The transmission cables from power stations are hundereds of miles long and their resistance is considerable. To reduce power dissipated by these wires, current may be carried at
   (1) enormous voltage
   (2) low voltage
   (3) moderate voltage
   (4) any values of voltage

7. The colour of a carbon resistor are brown, yellow, green as read from left to right. Resistance is
   (1) $(4 \times 10^4 \pm 5\%)\ \Omega$
   (2) $(14 \times 10^5 \pm 20\%)\ \Omega$
   (3) $(4 \times 10^4 \pm 20\%)\ \Omega$
   (4) $14 \times 10^5\ \Omega$

8. What is the work done in rotating a magnetic dipole of moment 2 amp-m^2 in a uniform magnetic field of $5\sqrt{2}$ Tesla from a position of 45° to zero potential energy position?
   (1) 10 J
   (2) $10(\sqrt{2} - 1)$ J
   (3) 5 J
   (4) None of these

9. A very long solenoid has $800/\pi$ turns per metre length. A current of 1.6 amp flows through it. The magnetic field induction at an end of the solenoid on the axis is
   (1) 8×10^{-4} Tesla
   (2) 2.56×10^{-4} Tesla
   (3) 32×10^{-4} Tesla
   (4) 4×10^{-4} Tesla

10. Figure shows a network of currents. Magnitude of currents is shown here. The current i will be

   (1) 3 A
   (2) 13 A
   (3) 23 A
   (4) − 3 A

11. The sum and the difference of self-inductances of two coils are 13 H and 5 H respectively. If mutual inductance of two coils is 3H, coefficient of coupling is
   (1) 0.6
   (2) 0.5
   (3) 1
   (4) 0.8

12. A conducting wire carrying no current is placed in an external uniform magnetic field. Consider the following two statements
    (A) Free electrons in the conductor experience magnetic force
    (B) Magnetic force on the wire is zero
    (1) Both (A) and (B) are true
    (2) Both (A) and (B) are false
    (3) (A) is true but (B) is false
    (4) (B) is true but (A) is false

13. Above curie point a Ferromagnetic material becomes
    (1) Diamagnetic
    (2) Paramagnetic
    (3) Non magnetic
    (4) None of these

14. A bar magnet of dipole moment 100 emu-cm^2 is free to rotate in a uniform magnetic field of strength 0.1 T. Torque required to keep it in a direction making an angle 37° with the magnetic field is
    (1) 3×10^{-4} Nm
    (2) 4×10^{-4} Nm
    (3) 6×10^{-3} Nm
    (4) 2×10^{-4} Nm

15. Match the physical quantities in column-I with their dimensions in column-II

Column-I		Column-II
a. Permeability of free space	p.	$[L^2A]$
b. Magnetic field	q.	$[ML^2T^{-2}]$
c. Magnetic moment	r.	$[MLT^{-2}A^{-2}]$
d. Torsion constant	s.	$[MT^{-2}A^{-1}]$

    (1) a-s, b-r, c-q, d-p
    (2) a-s, b-p, c-q, d-r
    (3) a-r, b-q, c-s, d-p
    (4) a-r, b-s, c-p, d-q

16. Which of the following statements is false?
    (1) In a simple battery circuit the point of lowest potential is negative terminal of the battery.
    (2) When two cells of different emf and no internal resistance are connected in parallel then the total current that will be flowing will be infinity.
    (3) The current in a circuit will be maximum when power consumed by the load is maximum.
    (4) Wheatstone bridge is most sensitive if all the arms of bridge have equal resistances.

17. Two identical inductance carry currents that vary with time according to linear laws (as shown in figure). The correct relation between the induced emf in two inductance is
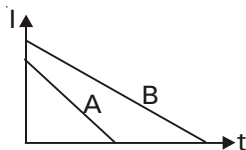
(1) $e_A > e_B$

(2) $e_A < e_B$

(3) $e_A = e_B$

(4) $e_A = 2e_B$

18. A charged particle is projected in a magnetic field of $(12\hat{i} - 3\hat{j})$ tesla and its acceleration is found to be $(2\hat{i} + x\hat{j})$ m/s^2. The value of x is

(1) 6

(2) 8

(3) 24

(4) 12

19.
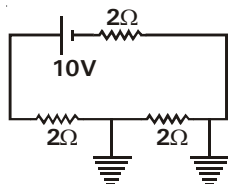
What is current supplied by cell in above figure?

(1) $\dfrac{2}{3}$ A

(2) $\dfrac{5}{4}$ A

(3) 5 A

(4) $\dfrac{5}{2}$ A

20. An alternating voltage $E = 141\sin(500\,t)$ volts is connected to a 1 microfarad capacitor through an ac ammeter. The reading of the ammeter shall be

(1) 100 mA

(2) 80 mA

(3) 50 mA

(4) 75 mA

21.
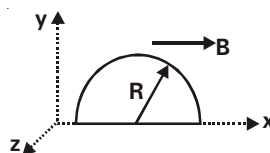
A semicircle conducting ring of radius R is placed in XY plane as shown in figure. A uniform magnetic field exists along x-axis. No current will flow if it moves along

(1) x-axis only

(2) y-axis only

(3) z-axis only

(4) any direction

22. Current density in a wire is 10 A/cm^2 and the electric field in the wire is 5 V/cm. Resistivity of material in S.I. units is

(1) 5×10^{-1}

(2) 200

(3) 4×10^{-3}

(4) 5×10^{-3}

23. Ratio of magnetic intensities for an axial point and a point on broad side-on position at equal distance d from the centre of magnet will be

(1) 1 : 1

(2) 2 : 3

(3) 2 : 1

(4) 3 : 2

24. **Assertion :** Iron filings are attracted strongly by the poles of a magnet.

Reason : Magnetic field around poles of a magnet is strong.

(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion

(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion

(3) Assertion is true statement but Reason is false

(4) Assertion is false

25.
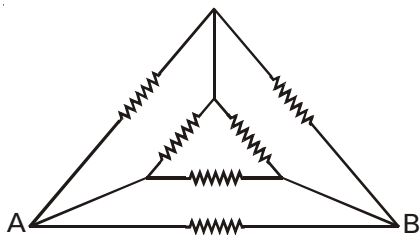
Six resistors each of resistance R are connected in the circuit as shown. The effective resistance between A and B is

(1) R/6   (2) zero

(3) 3R/5   (4) R/3

26. An alternating emf is applied across a resistance R, capacitance C and an inductance L independently. If I_R, I_L, I_C are the currents through R, L and C respectively, then the diagram which correctly represents, the phase relationship among I_R, I_L, I_C and source emf E, is given by
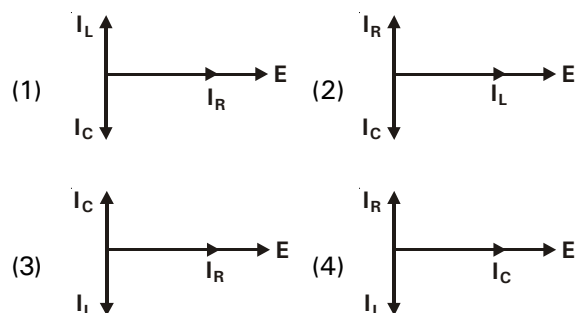
27. The deflection in a moving coil galvanometer for a given current flowing through it is

(1) directly proportional to the torsional constant

(2) directly proportional to the number of turns in the coil

(3) inversely proportional to the area of the coil

(4) inversely proportional to the magnetic field

28.
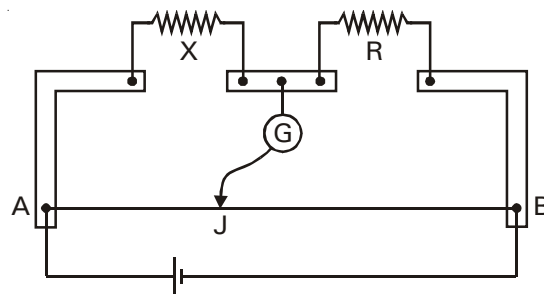
The figure shows a meter-bridge circuit, $X = 12 \ \Omega$ and $R = 18 \ \Omega$. The jockey J is at the null point. If R is made $8 \ \Omega$, through what distance will the jockey J have to be moved to obtain null point again?

(1) 10 cm   (2) 20 cm

(3) 30 cm   (4) 40 cm

29. Which of the following statements is true?

(1) The current flowing in two coaxial coils in the same direction. On increasing the distance between the two, the electric current will decrease

(2) Direction of induced e.m.f. during electromagnetic induction is given by Ampere's law.

(3) Energy stored in a pure inductance L when a current i flows through it, is $Li^2/4$.

(4) The equivalent quantity of mass in electricity is inductance.

30. Angle of dip at magnetic equator is

(1) 0°   (2) 45°

(3) 30°   (4) 90°

31. Magnetic field B along the axis of a finite straight solenoid is represented as
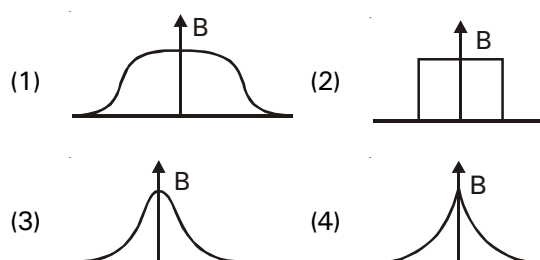
32. A charged particle is moving in a uniform magnetic field in a circular path of radius R. If energy of particle is doubled, then new radius will be

(1) 2 R
(2) $R\sqrt{3}$
(3) $R\sqrt{2}$
(4) 3 R

33. A magnet suspended in a vibration magnetometer makes 40 oscillations/minute in a city A. In another city B, the same magnet is found to make 60 oscillations/minute. The ratio of horizontal component of earth's magnetic field in city A to that in city B is

(1) 2 : 3
(2) 4 : 9
(3) $\sqrt{2}$: $\sqrt{3}$
(4) 9 : 4

34. Two long parallel wires carrying equal current separated by 8 m, exert a force of 10^{-7} N/m on one another. The current flowing through them is

(1) 2 A
(2) 2×10^{-7} A
(3) 1 A
(4) 1×10^{-7} A

35.
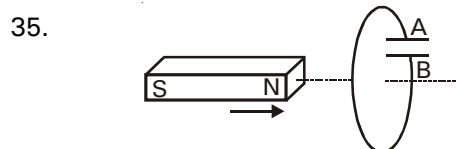
In the above situation which of the following statements is correct?
(1) Polarity of plate A will be positive w.r.t. plate B in the capacitor
(2) Polarity of plate A will be negative w.r.t. plate B in the capacitor
(3) Capacitor remains uncharged
(4) None of these

PHYSICS : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

36. The resistances of a wire at temperatures t°C and 0°C are related by

(1) $R_t = R_0 (1 + \alpha t)$
(2) $R_t = R_0 (1 - \alpha t)$
(3) $R_t = R_0 (1 + \alpha t)^2$
(4) $R_t = R_0 (1 - \alpha t)^2$

37.
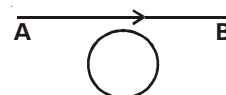
A current flowing from A to B first increases and then decreases in magnitude. The direction of induced current in the conducting loop is
(1) clockwise
(2) anticlockwise
(3) first clockwise and then anti clockwise
(4) first anticlockwise and then clockwise

38. **Assertion :** Out of galvanometer, ammeter and voltmeter, resistance of ammeter is lowest and resistance of voltmeter is highest.
Reason : An ammeter is connected in series and voltmeter in parallel in a circuit.
(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Assertion is false

39. A solenoid having 50 turns per centimeter carries a current of 1 A. A soft iron core inserted in the solenoid develops a magnetisation of 6×10^6 A/m. Then magnetising force inside the solenoid is

(1) 4000 A/m
(2) 300000 A/m
(3) 2000 A/m
(4) 5000 A/m

40.
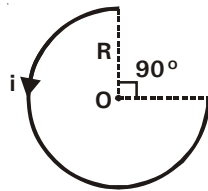
A current i ampere flows in a circular arc of wire whose radius is R, which subtends an angle $3\pi/2$ radian at its centre. The magnetic induction B at the centre is

(1) $\dfrac{\mu_0 i}{R}$

(2) $\dfrac{\mu_0 i}{2R}$

(3) $\dfrac{2\mu_0 i}{R}$

(4) $\dfrac{3\mu_0 i}{8R}$

41. Particles having negative charges occasionally come with high velocity from the sky towards the earth. On account of the magnetic field of earth, they would be deflected towards

(1) North   (2) South
(3) East   (4) West

42. A loop of irregular shape carrying current is located in an external magnetic field. If the wire is flexible
   (1) it changes to a circular shape
   (2) its shape remains same
   (3) it changes to an eliptical shape
   (4) it changes to a square shape

43.
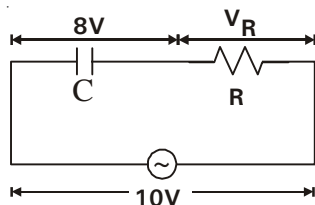
In a series CR circuit shown in figure, the applied voltage is 10 V and the voltage across capacitor is found to be 8V. Then the voltage across R, and the phase difference between current and the applied voltage will respectively be

(1) 6V, 53°   (2) 3V, 37°
(3) 6V, 45°   (4) none

44. A charged particle moves in a circular orbit with a uniform speed 'v'. If the magnetic field produced at the centre of the circle is B, then radius of the circle is proportional to

(1) $\sqrt{\dfrac{v}{B}}$

(2) $\sqrt{\dfrac{B}{v}}$

(3) $\dfrac{v}{B}$

(4) $\dfrac{B}{v}$

45. In the given potentiometer circuit having driver cell 12 V, null point is obtained at 20 cm mark. Resistance per unit length of the resistance wire AB is

(1) 10 Ω/m   (2) 8 Ω/m
(3) 5 Ω/m   (4) 2 Ω
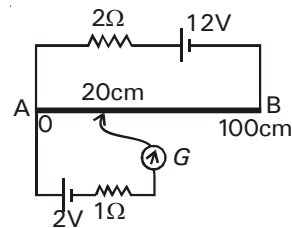
46.
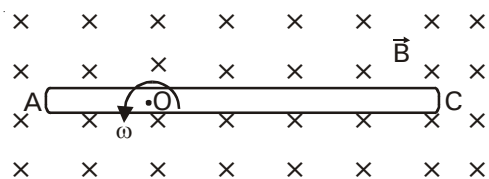
A conducting rod AC of length 5L is rotated about point O in a uniform magnetic field $\vec{B}$ directed into the paper. OA = 2L and OC = 3L. Then

(1) $V_A - V_0 = \dfrac{B\omega L^2}{2}$

(2) $V_0 - V_C = \dfrac{7B\omega L^2}{2}$

(3) $V_A - V_C = \dfrac{5B\omega L^2}{2}$

(4) $V_C - V_0 = \dfrac{3B\omega L^2}{2}$

47. Match the situations in column-I with posibility of induced current in column-II

Column-I	Column-II
a. A closed loop is held stationary in the magnetic field between north & south poles of two permanent very strong magnets held fixed, then	p. no current is induced
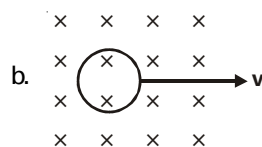
b.

circular loop moving out of uniform magnetic field to a field-free region with a constant velocity

q. induced emf is constant

c.
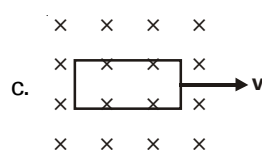
rectangular loop moving out of uniform magnetic field to a field-free region with a constant velocity

r. induced emf will vary

(1) a-p, b-q, c-r (2) a-q, b-p, c-r
(3) a-p, b-r, c-q (4) a-r, b-q, c-p

48.
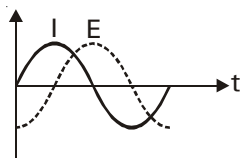
The variation of the instantaneous current and voltage for a circuit element in an ac circuit is shown above. The element is
(1) a resistor (2) a capacitor
(3) an inductor (4) any of these

49. At a Neutral point, which statement is false?
a. Magnetic field of the magnet is zero
b. Magnetic field of earth is zero
c. Magnetic field of magnet is perpendicular to field of earth
(1) both a & b (2) both b & c
(3) a, b & c (4) only c

50. A galvanometer gives full scale deflection with a current of 200mA. It is converted into an ammeter of range 5 ampere. The ratio of the resistance of ammeter to the shunt resistance used is
(1) 9 : 10 (2) 12 : 13
(3) 24 : 25 (4) 4 : 5

CHEMISTRY : SECTION-A

All questions are compulsory in section A

51. Electromagnetic separation is used in the concentration of
(1) copper pyrites (2) bauxite
(3) cassiterite (4) cinnabar

52. The alcohol which shall give most stable compound on dehydration is
(1) ethyl alcohol
(2) 1-phenylpropan-2-ol
(3) 4-phenylbutan-1-ol
(4) n-butyl alcohol

53. The standard reduction potential values of three metallic cations, X, Y, Z are 0.52, −3.03 and −1.18 V respectively. The order of reducing power of the corresponding metals is
(1) $Y > Z > X$ (2) $X > Y > Z$
(3) $Z > Y > X$ (4) $Z > X > Y$

54. The standard e.m.f. of a cell involving one electron change is found to be 0.591 V at 25°C. The equilibrium constant of the reaction is
(1) 10^{30} (2) 10^{5}
(3) 10^{10} (4) 10^{1}

55.
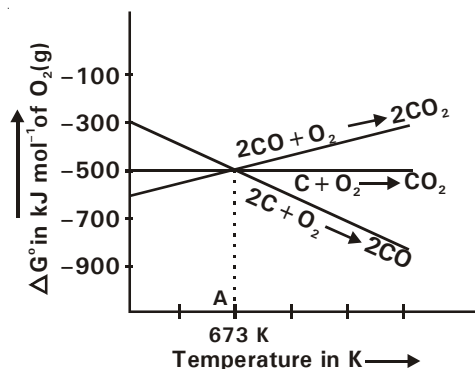
The correct statement is
(1) below point A, CO is better reducing agent than carbon
(2) as temperature rises tendency of carbon to get converted into CO increases
(3) above point A carbon is better reducing agent than CO
(4) all are correct

56. Silver acetate + Br_2 $\xrightarrow{CS_2}$ A (major)
The product A is
(1) CH_3–Br (2) CH_3COOCH_3
(3) CH_3COOH (4) CH_3COOAg

57. The order of reactivities of the following alkyl halides with Mg to form Grignard's reagent is
(1) R–F > R–Cl > R–Br > R–I
(2) R–F > R–Br > R–Cl > R–I
(3) R–Cl > R–Br > R–F > R–I
(4) R–I > R–Br > R–Cl > R–F

58. When aqueous $AgNO_3$ is electrolysed using inert electrodes, the products obtained at cathode and an anode respectively are
(1) H_2, O_2 (2) Ag, NO_2
(3) Ag, O_2 (4) H_2, NO_2

59. Absolute alcohol is
(1) 100% pure ethanol
(2) 95% alcohol + 5% H_2O
(3) Ethanol + water + phenol
(4) 95% ethanol + 5% methanol

60. What is major product of the following reaction?
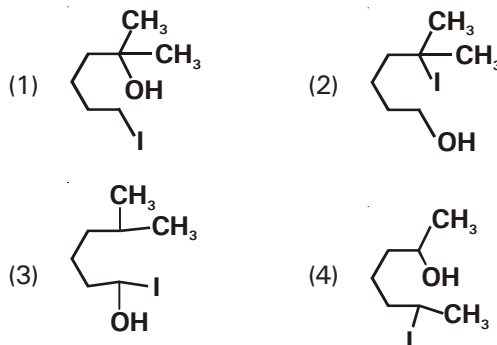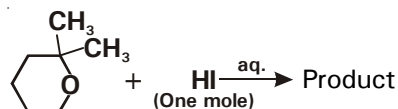
61. In the Froth Floatation process, zinc sulphide and lead sulphide can be separated by
(i) using collectors
(ii) adjusting the proportion of oil to water
(iii) using depressant
(iv) using froth stabilisers
(1) Both (ii) & (iv) (2) Both (i) & (ii)
(3) Both (i) & (iv) (4) Both (ii) and (iii)

62. Alkene R – CH = CH_2 reacts with B_2H_6 in the presence of H_2O_2 to give

(1) $R-\overset{\overset{\displaystyle O}{\|}}{C}-CH_3$ (2) $\underset{\underset{\displaystyle OH \quad OH}{|\quad\;|}}{R-CH-CH_2}$

(3) RCH_2CHO (4) RCH_2CH_2-OH

63. Acid catalysed hydrolysis of ester is a reversible and nucleophilic substitution process. During this process role of nucleophile is played by
(1) H_2O (2) OH^-
(3) NaOH (4) H_3O^+

64. Which of the following method is used for refining of metals used as semiconductors?
(1) van Arkel method (2) Zone refining
(3) Crystallization (4) Sublimation

65. An example of an oxide ore is
(1) copper glance (2) malachite
(3) cuprite (4) feldspar

66.
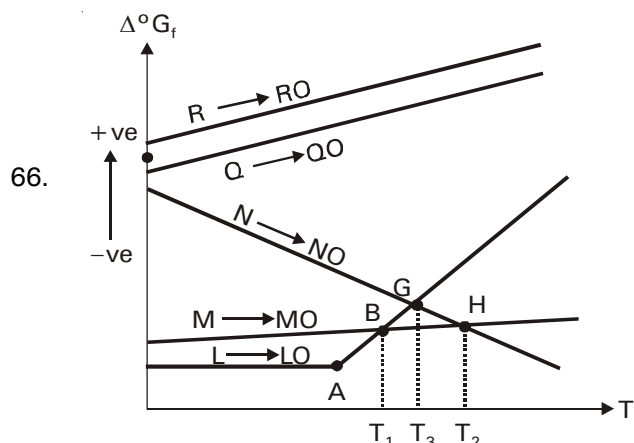
Which of the following can act as strongest reducing agent below $T_1 K$?

(1) L
(2) M
(3) Q
(4) R

67. **Assertion** : Sulphide ores are concentrated by Froth Flotation method.

Reason : Cresols stabilise the froth in Froth Flotation method.

(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Assertion is false

68. Extraction of zinc from zinc blende is achieved by

(1) electrolytic reduction
(2) roasting followed by reduction with carbon
(3) raosting followed by reduction with another metal
(4) roasting followed by self reduction

69. The oxidation potential of a hydrogen electrode at $pH = 1$ and $P_{H_2} = 1$ atm is

(1) 0.51 V
(2) 0.00 V
(3) $+0.59$ V
(4) 0.059 V

70. The increase in equivalent conductance of a weak electrolyte with dilution is due to

(1) increase in degree of dissociation and decrease in ionic mobility
(2) decrease in degree of dissociation and decease in ionic mobility
(3) increase in degree of dissociation and increase in ionic mobility
(4) decrease in degree of dissociation and increase in ionic mobility

71. Identify the false statement

(1) Kohlrausch law is valid for both strong & weak electrolytes
(2) Kohlrausch law is also called law of independent migration of ions
(3) Conductivity & resistivity remains same as concentration of electrolyte changes
(4) On dilution the number of ions per unit volume (that carry the current) decrease

72. The incorrect statement for nickel-cadmium cell is

(1) it has shorter life than lead storage cell
(2) it is more expensive than lead storage cell
(3) the product formed at anode is CdO(s)
(4) the product formed at cathode is $Ni(OH)_2(s)$

73. Match the terms given in Column I with the units given in Column II.

	Column-I		Column-II
i.	Λ_m	a.	S cm^{-1}
ii.	E_{Cell}	b.	m^{-1}
iii.	κ	c.	S cm^2 mol^{-1}
iv.	G^*	d.	V

(1) i-a, ii-d, iii-c, iv-b
(2) i-c, ii-a, iii-d, iv-b
(3) i-c, ii-b, iii-a, iv-d
(4) i-c, ii-d, iii-a, iv-b

74. $CH_3-\overset{\displaystyle |}{\underset{\displaystyle CH_3}{CH}}-CH=CH_2 + HBr \rightarrow A(Major)$

Product 'A' is

(1) $CH_3-\overset{\displaystyle |}{\underset{\displaystyle CH_3}{CH}}-\overset{\displaystyle |}{\underset{\displaystyle Br}{CH}}-CH_3$ (2) $CH_3-\overset{\displaystyle |}{\underset{\displaystyle CH_3}{CH}}-CH_2-CH_2-Br$

(3) $CH_3-\overset{\displaystyle \overset{\displaystyle Br}{|}}{\underset{\displaystyle \underset{\displaystyle CH_3}{|}}{C}}-CH_2-CH_3$ (4)   All of these

75. The reaction of 2-chlorobutane with aq.KOH produces
   (1) Butan-2-ol   (2) Butan-1-ol
   (3) 2-Methyl propan-2-ol   (4) 2-Methyl propan-1-ol

76. For which of the electrolyte, the value of equivalent conductance is the same as its molar conductance?
   (1) NaCl   (2) $BaCl_2$
   (3) H_2SO_4 (4) H_3PO_4

77. Treatment of ammonia with excess of ethyl chloride will yield
   (1) Diethyl amine
   (2) Ethane
   (3) Tetraethyl ammonium chloride
   (4) Methyl amine

78. The separation of $(\pm)$ lactic acid is
   (1) resolution   (2) racemisation
   (3) retention   (4) inversion

79. 1-phenyl 2-chloropropane on treating with alcoholic KOH gives mainly
   (1) 1-phenyl propene
   (2) 3-phenyl propene
   (3) 1-phenyl propanol-2
   (4) 1-phenyl propanol-1

80. E_2 fails for

   (1)   (2)

   (3)   (4)

81. **Statement A :** Aprotic polar solvent like DMSO and DMF favours SN^1 mechanism.
   Statement B : Allyl chloride is less reactive than n-propyl chloride toward nucleophilic sustitution reaction.
   (1) Both statement A & B are correct
   (2) Both statement A & B are incorrect
   (3) Statement A is correct, B is incorrect
   (4) Statement A is incorrect, B is correct

82. Highest rate of esterification with alcohols will be given by
   (1) HCOOH   (2) $(CH_3)_2CHCOOH$
   (3) $(CH_3)_3CCOOH$ (4) CH_3COOH

83. In Victor-Meyer test, red colouration is shown by
   (1) $1°$ alcohol   (2) $2°$ alcohol
   (3) $3°$ alcohol   (4) phenol

84. Oxidation of 1^0 alcohols can be stopped at aldehyde stage using
   (1) Collin's reagent   (2) PCC
   (3) $K_2Cr_2O_7$ (4) Either 1 or 2

85. Which has lowest solubility in water?

   (1) $CH_3CH_2CH_2CH_2OH$ (2) $CH_3\overset{\displaystyle \overset{\displaystyle CH_3}{|}}{CH}CH_2OH$

   (3) $HO\,H_2C-CH_3$ (4) $C_6H_5\,CH_2\,CH_2\,OH$

CHEMISTRY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

86. Which of the following is incorrect regarding classification of alcohols.
   (1) $-OH$ group is attached to sp^3 hybridised carbon next to the $C-C$ double bond in allylic alcohols.
   (2) Phenol is a type of vinylic alcohol.
   (3) Ethylene glycol is trihydric alcohol
   (4) Allylic and benzylic alcohols may be primary secondary or tertiary.

87. Match the compounds in column I with the reagents in column II used to separate them

Column-I	Column-II
a. Methyl chloride and chlorobenzene	(i) Na
b. Isopropyl alcohol and tertiary butyl alcohol	(ii) NaOI
c. Methanol and ethanol	(iii) $AgNO_3$ at room temperature
d. Ethanol and Diethyl ether	(iv) HCl conc. + anhyd. $ZnCl_2$

(1) a–(iii), b–(iv), c–(ii), d–(i)
(2) a–(iii), b–(iv), c–(i), d–(ii)
(3) a–(iii), b–(ii), c–(iv), d–(i)
(4) a–(ii), b–(iv), c–(iii), d–(i)

88. **Assertion:** Anisole on reaction with HI gives phenol and CH_3I.

Reason : Phenolic oxygen bond is stronger than methyl-oxygen bond in anisole and hence is not cleaved by HI.

(1) Both Assertion and Reason are true & reason is correct explanation of assertion.

(2) Assertion is true but Reason is false.

(3) Both Assertion and Reason are true but reason is not correct explanation of assertion.

(4) Assertion is false.

89. The blue colour of copper sulphate disappears on adding zinc granules to it. It is because of

(1) oxidation of Zn^{2+}

(2) reduction of Cu^{2+}

(3) oxidation of Cu atoms

(4) reduction of Zn^{2+}

90. Which one of the following is commonly used as a lewis acid in groove's process?

(1) NaI   (2) BF_3

(3) Ag^+ (4) $ZnCl_2$

91. Which one(s) of the following is/are factor for lesser reactivity of haloarenes ?

(1) Resonance effect

(2) Stability of carbocation

(3) Bond strength of C–X bond

(4) All of these

92. How many faradays are required to reduce 1 mol BrO_3^- to Br^-?

(1) 3   (2) 5

(3) 6   (4) 4

93. Consider the following reaction.

i. $(CH_3)_3CBr \xrightarrow[\text{EtOH}]{\text{EtO}^-\text{Na}^+}$

ii. $(CH_3)_3CBr \xrightarrow{\text{Pure EtOH}}$

Which of the following statements is true regarding these reactions?

(1) Both give the same major product

(2) The products in both are isomers of each other

(3) Major product in (i) is formed by SN reaction

(4) The major product in (ii) is an ether

94. Which of the following is likely to give a precipitate with cold $AgNO_3$ solution

(1) CCl_4 (2) C_2H_3Cl

(3) $(CH_3)_4N^+Cl^-$ (4) $CHCl_3$

95. The most reactive towards both S_{N^1} and S_{N^2} is

(1) R-F   (2) R-I

(3) R-Cl   (4) R-Br

96. A compound X with molecular formula C_3H_8O can be oxidised to a compound Y with the molecular formula $C_3H_6O_2$. X is most likely to be

(1) Primary alcohol   (2) Secondary alcohol

(3) Aldehyde   (4) Ketone

97.

$$CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2-NH_2 \xrightarrow{\text{NaNO}_2\text{(aq)} + \text{HCl}}$$

The major product in the reaction is

(1) $CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2OH$ (2) $CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-OH$

(3) $CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2Cl$ (4) none of these
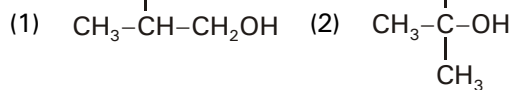
98. The reaction between an ester and excess of Grignard reagent cannot result in formation of
(1) 1° alcohol (2) 2° alcohol
(3) 3° alcohol (4) both (2) and (3)

99. Maximum number of moles of HI required to react

with 1 mole of (benzene ring with OCH_3, OCH_3, OCH_3 substituents)

(1) 3 (2) 6
(3) 9 (4) 5

100 Alcohol is less volatile than an ether having the same molecular formula. This is due to
(1) Dipolar character of ether
(2) Resonance in alcohol
(3) Inter-molecular hydrogen bonding in alcohol
(4) Inter-molecular hydrogen bonding in ether

ZOOLOGY : SECTION-A

All questions are compulsory in section A

101. Methanogens
(1) are aerobes of the primary sludge
(2) occur in rumen of cattle and help in digestion of cellulose
(3) produce gases like CH_4, CO_2, H_2S
(4) both (2) and (3)

102. A small part of activated sludge from settling tank is
(1) Pumped into anaerobic sludge digester to serve as inoculum
(2) suitable for release into rivers and streams
(3) Pumped into aeration tank to serve as inoculum
(4) Rich in floating debris and stable particles

103. **Assertion :** Biochemical oxygen demand is a value that indicates polluting potential of water.
Reason : Biochemical oxygen demand is direct measure of organic matter present in water
(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Assertion is false

104. Which of the following is a correct statement about the origin of antibody diversity?
(1) Antigen exposure is necessary prior to the generation of the antibody's combining site for antigen
(2) Only one class of antibody can be prepared against one antigen
(3) Antigen-binding specificity is developed early in the B-lymphocyte and in the absence of antigen
(4) B-cell and T-cell are different but still both are specific cytokine barriers

105. Match the following list of bioactive substances and their roles:

Bioactive Substance	Role
(i) Statin	(a) Removal of oil stains
(ii) Cyclosporin A	(b) Removal of clots from blood vessels
(iii) Streptokinase	(c) Lowering of blood cholesterol
(iv) Lipase	(d) Immuno-suppressive agent

Choose the correct match:
(1) i-b, ii-c, iii-a, iv-d (2) i-d, ii-b, iii-a, iv-c
(3) i-d, ii-a, iii-d, iv-c (4) i-c, ii-d, iii-b, iv-a

106.

Botanical name	Common name	Product obtained
Erythroxylum	(i)	(ii)
(iii)	Hemp plant	(iv)
(v)	(vi)	LSD

Name (i)–(vi) in the given table and choose the correct option:
(1) Coca plant, Cocaine, *Cannabis,* Bhang*, Claviceps*, Ergot fungus
(2) Coffee plant, Coke, *Theobroma*, Bhang*, Claviceps*, Ergot fungus
(3) Poppy*,* Tea, *Cannabis* , Coke, *Theobroma*, Coffee plant
(4) Coca plant, Coffee, *Cannabis,* Charas, *Theobroma,* Poppy

107. If you keep the sanitary system around yourself sound then the diseases which will not most probably break out are
    (1) cholera, diphtheria
    (2) cholera, deficiency diseases
    (3) cholera, dysentry
    (4) all of these

108. Identify the incorrect statement
    (1) Microbes are diverse– protozoa, bacteria & fungi
    (2) All microbes can be artifically cultured & their colonies are visible to naked eye
    (3) Several microbes are useful to man in diverse ways
    (4) Microbes are not visible to naked eye as these are less than 0.1mm

109. A correct pair of a plant ; part from which its product is obtained and its product is
    (1) *Papaver*   -   Latex of plant - Afeem
    (2) *Cannabis*   -   Plant resin   - Caffeine
    (3) *Claviceps*   -   Fruiting bodies - Ganja
    (4) *Erythroxylum* - Leaves   - LSD

110. Which of the following is incorrect statement?
    (1) Louis Pasteur by careful experimentation demonstrated that life comes only from pre-existing life.
    (2) In Galapagos island, from finches with original seed-eating features, many other forms with altered beaks arose, enabling them to become insectivorous and vegetarian finches.
    (3) In 1938, a fish caught in South Africa happened to be a Coelacanth which was thought to be extinct and these animals probably evolved into the first amphibians.
    (4) In the palaeozoic era, reptiles of different shapes and sizes dominated on earth.

111. Cancer cells are different from normal cells in that they
    a. possess oncogenes
    b. have lost property of contact inhibition
    c. possess irregular nucleus with abundant granules
    d. show more mitochondrial cristal and few lysosomes
    (1) a, b, c, d   (2) a, b, c
    (3) b, c, d   (4) a, c, d

112. Receptors for the drugs produced by the plant shown below are present in

    (1) central nervous system
    (2) gastro-intestinal tract
    (3) heart so affects the cardiovascular system of the body mainly
    (4) both (1) and (2)

113. What is common to pneumonia and common cold?
    (1) Both infect the upper respiratory passage
    (2) Fever, cough, headache, coughing, sneezing sore throat, fluid filled alveoli are common symptoms
    (3) Both are air borne
    (4) Both are transmitted by droplet infection as well as contaminated food and water

114. Which of the following are produced by bacteria ?
    (1) Acetic acid and butyric acid
    (2) Lactic acid and citric acid
    (3) Streptokinase
    (4) Both (1) and (3)

115. **Statement-A :** Adaptive radiation refers to evolution of different species from a common ancestor.
    Statement-B : Different structures evolving for the same function and have similarity can be examplified by sweet potato and potato.
    (1) Both statement A & B are correct
    (2) Both statement A & B are incorrect
    (3) Statement A is correct, B is incorrect
    (4) Statement A is incorrect, B is correct

116. Which of the following is correctly matched?
    (1) Free-living nitrogen fixing – *Nostoc* bacteria
    (2) symbiotic-N_2 fixing bacteria– *Azotobacter*
    (3) Mycorhiza association   – Pines & birches
    (4) None of these

117. In family tree of reptiles, A and B are respectively
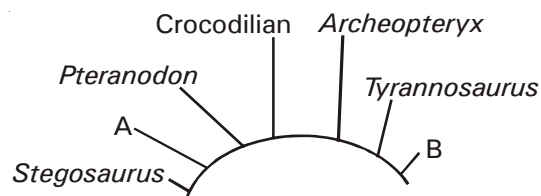
    (1) *Brachiosaurus, Triceratops*
    (2) *Triceratops, Icthyosaurus*
    (3) *Triceratops, Brachiosaurus*
    (4) *Brachiosaurus, Icthyosaurus*

118. Choose the incorrect pair:

	Product	Source / Character
(1)	Curd	*Lactobacillus*
(2)	Swiss cheese	*Saccharomyces cerevisae*
(3)	Toddy	Fermentation product from palm sap
(4)	Roquefort cheese	Ripened by a specific fungi

119. Study the graph given below and identify the correct set which represents primary (A) and anamnestic (B) response respectively
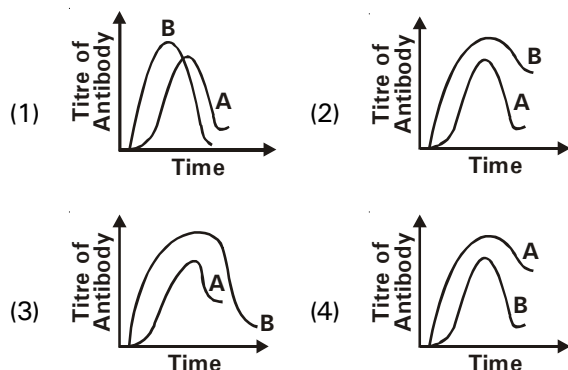
120. Which of the following options is correct

	Convergent evolution	Divergent evolution
(1)	Flippers of whale and penguin	Flipper of seal and fin of fish
(2)	Thorns of *Bougainvillea* and cladode of *Ruscus*	Eye of octopus and of mammals
(3)	Sting of honey bee and scorpion	Legs of Insects
(4)	Mouth parts of Insects	Sweet potato and potato

121. According to Oparin and Haldane formation of life was preceded by chemical evolution as
    (1) diverse inorganic molecules are formed from organic molecules
    (2) diverse inorganic molecules are formed from simple organic molecule
    (3) diverse organic molecules are formed from inorganic molecules
    (4) all of these

122. **Assertion :** Secondary immune response is quick and heightened as compared to the primary immune response.
    Reason : Memory of the first encounter with the antigen is retained in the body.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

123. Living modern day counter part organisms of Dinosaurs are
    (1) *Brachiosaurus*
    (2) *Tyrannosaurus rex*
    (3) *Triceratops*
    (4) Crocodile and Birds

124. **Statement-I** : Karl Ernst Von Baer stated that embryos never pass through adult stages of other animals.
    Statement-II : According to Ernst Haeckel, tadpole of *Rana tigrina* resembles fish.
    (1) Both statements I & II are correct
    (2) Both statements I & II are incorrect
    (3) Statements I is correct but statement II is incorrect
    (4) Statements I is incorrect but statement II is correct

125. Identify the correct statements regarding *Nostoc, Azotobacter* and *Rhizobium*
    (1) All are free living bacteria
    (2) *Rhizobium* is and *Azotobacter* are prokaryotes while *Nostoc* is eukaryotic alga
    (3) All three are symbionts in the roots of higher plants
    (4) *Rhizobium* can fix nitrogen symbiotically while others do so as free living forms

126. How many of the following compounds were formed in Miller's experiment ?
    HCN, Aspartic acid, Lactic acid, NH$_3$, Glycine, Pyrimidine, Alanine, Formic acid, Pigments, Uracil
    (1) Eight   (2) Seven
    (3) Nine   (4) Six

127. In the diagram given below, A, B & C respectively are
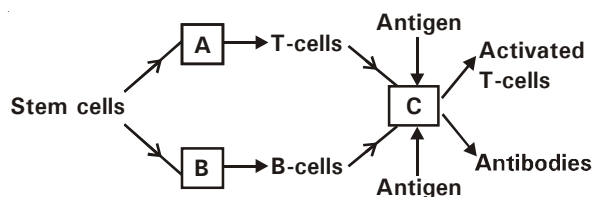
    (1) Bone marrow, thymus & spleen
    (2) Spleen, Bursa fabricus & lymph node
    (3) Thymus, Bone marrow & lymph node
    (4) Thymus, Lymph node & Bone marrow

128. Identify the group of drugs responsible for depressing the functions of CNS
    (1) Heroin, Cocaine, Barbiturates
    (2) Morphine, Benzodiazepines, Codeine
    (3) LSD, Caffiene, Bhang
    (4) Charas, Novocaine, Smack

129. What is true for Darwin's finches?
    (1) Their original stock was insectivorous
    (2) They show adaptive convergence
    (3) They are naturally selected group of birds in Galapagos islands
    (4) All of the above

130. How many of the following are applicable to analogous structures?

    Common adaptation, Similar habitat, Divergent evolution, Common ancestor, Similiar internal organisation, Similar development, Similar function

    (1) two   (2) three
    (3) four   (4) six

131. Choose the correct option

	Barrier type	Examples	Exception
(1)	Physiological barriers	Saliva, tears, HCl in stomach	Tears
(2)	Cellular barriers	Neutrophils, monocytes, NK cells	NK cells
(3)	Physical barriers	Skin, mucous coating in GIT, interferons	Interferons
(4)	Cytokine barriers	Interferon, compliment system	None

132. Correct sequence of events of HIV taking control of the cellular machinery will be
    a. virus progeny is produced
    b. reverse transcriptase produces dsDNA
    c. viral RNA and enzymes enter cell
    d. viral genes are transcribed and translated to produce viral proteins
    e. viral DNA integrates with host DNA
    (1) c - b - e - d - a   (2) a - b - e - d - c
    (3) c - e - d - b - a   (4) a - e - b - d - c

133. *Ascaris* and *Wuchereria* are similar in that both are
    (1) intestinal parasites
    (2) pathogenic helminths
    (3) transmitted by female mosquito vectors
    (4) both (1) & (2)

134. Immunosuppressive agent used in organ transplant is _____ that is obtained from _____
    (1) Streptokinase ; Yeast
    (2) Bioactive substance ; *Trichoderma*
    (3) Bacterial extract ; *Acetobacter*
    (4) Cyclosporin A ; *Aspergillus*

135. Represented below is the transmission pattern of some disease in human. Which one of the following could be an example?
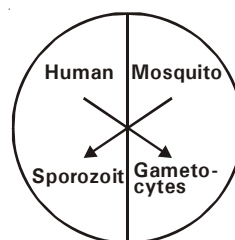
    (1) Dengue   (2) Filariasis
    (3) Malaria   (4) both (2) and (3)

ZOOLOGY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

136. Find the incorrect statement
    (1) Evolutionary biology is the study of history of life forms on earth
    (2) When we look at stars on a clear night sky we are looking back in time
    (3) Stellar distances are measured in light years
    (4) The universe is very old−almost 5-7 billion years old

137. How many of the following are associated with the infection of *Haemophilus influenzae* ?
    Flu, Pneumonia, Droplet infection, Fever, Chill, Difficulty in breathing, Degeneration of motor neurons, Widal test
    (1) Three   (2) Four
    (3) Five   (4) Six

138. Identify A, B, C and D in the given diagram of HIV
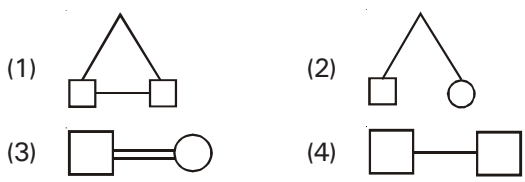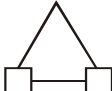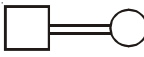
	A	B	C	D
(1)	Lipid bilayer	Glycoprotein spikes	Protein coat	DNA
(2)	Glycoprotein spikes	Lipid Bilayer	Protein coat	RNA
(3)	Glycoprotein spikes	Protein coat	Lipid bilayer	Reverse transcriptase
(4)	Protein coat	Lipid bilayer	Glyco protein spikes	RNA

139. What is not true about Big bang theory?
    (1) It talks about single huge explosion
    (2) Expansion of universe and decrease in temperature
    (3) Formation of galaxies by expansion of gases
    (4) Formation of hydrogen and helium

140. Which of the following set of lymphoid organs provide the sites for interaction of lymphocytes with the antigen?
    (1) bone marrow and thymus
    (2) lymph nodes and spleen
    (3) tonsils and thymus
    (4) all of these

141. Symptoms like fever, inflammation, deformities and enlargement of limbs occur in
    (1) amoebiasis   (2) elephantiasis
    (3) ascariasis   (4) entritis

142. Choose the correct sequence of origin of different types of prokaryotes during evolution starting from earliest to recent
    a. Chemoheterotrophs
    b. Anoxygenic photoautotrophs
    c. Chemoautotrophs
    d. Cyanobacteria
    (1) b → a → d → c   (2) a → b → d → c
    (3) a → c → b → d   (4) b → c → a → d

143. Primary treatment of sewage include
    a. filteration and sedimentation
    b. physical removal of small and large particles
    c. Microbial breakdown of organic waste
    d. separation of primary sludge
    (1) a, b, c & d   (2) a, b & c
    (3) b, c & d   (4) a, b & d

144. **Statement-I :** *Tyrannosaurus rex* was about 20 feet in height and had huge fearsome dagger like teeth.
    Statement-II : About 165 mya, the dinosaurs suddenly disappeared from the earth.
    (1) Both statements I & II are correct
    (2) Both statements I & II are incorrect
    (3) Statements I is correct but statement II is incorrect
    (4) Statements I is incorrect but statement II is correct

145. Stanley miller in an experiment synthesized simple amino acids like _____ from CH_4, H_2 and ammonia in the ratio _____ using water vapours
    (1) Glycine; 1:2:2
    (2) Alanine 1 : 1 :2
    (3) Aspartic acid ;2:2:1
    (4) Threonine, 2:1:2

146. **Statement-I** : In 1938, a fish caught in South Africa happened to be a Coelacanth which was thought to be extinct.
    Statement-II : Lobefins evolved into the first amphibians.
    (1) Both statements I & II are correct
    (2) Both statements I & II are incorrect
    (3) Statements I is correct but statement II is incorrect
    (4) Statements I is incorrect but statement II is correct

147. What all is related with cancer?
    a. Reduction in the T-helper lymphocytes mainly
    b. Biopsy and histopathological studies of a tissue.
    c. Increase in leucocyte count
    d. Pap test
    e. Hypersensitivity of a person towards environmental pollutant
    (1) a, b, d   (2) a, c, e
    (3) b,c ,d   (4) b, c, e

148. A disease whose vector is an arthropod and pathogen is a virus is
    (1) chikungunya   (2) trichomoniasis
    (3) measles   (4) mumps

149. Match the following
    a. Universal genetic code   (i) Anatomical evidence
    b. Antibodies in vertebrates (ii) Molecular evidence
    c. Living laboratory of evolution (iii) Biogeographical evidence
    d. Vertebrate brain   (iv) Physiological evidence
    (1) a−(ii); b−(iii); c−(i); d−iv
    (2) a−(iv); b−(ii); c−(iii); d−i
    (3) a−(ii); b−(iv); c−(iii); d−i
    (4) a−(iii); b−(ii); c−(iv); d−i

150. Which of the following is correct w.r.t. *Entamoeba histolytica*?
    a. Active form feeds on RBCs, mucosa and submucosa of colon
    b. Cramps, stools with excess mucous and blood
    c. Female *Anopheles* acts as mechanical carrier
    d. Parasite in large intestine of human
    (1) a, b, c are correct
    (2) a, b, d are correct
    (3) a, c, d are correct
    (4) a, b, c, d are correct

BOTANY : SECTION-A

All questions are compulsory in section A

151. Conditions of a karyotype 2n ± 1 and 2n ± 2 are called
    (1) Aneuploidy (2) Polyploidy
    (3) Allopolyploidy (4) Monosomy

152. **Assertion :** Translocations do not involve change in number of chromosomes.
    Reason : During translocation a part of a chromosome becomes detached and joins a part of a nonhomologous chromosome.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

153. Which of the following symbol in pedigree analysis represents a dizygotic twin?
    (1)   (2)
    (3)   (4)

154. Down syndrome is due to
    (1) Trisomy of 21st pair autosome
    (2) monosomy of 21st pair autosome
    (3) Trisomy of 18th pair autosome
    (4) monosomy of 18th pair autosome

155. Parents having blood group A and B, can have a child with blood group O if their genotypes are
    (1) $I^A i$ and $I^B i$ (2) $I^A I^A$ and $I^B i$
    (3) $I^A i$ and $I^B I^B$ (4) $I^A i$ and ii

156. Chromosomes replicate semi-conservatively was proved experimentally by .... on ....
    (1) Meselson and Stahl, *E. coli*
    (2) Taylor *et al, E coli*
    (3) Taylor *et al, Vicia faba*
    (4) Watson and Crick, *E. coli*

157. DNA as an acidic substance present in nucleus was first identified by
    (1) Hofmeister in PMC
    (2) Friedrich Meischer in 1869
    (3) Friedrich Meischer in 1853
    (4) Friedrich Meischer in 1879

158. In a DNA strand, nucleotides are linked together by
    (1) glycosidic bonds
    (2) phosphodiester bonds
    (3) peptide bonds
    (4) hydrogen bonds

159. *Escherchia coli* has
    (1) 5386 nucleotides (2) 48502 bp
    (3) 3.3×10^9 bp (4) 4.6×10^6 bp

160. Thymine is also known as
    (1) 5-methyl uracil (2) 3-methyl uracil
    (3) uracil (4) 5-methyl cytosine

161. The DNA dependent DNA polymerases catalyse polymerisation only in one direction, that is
    (1) $5' \leftarrow 3'$ (2) $5' \rightarrow 3'$
    (3) $3' \rightarrow 3'$ (4) $5' \rightarrow 5'$

162. Requirement of an adapter molecule for translation was proposed by
    (1) Francis Crick (2) Aaron Klug
    (3) James Watson (4) Robert Holley

163. How many coding codons are present in the genetic code?
    (1) 64 (2) 20
    (3) 61 (4) 60

164. Which of the following characteristics represent 'Inheritance of blood groups' in humans?
    a. Dominance   b. Co-dominance
    c. Multiple allele
    d. Incomplete dominance
    e. Polygenic inheritance
    (1) a, c and e (2) b, d and e
    (3) b, d and a (4) a, b and c

165. Which pair always segregates independently of another pair?
    (1) Chromosome (2) Genes
    (3) Alleles (4) All of these

166. Each metaphasic chromosome is made up of chromatids whose number is
    (1) 2 (2) 3
    (3) 4 (4) 6

167. Barr body is
    (1) facultative heterochromatin in human female
    (2) facultative euchromatin in human male
    (3) constitutive heterochromatin in human female
    (4) constitutive heterochromatin in human male

168. The NOR has genes coding for
    (1) 28 s mRNA
    (2) 28 s, 18s, 5.8 s mRNA
    (3) 28 s, 18 s, 5.8 s rRNA
    (4) 13, 14, 15, 21, 22 chromosomes

169. In a given cross of brown body red eyed male with yellow body white eyed female in *Drosophila*, the number of parental types are
    (1) 60%   (2) 75%
    (3) 100%   (4) 98.7%

170. The number of linkage group in a species corresponds to _____ number of chromosomes
    (1) haploid   (2) diploid
    (3) triploid   (4) tetraploid

171. **Statement I** : In eukaroyotes primary transcript contains both exons and intron.
    Statement II : Primary transcript is often larger than functional RNAs in eukaryotes .
    (1) Both statement I and statement II are correct
    (2) Both statement I and statement II are incorrect
    (3) Statement I is correct but statement II is incorrect
    (4) Statement I is incorrect but statement II is correct

172. In capping, mGppp is added to the
    (1) 5′ end of m-RNA   (2) 3′ end of hn-RNA
    (3) 5′ end of hn-RNA   (4) 5′ end of DNA

173. Hershey and Chase provided indisputable proof that DNA is genetic material because
    (1) bacteria, infected with viruses having radio active protein coat were radioactive
    (2) bacteria, infected with viruses having radioactive DNA, were radioactive
    (3) bacteria, infected with viruses having radioactive DNA did not show any radioactivity
    (4) all of these

174. A chromosome carrying the centromere at one of the ends is
    (1) acentric   (2) acrocentric
    (3) telocentric (4) metacentric

175. Which among the following r-RNA is common to prokaryotic and eukaryotic ribosomes w.r.t. its size?
    (1) 16s−r-RNA   (2) 5s−r-RNA
    (3) 23s−r-RNA   (4) 28s−r-RNA

176. A core of nucleosome contains the following group of histone proteins :
    (1) H_2A, H_2A, H_2B, H_4.   (2) H_1, H_2A, H_2B, H_3.
    (3) H_2, H_2, H_3, H_4.   (4) H_3, H_2A, H_2B, H_4.

177. Study the following diagram carefully and label a, b, c, d and e respectively
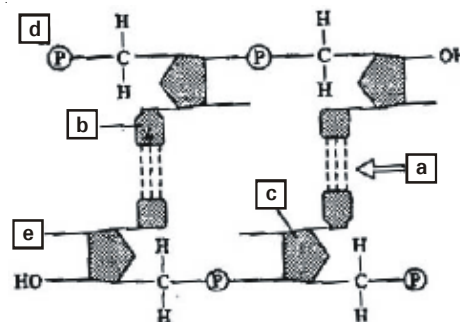
    (1) Glycosidic bond, N-base, ribose sugar, 5′-P, 3′-OH group
    (2) Hydrogen bond, N−base, deoxyribose sugar, 5′-P, 3′-OH group
    (3) Hydrogen bond, N−base, ribose sugar, 5′-P, 2′-OH group
    (4) Hydrogen bond, N−base, deoxyribose sugar, 5′-P, 2′-H group

178. **Assertion :** In grasshopper sperms are responsible for sex determination.
    Reason : In grasshoppers two types of sperms are present, one containing X chromosome and other lacking it.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

179. During DNA replication, the term leading strand is applied to the one which replicates in
    (1) 5′ → 3′ direction continuously towards the fork
    (2) 5′ → 3′ direction continuously away from the fork
    (3) 5′ → 3′ direction discontinuously towards the fork
    (4) 3′ → 5′ direction discontinuously away from the fork

180. Which is correct statement w.r.t. Haemophilia?
    a. Heterozygous female carrier may transmit the disease to sons
    b. The possibility of a female being a haemophilic is extremely rare
    c. Queen Victoria was a carrier of the disease
    d. Heterozygous female carriers do not transmit the disease to sons
    (1) both b & c only   (2) both a & d only
    (3) a, b, c but not d   (4) a, b, c & d

181. Which of the following is modern central dogma of molecular biology?

(1) DNA $\xrightarrow{\text{Transcription}}$ RNA $\xrightarrow{\text{Translation}}$ protein

(2) DNA $\underset{\text{Reverse transcription}}{\overset{\text{Transcription}}{\rightleftarrows}}$ RNA $\xrightarrow{\text{Translation}}$ protein

(3) DNA $\xrightarrow{\text{Replication}}$ mRNA $\xrightarrow{\text{Translation}}$ protein

(4) DNA $\underset{\text{Transcription}}{\overset{\text{Reverse transcription}}{\rightleftarrows}}$ RNA $\xrightarrow{\text{Translation}}$ protein

182. If the frequency of an autosomal dominant allele is 0.4. Calculate the frequency of recessive phenotype in a population of 10,000
    (1) 6400   (2) 3600
    (3) 1200   (4) 1000

183. *Escherichia coli* cells are grown for many generation in a medium having heavy nitrogen ^{15}N. They are then transferred to a medium having ^{14}N. How many bands are expected in CsCl density gradient after two rounds of replication (assuming replication to be conservative type)?
    (1) one   (2) two
    (3) three   (4) zero

184. Match the following with their correct match
    i. UAA   a. Initiator
    ii. UGA   b. Ochre
    iii. UAG   c. Opal
    iv. AUG   d. Amber
    (1) i-b, ii-c, iii-d, iv-a   (2) i-c, ii-b, iii-d, iv-a
    (3) i-b, ii-d, iii-c, iv-a   (4) i-a, ii-d, iii-c, iv-b

185. The number of related changes caused by single gene is called
    (1) codominance   (2) pleiotropy
    (3) multiple allelism   (4) both (2) and (3)

BOTANY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

186. The number of hydrogen bonds in the DNA molecule of 150 base pairs having 60 AT pairs would be
    (1) 300   (2) 150
    (3) 390   (4) 490

187. Human height is controlled by _____ number of polygenes.
    (1) 3 pairs   (2) 25 pairs
    (3) 5 pairs   (4) 7 pairs

188. Match the terms column-I with column-II

	Column-I		Column-II
a.	Parental types	i.	Complete linkage
b.	Parentals = 100%	ii.	Through son
c.	Diandric	iii.	Distance
d.	C.O.F	iv.	Non-cross overs

    (1) a–iv, b–i, c–ii, d–iii   (2) a–i, b–ii, c–iii, d–iv
    (3) a–ii, b–iv, c–iii, d–i   (4) a–iii, b–i, c–iv, d–ii

189. Human karyotype is
    (1) parallel   (2) asymmetric
    (3) symmetric   (4) continuous

190. During thalassemia
    (1) one of the globin chain is produced in less amount
    (2) one of the globin chain is produced in twice amount
    (3) no globin chains are produced
    (4) all of the above

191. DNA replication results in
    (1) Two completely new DNA molecules
    (2) Two DNA molecules, each with one parental and one new strand
    (3) One new DNA molecule and one old molecule
    (4) Formation of one DNA and RNA molecule

192. Histones are rich in the basic amino acid residues
    (1) Lysine and Asparagine
    (2) Arginine and Alanine
    (3) Lysine and Arginine
    (4) Arginine and Glutamine

193. Which of the following statement is true ?
    (1) Henking who observed sex chromosomes for the first time named it as Y-body.
    (2) Both male and female organisms always have same chromosome number.
    (3) Male heterogamety is shown by *Drosophila* cockroaches and mammals.
    (4) Peacock shows male heterogamety

194. A polysome is
    (1) a group of several chromosomes
    (2) a group of ribosomes attached to m-RNA
    (3) The structure responsible for organisation of spindle pole
    (4) an organism in which the cells have more than the diploid level of DNA.

195. Streptomycin inhibits
    (1) prokaryotic translation
    (2) prokaryotic transcription
    (3) eukaryotic translation
    (4) eukaryotic transcription

196. **Assertion :** Human skin colour is an example of quantitative inheritance.
    Reason : It is controlled by one gene.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

197. The core enzyme constituting the *E.coli* RNA polymerase consists of following subunits
    (1) $\beta, \beta', \sigma, \alpha$
    (2) $\beta, \beta', 2\alpha, \omega$
    (3) $\beta, \beta', \sigma, \omega$
    (4) $\beta, \sigma, \alpha, \omega$

198. **Statement I** : In Pea seeds, if size of starch grain is considered then alleles show complete dominance.
    Statement II : In pea seeds, if seed shape is considered then alleles show incomplete dominance
    (1) Both statement I and statement II are correct
    (2) Both statement I and statement II are incorrect
    (3) Statement I is correct but statement II is incorrect
    (4) Statement I is incorrect but statement II is correct

199. Select the mismatch
    (1) RNA dependent DNA polymerase – Reverse transcription
    (2) DNA dependent RNA polymerase– Transcription
    (3) RNA dependent RNA polymerase – Primer synthesis
    (4) DNA dependent DNA polymerase – Replication

200. Template DNA sequence of GTAGCTTA is transcribed as
    (1) AUUCGAUG
    (2) UAAGCUAC
    (3) CAUCGAAU
    (4) GUAGCUUA

Dated : 16-08-2022

M.L. Syal's Helix Institute

S.C.O. 343-345, Top Floor, Sector 34-A, Chandigarh. Ph : 0172-2623155

XII cum Competition Course for Medical – Test - 9 (Revision)

1.	(3)	51.	(3)	101.	(4)	151.	(1)
2.	(3)	52.	(2)	102.	(3)	152.	(1)
3.	(1)	53.	(1)	103.	(3)	153.	(2)
4.	(2)	54.	(3)	104.	(3)	154.	(1)
5.	(2)	55.	(4)	105.	(4)	155.	(1)
6.	(1)	56.	(1)	106.	(1)	156.	(3)
7.	(2)	57.	(4)	107.	(3)	157.	(2)
8.	(1)	58.	(3)	108.	(2)	158.	(2)
9.	(2)	59.	(1)	109.	(1)	159.	(4)
10.	(3)	60.	(2)	110.	(4)	160.	(1)
11.	(2)	61.	(4)	111.	(2)	161.	(2)
12.	(1)	62.	(4)	112.	(4)	162.	(1)
13.	(2)	63.	(1)	113.	(3)	163.	(3)
14.	(3)	64.	(2)	114.	(4)	164.	(4)
15.	(4)	65.	(3)	115.	(1)	165.	(1)
16.	(3)	66.	(1)	116.	(3)	166.	(1)
17.	(1)	67.	(2)	117.	(3)	167.	(1)
18.	(2)	68.	(2)	118.	(2)	168.	(3)
19.	(4)	69.	(4)	**119.**	**(2)**	169.	(4)
20.	(3)	70.	(3)	120.	(3)	170.	(1)
21.	(4)	71.	(3)	121.	(3)	171.	(1)
22.	(4)	72.	(1)	122.	(1)	172.	(3)
23.	(3)	73.	(4)	123.	(4)	173.	(2)
24.	(2)	74.	(3)	124.	(1)	174.	(3)
25.	(4)	75.	(1)	125.	(4)	175.	(2)
26.	(3)	76.	(1)	126.	(4)	176.	(4)
27.	(2)	77.	(3)	127.	(3)	177.	(4)
28.	(2)	78.	(1)	128.	(2)	178.	(1)
29.	(4)	79.	(1)	129.	(3)	179.	(1)
30.	(1)	80.	(2)	130.	(2)	180.	(3)
31.	(1)	**81.**	**(2)**	131.	(3)	181.	(2)
32.	(3)	82.	(1)	132.	(1)	182.	(2)
33.	(2)	83.	(1)	133.	(2)	183.	(2)
34.	(1)	84.	(4)	134.	(2)	184.	(1)
35.	(1)	85.	(4)	135.	(3)	185.	(2)
36.	(1)	86.	(3)	136.	(4)	186.	(3)
37.	(4)	87.	(1)	137.	(3)	187.	(3)
38.	(2)	88.	(1)	138.	(2)	188.	(1)
39.	(4)	89.	(2)	139.	(3)	189.	(2)
40.	(4)	90.	(4)	140.	(2)	190.	(1)
41.	(4)	91.	(4)	141.	(2)	191.	(2)
42.	(1)	92.	(3)	142.	(3)	192.	(3)
43.	(1)	93.	(4)	143.	(4)	193.	(3)
44.	(1)	94.	(3)	144.	(3)	194.	(2)
45.	(1)	95.	(2)	145.	(3)	195.	(1)
46.	(3)	96.	(1)	146.	(1)	196.	(3)
47.	(3)	97.	(2)	147.	(3)	197.	(2)
48.	(2)	98.	(1)	148.	(1)	198.	(2)
49.	(3)	99.	(1)	149.	(3)	199.	(3)
50.	(3)	100.	(3)	150.	(2)	200.	(3)

PHYSICS : SECTION-A

All questions are compulsory in section A

1. In an ac circuit, voltage and current are given by
   V = 100 sin (100 t) volts,

   $$I = 100\sin\left(100t + \frac{\pi}{3}\right)mA .$$

   The power dissipated in circuit is
   (1) 10^4 watt   (2) 10 watt
   (3) 2.5 watt   (4) 5 watt

2. Stopping potential in a photoelectric experiment is 1V for metal A when light of wavelength 6000 Å is incident on it . Another metal B has work function 1eV more than metal A. When light of wavelength 3000 Å is incident on metal B, stopping potential will be about
   (1) 3 V   (2) 2.8 V
   (3) 1 V   (4) 2 V

3. A circuit when connected with ac supply consumes on an average only half of peak power. The phase difference between the applied voltage and the current in the circuit is
   (1) 30°   (2) 45°
   (3) 0°   (4) 90°

4. A choke coil has
   (1) High inductance and low resistance
   (2) Low inductance and high resistance
   (3) High inductance and high resistance
   (4) Low inductance and low resistance

5. The correct graph between the maximum energy of a photoelectron and the inverse of wavelength of the incident radiation is given by the curve

   (1)   (2)
   (3)   (4)
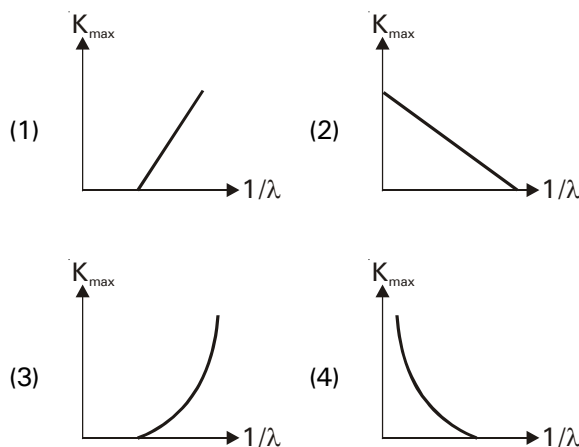
6. If frequency of incident radiations exceeds the threshold frequency, the photoelectric emission starts in a time of the order of
   (1) $\leq 10^{-6}$ s   (2) $\leq 10^{-9}$ s
   (3) $\leq 10^{-7}$ s   (4) $\leq 10^{-2}$ s

7. A resonant ac circuit contains a capacitor of capacitance $100\,\mu F$ and an inductor of 10m H. The frequency of electrical oscillations will be
   (1) 2000 Hz   (2) $\dfrac{1000}{\pi}$ Hz
   (3) $\dfrac{100}{\pi}$ Hz   (4) $\dfrac{500}{\pi}$ Hz

8. A coil has a power factor of 0.707 at 60 Hz. Then its power factor at 180 Hz will be

   (1) $\dfrac{1}{\sqrt{2}}$ (2) $\dfrac{1}{\sqrt{5}}$

   (3) $\dfrac{1}{\sqrt{10}}$ (4) $\dfrac{1}{\sqrt{3}}$

9. The energy of the photon is increased by a factor of four. Then its momentum
   (1) does not change
   (2) decreases by a factor of four
   (3) increases by a factor of four
   (4) decreases by a factor of two

10. A power transformer is used to step up an alternating e.m.f. of 220 V to 22 kV to transmit 11 kW of power. If the primary coil has 500 turns, what is the current rating of the primary? Assume 100% efficiency for the transformer
    (1) 10 A   (2) 5 A
    (3) 50 A   (4) 100 A

11. **Statement-I** : If a lamp consumes rated power in an a.c. circuit, the peak value of current through the lamp is more than the rated current.
    Statement-II : An alternating current of frequency 'f' is flowing in a circuit containing a resistance R and a choke L in series. The impedance of this circuit will be $\sqrt{R^2 + 4\pi^2 f^2 L^2}$.
    (1) Both statement-I and statement-II are correct
    (2) Both statement-I and statement-II are incorrect
    (3) Statement-I is correct but statement-II is incorrect
    (4) Statement-I is incorrect but statement-II is correct

12.
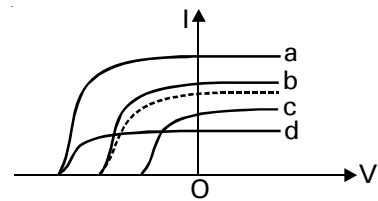
Graph of photoelectric current 'I' is plotted against potential difference V. The graph in the broken line represents one for a given frequency and intensity of the incident radiation. If the frequency is increased and the intensity is reduced, the curve which now represents the situation is
(1) a   (2) b
(3) c   (4) d

13. What is the de-Broglie wavelength of the α-particle accelerated through a potential difference V

    (1) $\dfrac{0.3}{\sqrt{V}}$ Å   (2) $\dfrac{12.27}{\sqrt{V}}$ Å

    (3) $\dfrac{0.1}{\sqrt{V}}$ Å   (4) $\dfrac{0.2}{\sqrt{V}}$ Å

14. Which of the following is correct w.r.t. ac voltage applied to a resistor?
    (1) In a pure resistor, the voltage and current are not in phase
    (2) Sum of the instantaneous current values over one complete cycle is finite
    (3) There is Joule heating and dissipation of electrical energy
    (4) Average power consumed is zero

15. Work function for a metal surface, whose threshold wavelength is 380 nm, is
    (1) 2.81 V   (2) 4.36 eV
    (3) 3.27 eV   (4) 2.17 eV

16. A particle starts to fall under gravity. Its de Broglie wavelength depend on time as
    (1) $\lambda \propto t$ (2) $\lambda \propto t^2$
    (3) $\lambda \propto t^{-1}$ (4) $\lambda \propto t^0$

17. A sinusoidal voltage of peak value 283 V and frequency 50 Hz is applied to a series LCR circuit in which $R = 3\,\Omega$, $L = 25.48$ mH and $C = 796\,\mu F$. What is the power dissipated in the circuit?
    (1) 2400 W (2) 3000 W
    (3) 3600 W (4) 4800 W

18.
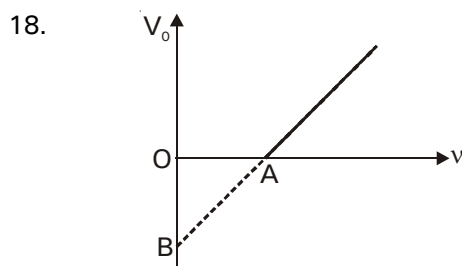
In the above graph plotted for a photoelectric experiment, the work function of the photoelectric surface is given by
    (1) (OB)e (2) (OA)e
    (3) slope of line AB (4) none of these

19. A resistor and a capacitor are connected to an A.C. supply of 200 volt, 50 hertz in series. The current in the circuit is 5 ampere. If the power consumed in the circuit is 200 watt, then power factor for the circuit is
    (1) 0.26 (2) 0.33
    (3) 0.5 (4) 0.2

20. **Assertion** : Two metals A and B have work function 2eV and 4eV respectively. Metal A has lower threshold of wavelength for photoelectric effect.

    Reason : $\phi_0 = h\nu_0 = hc/\lambda_0$

    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

21. First, protons are accelerated in a cyclotron. Then, α-particles are accelerated in the same cyclotron without changing any parameters of the cyclotron. The ratio of de-Broglie wavelength of emerging protons to that of emerging α-particles will be
    (1) 1 (2) 0.5
    (3) 2 (4) 4

22. Alternating current may be termed as 'wattless' in case of
    (1) all series LR circuits
    (2) all series RC circuits
    (3) all series LC circuits
    (4) series resonant LCR circuits

23. Which of the following statements is true?
    (1) Einstein's photoelectric equation states that $E_k = h\nu - \phi$. In this equation E_k refers to mean kinetic energy of the emitted electrons.
    (2) The photo-electrons emitted from a surface of sodium metal have same speed.
    (3) In a photon−electron collision, total energy and momentum are conserved.
    (4) When the kinetic energy of a proton is increased by 1%, de-Broglie wavelength decreases by 1%

24. A charged particle is moving in a region. Assuming no energy loss due to radiation, de-Broglie wavelength of particle will definitely change if the region contains only
    a. an electric field
    b. a uniform magnetic field
    c. a non uniform magnetic field
    d. a time varying magnetic field
    (1) a, b , c and d (2) b, c and d
    (3) a, c and d (4) a and d

25. Frequency and intensity of a light source are both doubled. Consider the following statements.
    (i) Saturation photocurrent remains almost same.
    (ii) The maximum kinetic energy of the photoelectrons is doubled.
    (1) Both (i) and (ii) are true
    (2) (i) is true but (ii) is false
    (3) (i) is false but (ii) is true
    (4) both (i) and (ii) are false

26. **Statement-I** : The number of photo-electrons emitted per second from a metal surface increases proportionally when the energy of incident photons increases.

   Statement-II : Stopping potential does not depend upon intensity of incident light.
   (1) Both statement-I and statement-II are correct
   (2) Both statement-I and statement-II are incorrect
   (3) Statement-I is correct but statement-II is incorrect
   (4) Statement-I is incorrect but statement-II is correct

27. Two particles A and B of de-Broglie wavelengths $3000\,Å$ and $7000\,Å$ moving in same direction, combine to form a particle C. The de Broglie wavelength of the particle C is
   (1) $5000\,Å$
   (2) $2100\,Å$
   (3) $4200\,Å$
   (4) $10000\,Å$

28. In photoelectric emission the stopping potential is plotted against the frequency ν of incident light. The resulting curve is a straight line which makes an angle θ with the ν-axis. Then $\tan\theta$ will be equal to (ϕ = work function)
   (1) h/e
   (2) e/h
   (3) $-\phi/e$
   (4) eh/ϕ

29. Match the figures for a given photosensitive material in column I with observations in column II.
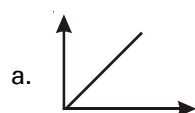
Column I		Column II
a.		p. graph between stopping potential and frequency of light
b.		q. graph between photoelectric current and intensity of light
c.		r. graph between photo-electric current and potential of collector plate
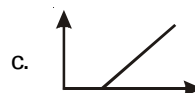
   (1) a-r, b-p, c-q
   (2) a-q, b-r, c-p
   (3) a-r, b-q, c-p
   (4) a-p, b-r, c-q

30.
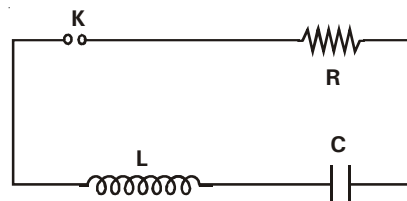
   In the circuit shown, capacitor is charged. When key K is closed, charge on the capacitor changes with time. This change is best represented as
   (1) an SHM
   (2) damped oscillations
   (3) forced oscillations
   (4) none of these

31. The stopping potential are V_1 and V_2 with incident lights of wavelengths λ and 2λ respectively. Then $V_1 - V_2 = ?$
   (1) $\dfrac{hc}{\lambda e}$
   (2) $\dfrac{2hc}{\lambda e}$
   (3) $\dfrac{hc}{2\lambda e}$
   (4) $\dfrac{he}{\lambda c}$

32. In an LCR series circuit, Q factor is 0.3. Now resistance is made double, inductance four times and capacitance one fourth of initial values. Q-factor for the circuit
   (1) remains 0.3
   (2) becomes 0.6
   (3) becomes 0.15
   (4) becomes 0.45

33. Which graph represent the variations of particle momentum & associated de-Broglie wavelength?
   (1)
   (2)
   (3)
   (4)
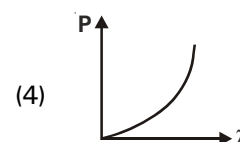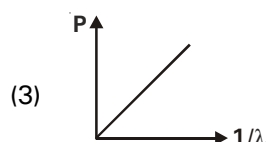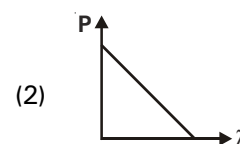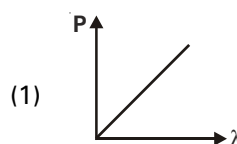
34. If momentum of a particle is increased by 100%, the de-Broglie wavelength
   (1) increases by 100%
   (2) decreased by 100%
   (3) increases by 50%
   (4) decreases by 50%

35. The equation $E = pc$ is valid (where E = energy, p = momentum, c = velocity of light)
    (1) for an electron as well as for a photon
    (2) for an electron but not for a photon
    (3) for a photon but not for an electron
    (4) neither for an electron nor for a photon

PHYSICS : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

36. In general in an alternating current circuit
    (1) The average value of current is zero
    (2) The average value of square of the current is zero
    (3) Average power dissipation is zero
    (4) The phase difference between voltage and current is zero

37. The threshold frequency for a certain metal is 4×10^{14} Hz. If light of frequency 8×10^{14} Hz is incident on the metal, what will be the cutoff voltage for the photoelectric emission?
    (1) 1.35 V   (2) 2.15 V
    (3) 1.65 V   (4) 1.95 V

38.
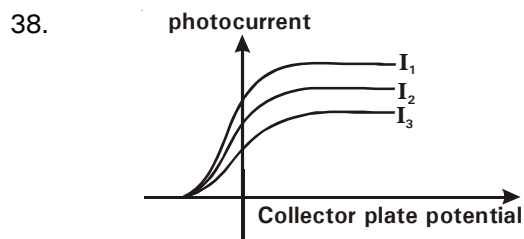
If a graph is plotted for variation of photocurrent with collector plate potential for different intensity of incident radiation, which relation is correct?
    (1) $I_1 = I_2 = I_3$ (2) $I_1 > I_2 > I_3$
    (3) $I_1 < I_2 < I_3$ (4) none of these

39. The momentum of photon of energy 2 MeV will approximately be
    (1) 10^{-21} kg-m/s   (2) 5×10^{-22} kg-m/s
    (3) 2×10^{-21} kg-m/s   (4) 5×10^{-21} kg-m/s

40. The transformer is use to light a 500 W, 220 V lamp from 2200 V mains. If the main current is 0.5 A, the efficiency of the transformer is
    (1) 11%   (2) 55%
    (3) 45.5%   (4) 39%

41. **Statement-I** : The number of photons in a beam of a particular intensity of light is directly proportional to the frequency.
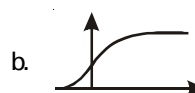   **Statement-II** : A photon of higher energy has higher velocity.
    (1) Both statement-I and statement-II are correct
    (2) Both statement-I and statement-II are incorrect
    (3) Statement-I is correct but statement-II is incorrect
    (4) Statement-I is incorrect but statement-II is correct

42. A particle of mass M at rest decays into two particles of masses m_1 and m_2, having non zero velocities. The ratio of the de Broglie wavelengths of the particles, λ_1/λ_2 is
    (1) $\dfrac{m_1}{m_2}$ (2) $\dfrac{m_2}{m_1}$
    (3) 1   (4) $\sqrt{\dfrac{m_2}{m_1}}$

43. An electron is moving with a velocity 6×10^7 m/s. If its de-Broglie wavelength is equal to the wavelength of photon, then ratio of kinetic energy of the electron to that of photon is
    (1) 1 : 4   (2) 1 : 5
    (3) 1 : 10   (4) 1 : 3

44.
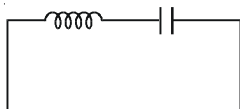
In an LC circuit, the capacitor has maximum charge q_0. The maximum value of current in the circuit is

(1) $\dfrac{q_0}{LC}$

(2) $\dfrac{q_0}{\sqrt{LC}}$

(3) $\dfrac{q_0}{LC} - 1$

(4) $0.5\dfrac{q_0}{\sqrt{LC}}$

45. Which of the following statements is true?
   (1) The choke coil in a circuit increases the current.
   (2) A bulb connected in series with a solenoid is connected to ac source. If a soft iron core is introduced in the solenoid, the bulb will glow brighter.
   (3) In an ac circuit, the power factor is unity when the circuit contains an ideal resistance only
   (4) For high frequency, a capacitor offers more reactance.

46. When orange light is incident on a surface, no electrons are emitted while blue light can emit. Photoemission may also take place if colour of incident light is
   (1) red
   (2) yellow
   (3) both 1 & 2
   (4) neither 1 nor 2

47. An attempt to decrease flux leakage loss may result in an increase in
   a. Joule heating in winding
   b. Eddy current loss
   c. Hysterisis loss
   (1) a, b and c
   (2) a and b
   (3) b and c
   (4) a and c

48. Match the cause of energy losses in transformers in column I with the procedure of minimizing those in column II.

Column I	Column II
a. Copper loss	p. winding primary & secondary coils one over other
b. Iron loss	q. using laminated core
c. Flux leakage	r. using thick wires

   (1) a-r, b-q, c-p
   (2) a-r, b-p, c-q
   (3) a-p, b-r, c-q
   (4) a-q, b-r, c-p

49. **Assertion** : de-Broglie wavelength associated with a moving electron is much longer than that associated with a proton having same speed.
   Reason : Mass of an electron is much smaller than that of a proton.
   (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
   (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
   (3) Assertion is true statement but Reason is false
   (4) Assertion is false

50. Light of intensity 10 W/m^2 and frequency 4×10^{14} Hertz is falling on a metal with a threshold wavelength of $1\,\mu m$. Assuming 1% of incident photons eject photoelectrons, saturation photo current from 1 cm^2 area of metal surface in photoelectric experimental arrangement will be about
   (1) 2 μA
   (2) 4 μA
   (3) 6 μA
   (4) zero

CHEMISTRY : SECTION-A

All questions are compulsory in section A

51. Which process yields phenol?
   (1) Schotten Baumann
   (2) Kolbe
   (3) Dow's
   (4) Reimer-Tiemann

52. When ethene is heated at 463-483 K under a pressure of 1000-2000 atm in presence of traces of peroxide, the product formed is
   (1) PVC
   (2) Synthetic rubber
   (3) LDPE
   (4) HDPE

53. After oxidation phenol gives
   (1) p–benzoquinone
   (2) catechol
   (3) phloroglucinol
   (4) anisole

54. Phenol $\xrightarrow[\text{2 } CO_2/140^\circ C]{\text{1. NaOH}}$ A $\xrightarrow{H^+/H_2O}$ B $\xrightarrow{Ac_2O}$ C

   In this reaction, the end product C is
   (1) salicyladehyde
   (2) salicylic acid
   (3) phenyl acetate
   (4) aspirin

55. Which of the following polymers has an aromatic monomer?
   (1) Melamine- formaldehyde resin
   (2) Bakelite
   (3) Terylene
   (4) All of these

56. The major product of reaction between phenol and PCl$_5$ is
    (1) chlorobenzene
    (2) triphenylphosphate
    (3) o-chlorophenol
    (4) p-chlorophenol

57. Schotten Baumann reaction is when
    (1) PhOH is reacted with CH$_3$COCl in presence of pyridine
    (2) PhOH is reacted with C$_6$H$_5$COCl in presence of H$_2$SO$_4$
    (3) PhOH is reacted with C$_6$H$_5$COCl in presence of NaOH
    (4) PhOH is reacted with (CH$_3$CO)$_2$O in presence of NaOH

58. Which of the following polymer is used to manufacture paints and lacquers?
    (1) Orlon
    (2) Nylon-6,10
    (3) Nylon-2- Nylon-6
    (4) Glyptal

59. Which does not form azo dye?
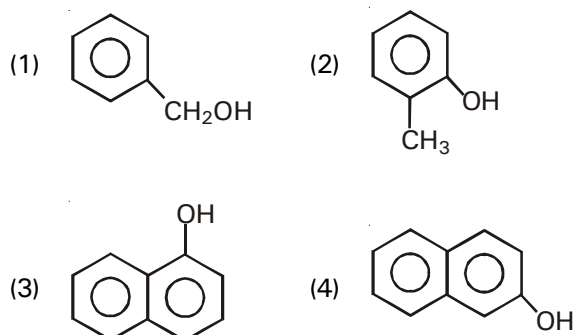
60. Phenols reacts with bromine in carbon disulphide to give
    (1) o - bromophenol
    (2) o & p-bromophenol
    (3) 2,4,6-tri bromophenol
    (4) p - bromophenol

61. **Statement-I** : Phenol and formaldehyde in acidic or basic medium form o- & p-(hydroxymethyl) phenol.
    Statement-II : The reaction between phenol and formaldehyde follow electrophilic substitution mechanism .
    (1) Both statement-I and statement-II are correct
    (2) Both statement-I and statement-II are incorrect
    (3) Statement-I is correct but statement-II is incorrect
    (4) Statement-I is incorrect but statement-II is correct

62. The major product of following reaction is (the product B)
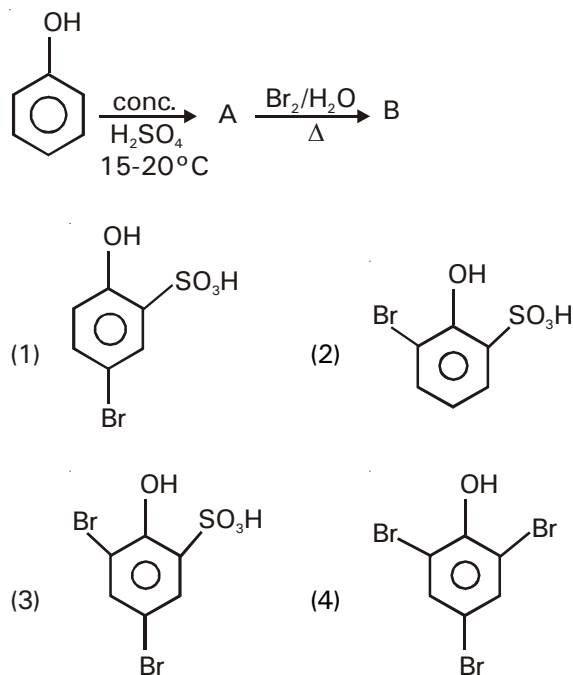
63. Sulphonation of phenol with conc. H$_2$SO$_4$ at 288-293 K gives
    (1) o-phenol sulphonic acid
    (2) p-phenol sulphonic acid
    (3) sulphanilic acid
    (4) picric acid

64. Which of the following is most likely to undergo both free radical and cationic polymerisation?
    (1) Ethene
    (2) Methyl acrylate
    (3) Acrylnitrile
    (4) Styrene

65. The compound with highest pKa is
    (1) Ethanol
    (2) p-Cresol
    (3) Phenol
    (4) p-Nitrophenol

66. **Assertion** : Condensation polymerisation is also called step-growth polymerisation.
    Reason : Each step produces a distinct functionalised species & is independent of each other.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

7   10PCZB/HMC-8/Helix-2022

67. Phenol is less acidic than _____ .
    (1) ethanol
    (2) *o*-nitrophenol
    (3) *o*-methylphenol
    (4) *o*-methoxyphenol

68. Which of the following is a condensation polymer?
    (1) Polythene
    (2) PVC
    (3) Orlon
    (4) Terylene

69. Match the column-I with column -II

Column -I	Column-II
i. Baby feeding bottles	a. Nylon 6
ii. Aircraft window glass	b. Perspex
iii. Tyre cords	c. Guttta percha
iv. Dentistry	d. Styrene

    (1) i-d,ii-b,iii-a,iv-c
    (2) i-b,ii-d,iii-a,iv-c
    (3) i-d,ii-c,iii-a,iv-b
    (4) i-d,ii-b,iii-d,iv-a

70. The product formed on heating benzene diazonium chloride with water is
    (1) Anisole
    (2) Phenol
    (3) Phenetole
    (4) Cresol

71. X is used in the controlled release of drugs. The monomers of X are
    (1) glycine and $\in$-aminocaproic acid
    (2) glycollic acid and lactic acid
    (3) 3-hydroxybutanoic acid and 3-hydroxy pentanoic acid
    (4) 3-hydroxybutanoic acid and 2-hydroxy pentanoic acid

72. Identify the correct statement(s) regarding Riemer Tiemann reaction
    a. It involves α-elimination
    b. It involves SE_{Ar}
    c. It involves SN
    d. Methylene carbene attacks as $E^{\oplus}$
    (1) a & b only
    (2) a, b, c only
    (3) only b
    (4) a, b, c, d

73. Phenol can be distinguished from ethanol by the reactions with _____ .
    (1) Br_2/water
    (2) Na
    (3) Neutral $FeCl_3$
    (4) Both (1) & (3)

74. Which one of the following reactions gives a good yield of the products?
    (1) PhOH $\xrightarrow{CH_3Cl, AlCl_3}$
    (2) PhOH $\xrightarrow{dil.HNO_3}$
    (3) PhOH $\xrightarrow{conc. HNO_3}$
    (4) None of these

75. **Statement-I** : Dextron and terylene are both polymers and can be regarded as polyesters.
    Statement-II: Dextron and terylene both are condensation and synthetic polymers .
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

76. SE_{Ar} reaction in phenol takes place at
    (1) 4- position
    (2) 3- position
    (3) 2- position
    (4) 2 and 4- position

77. Match the column

Column -I	Column-II
a. Phenol $\xrightarrow[KOH]{CHCl_3}$	i. Acetylation
b. Salicylic acid $\xrightarrow{CH_3OH}$	ii. Acid-base reaction
c. Salicylic acid $\xrightarrow{CH_3COCl}$	iii. Electrophillic substitution
d. Ph-OH + CH_3-Mg-Cl	iv. Esterification

    (1) a−iii, b−iv, c−i, d−ii
    (2) a−iii, b−ii, c−i, d−iv
    (3) a−ii, b−i, c−iii, d−iv
    (4) a−i, b−ii, c−iii, d−iv

78. Which of the following is not a semisynthetic polymer?
    (1) Nylon 6, 6
    (2) Cellulose nitrate
    (3) Cellulose acetate
    (4) Vulcanised rubber

79.

$$\xrightarrow{AlCl_3, \Delta} P$$

Product P is

(1)

(2)

(3)
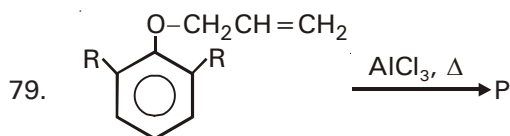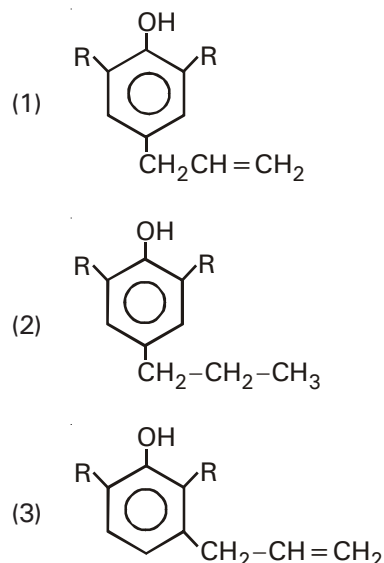
(4) none of these

80. The incorrect statement(s) regarding following sequence of reaction is/are
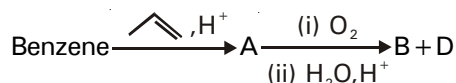
B is poisnous in nature

(1) Both B & D gives iodoform test
(2) B gives pink colour on condenstion with phthallic anhydride
(3) D can be used for acylation of phenol
(4) All are incorrect

81. Which one of the following causes effervescence with CO_3^{2-} or HCO_3^- ?

(1) Phenol
(2) 2,4-dinitrophenol
(3) 2,4,6-trinitrophenol
(4) Both (2) and (3)

82. Sodium salicylate with soda lime gives

(1) salicylic acid
(2) sodium phenoxide
(3) benzene
(4) none of these

83. When phenol is distilled with Zn dust, the main product is

(1) biphenyl
(2) benzene
(3) benzaldehyde
(4) phenol

84. **Assertion :** Resorcinol and benzoic acid can be distinguished by NaOH.

Reason : Resorcinol dissolves in NaOH.

(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Assertion is false

85. Ziegler - Natta - catalyst is used in preparation of

(1) low density polythene
(2) dacron
(3) high density polythene
(4) PVC

CHEMISTRY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

86. Most stable intermediate species formed when $\overset{+}{N}O_2$ attack on phenol is

(1)

(2)

(3)

(4) All are equally stable
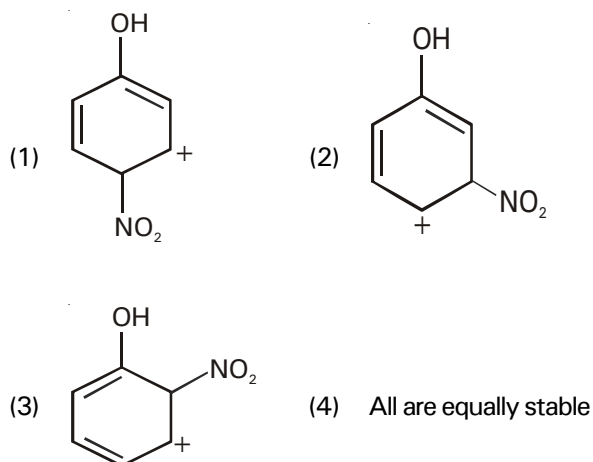
87. Identify the correct statement

   (1) Carbolic acid on nitrosation gives o-nitroso as major product

   (2) One molecule salol on hydrolysis with H_2O, H^+ gives two molecules of phenol

   (3) Fries rearrangement leads to formation of o- allyphenol

   (4) p-hydroxy benzylalcohol gives $FeCl_3$ test

88. **Assertion** : The nucleophile must be very strong for anionic polymerisation in alkenes.

   Reason : Styrene undergoes anionic polymerisation faster than vinyl cyanide

   (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion

   (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion

   (3) Assertion is true statement but Reason is false

   (4) Assertion is false

89. Which of the following is not true about coupling reaction of phenol?

   (1) p-hydroxyazobenzene is the major product
   (2) Phenoxide ion act as the nucleophile

   (3) p-nitrobenzenediazonium chloride will react slower than benzenediazonium chloride in this reaction

   (4) The reaction is used to identify phenol

90. When phenol reacts with ammonia in presence of $ZnCl_2$ at 400°C, it gives

   (1) Primary amine   (2) Secondary amine

   (3) Tertiary amine   (4) Both (2) and (3)

91. Consider the following compounds (I) and (II)

   (I)

   (II)
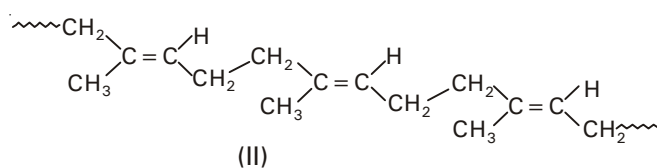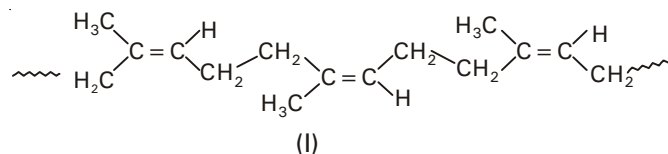
   Which of the following is true about the above two compounds (I) and (II)?
   (1) (I) has low water absorption capacity
   (2) (I) & (II) are geometrical isomers
   (3) (II) is neoprene
   (4) both (I) & (II)

92. Which one is a homopolymer?
   (1) Bakelite   (2) Nylon-6,6
   (3) Terylene   (4) Neoprene

93. Which of the following polymer can be formed by using the following monomer unit?
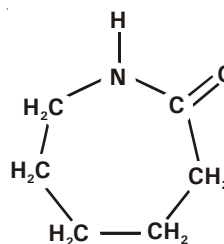
   (1) Nylon 6, 6   (2) PAN
   (3) Melamine polymer   (4) Nylon-6

94. Match the column-I with column-II and mark the appropriate choice

Column-I		Column-II	
a.	PVC	i.	Rubber
b.	Condensation polymer	ii.	Thermoplastic
c.	Polysaccharide	iii.	Dacron
d.	Elastomer	iv.	Natural polymer

   (1) a−ii, b−iii, c−iv, d−i   (2) a−i, b−ii,c−iv,d−iii
   (3) a−iii, b−iv, c−i, d−ii   (4) a−iv,b−i,c−iii,d−ii

95. Which of the following reagents leads to trisubstitution in phenol ?
    (1) Br_2, CS_2
    (2) Conc. HNO_3
    (3) CH_3Cl, $AlCl_3$
    (4) C_6H_5COCl, NaOH

96. **Statement I** : o-nitrophenol has more vapour pressure than p-nitrophenol.
    Statement II : Intramolecular hydrogen bonding is present in o-nitrophenol while intermolecular H-bonding is in p-nitrophenol.
    (1) Both statement-I and statement-II are correct
    (2) Both statement-I and statement-II are incorrect
    (3) Statement-I is correct but statement-II is incorrect
    (4) Statement-I is incorrect but statement-II is correct

97. Which one of the following shall react with aqueous NaOH?
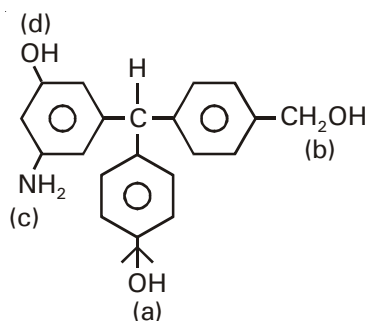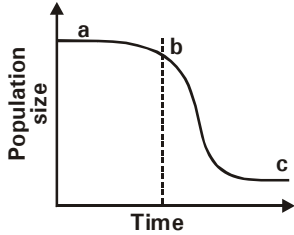
    (1) (a)
    (2) (b)
    (3) (c)
    (4) (d)

98. Increasing order of acidic character of phenol, ortho-cresol, meta-cresol, para-cresol is
    (1) ortho-cresol < para-cresol < meta- cresol < phenol
    (2) meta-cresol < phenol < ortho-cresol < para-cresol
    (3) para-cresol < meta-cresol < phenol < ortho-cresol
    (4) phenol < meta-cresol < ortho-cresol < para-cresol

99. Identify the mismatch

Initiator	Polymerisation
(1) BF_3	Cationic
(2) KNH_2	Anionic
(3) H_2O_2	Free radical
(4) $AlCl_3$	Free radical

100. Oil of wintergreen is obtained on treating A with B in acidic medium. A and B are
    (1) Salicylic acid and methanol
    (2) Salicylic acid and phenol
    (3) Phenol and Benzoyl chloride
    (4) Cumene and air

ZOOLOGY : SECTION-A

All questions are compulsory in section A

101. On which islands Wallace worked?
    (1) Galapagos
    (2) Malay Archipelago
    (3) Andaman and Nicobar
    (4) Australia

102. Which phenomenon accentuate variations leading to appearance of new species ?
    (1) Habitat fragmentation
    (2) Founder effect
    (3) Bottle neck effect
    (4) All of these

103. "It is based on chance events in nature & chance mutations in organisms". This statement can be applied to
    (1) Natural selection
    (2) Darwinian variations
    (3) Evolution
    (4) All of these

104. How many are applicable to a population in genetic equilibrium?
    a. Constancy of allelic frequency
    b. Lack of random mating
    c. Lack of natural selection
    d. No mutation
    e. Lack of migration
    (1) a, b, c, d & e
    (2) b, d & e
    (3) a, c, d & e
    (4) a, b & c

105. Which of the following statement is correct regarding evolution?
    (1) It is a direct process in the sense of determinism
    (2) It is a stochastic process which has a fixed direction
    (3) It is based on chance events in nature and chance mutation in organisms
    (4) Both (1) and (3)

106. **Statement-I :** Darwin stressed on continuous directional & minor variations as basis of evolution.
Statement-II : Organisms that survive are considered fit.
(1) Both statement-I and statement-II are incorrect
(2) Statement-I is correct but statement-II is incorrect
(3) Both statement-I and statement-II are correct
(4) Statement-I is incorrect but statement-II is correct

107. How many of the following statements are correct?
a. German shepherd breed of dog is less likely to be affected by natural selection
b. Variations in a population may be random but natural selection is not
c. Repeated migration between two populations can wipe out differences developing between them
d. Non random mating can alter allelic frequncies in a population
(1) One   (2) Two
(3) Three   (4) Four

108. A colony of bacteria growing on a given medium has built in variation in terms of ability to utilise a feed component. A change in medium composition would
(1) eliminate the bacterial colony
(2) bring out only that part of population that can survive under this conditions
(3) cause the formation of spores in bacterial colony
(4) have no effect at all on the bacterial colony

109. The novelty and brilliant insight of Darwin was that he asserted that variations are
(1) non inheritable and make resource utilization better for few individuals
(2) Inheritable and make resource utilizations better for few individuals
(3) inheritable and make some individuals to leave more progeny
(4) both (2) and (3)

110. Identify the correct statement
(1) Natural selection can create populations with different characteristics at different places
(2) Large discontinuous and random variations are called mutations
(3) Directional selection establishes an evolutionary trend
(4) All are correct

111. **Assertion :** Variations exist within all populations of sexually reproducing organisms.
**Reason :** One of the sources of variation in sexually reproducing organisms is mutation.
(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Assertion is false

112. According to Darwin, evolution is
(1) a sudden but discontinuous process
(2) a slow, gradual and continuous process
(3) a slow, sudden and discontinuous process
(4) a slow and discontinuous process

113. Artificial selection to obtain cows having high milk output represents.
(1) Directional selection as it removes the extreme variant from original milk yielding cows
(2) Stabilizing selection as it stabilizes this new variety in the population
(3) Sympatric speciation due to sudden mutation
(4) Directional selection as it pushes the mean of a character to one direction

114.

The graph illustrates changing population size in a small population of a certain species due to chance events. What is true for population at 'c'?
(1) Reduced genetic variation
(2) Increased homozygosity
(3) Genetic drift
(4) All of these

115. Some bacteria are able to grow in streptomycin containing medium due to
(1) pre-adaptive mutation
(2) induced mutation
(3) reproductive isolation
(4) genetic drift

116. How many of the given features describe variations discussed by Darwin
Minor, random, directionless, inheritable, small, discontinuous, abrupt
(1) 4   (2) 3
(3) 7   (4) 6

117. Fitness, according to Darwin refers to
(1) ability to defend
(2) dominance over others
(3) reproductive fitness
(4) ability to adapt

118. **Statement-I :** Homology is accounted for by idea of branching descent.
Statement-II : Branching descent is formation of species from a common ancestor.
(1) Both statement-I and statement-II are incorrect
(2) Statement-I is correct but statement-II is incorrect
(3) Statement-I is incorrect but statement-II is correct
(4) Both statement-I and statement-II are correct

119. Match the column - I with column - II. Choose the right option

Column I		Column II	
a.	Mutation	i.	multiple gene migrations
b.	Gene flow	ii.	changes in allele frequencies by chance
c.	Genetic drift	iii.	source of new alleles
d.	Natural selection	iv.	differences in survival and reproduction among variant individuals

(1) a-iv, b-ii, c-i, d-iii   (2) a-iv, b-iii, c-ii, d-i
(3) a-ii, b-iii, c-iv, d-i   (4) a-iii, b-i, c-ii, d-iv

120. Random genetic drift in a population probably results in
   (1) highly genetically variable individuals
   (2) inbreeding within this population
   (3) constant gene migration
   (4) formation of large variant population

121. The two key concept of Darwin theory of Evolution are
   (1) Branching descent and natural selection
   (2) Random and directionless variation
   (3) Use and disuse and inheritance of acquired character
   (4) Differential reproduction and isolation

122. **Statement- I** : Rate of evolution in a population depends on difference in allelic frequencies noticed over generations.
   Statement- II : Shorter life spans of organisms favour faster evolution.
   (1) Both statement-I and statement-II are correct
   (2) Both statement- I and statement-II are incorrect
   (3) Statement-I is correct but statement-II is incorrect
   (4) Statement-I is incorrect but statement-II is correct

123. What is common to gene migration & genetic drift?
   (1) Both operate only in small sized populations
   (2) Gene frequencies change in the populations in both
   (3) Both are non-random & directional
   (4) All of these

124. In an area completely free from smoke pollution white and melanic moths were introduced in the ratio of 50 :50 by a scientist. Which of the following correctly represents the recaptured sample of moths
   (1) more melanic than white
   (2) more white than melanic
   (3) melanic and white in the ratio 1 :1
   (4) cannot be said

125. Evolution by natural selection would have started when
   (1) microbes with ability of fast division originated
   (2) continental drift started operating
   (3) cellular form of life with difference in metabolic capacity arose
   (4) dinosaurs disappeared from the earth

126. **Assertion :** Gene for sickle cell anaemia is more common in African population.
   Reason : Heterozygous individual for sickle cell anaemia has survival advantage in malaria prevalent regions.
   (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
   (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
   (3) Assertion is true statement but Reason is false
   (4) Assertion is false

127. An isolated population of mice with approximately equal numbers of white and black members was disturbed by a calamity. Only a few white ones remained to form the next generation. This kind of change in the gene pool is called
   (1) gene migration
   (2) genetic recombination
   (3) blocked gene flow
   (4) genetic bottle neck effect

128. Ancestral giraffes had necks of varied length, long necked giraffes were found to be more suitable for obtaining foliage from trees. Therefore, competition led to the survival of long necked individuals. This supports.
   (1) Lamarck's theory   (2) Darwin's theory
   (3) De Vries theory   (4) None of these

129. Based on chance events and chance mutations in nature, the evolution is a
   (1) directed process   (2) determined process
   (3) stochastic process   (4) static process

130. Select the correct option
   (1) Survival in the struggle for existence is always random
   (2) Mutations are random and directional
   (3) Fitness is the end result of the ability to adapt and get selected by nature
   (4) The concept of branching descent opposes Darwin finches

131. Non melanic varieties were not spotted easily before industralisation
   (1) due to absence of smoke
   (2) due to absence of lichens
   (3) due to presence of thick growth of lichens
   (4) due to presence of thick soot

132. Amongst the given sets of characters which is not applicable to genetic drift
    (1) chance event, sampling error
    (2) non-directional, inbreeding
    (3) homozygosity, decrease in variations
    (4) directional, increase in variations

133. **Statement-I :** Natural selection is the survival and differential reproduction by those individuals which are better adapted to existing environmental conditions.
    Statement-II : Natural selection is supported by entomophily.
    (1) Both statement-I and statement-II are incorrect
    (2) Both statement-I and statement-II are correct
    (3) Statement-I is correct but statement-II is incorrect
    (4) Statement-I is incorrect but statement-II is correct

134. Geographic and reproductive isolations are most closely associated with
    (1) Extinction　　(2) Competition
    (3) Over production　(4) Speciation

135. The average circumference of sunflowers collected from an area is 5 cm. If stabilizing selection is operating then there would be sunflower with circumference of
    (1) 5 cm with fewer variations than before
    (2) 5 cm with greater variations than before
    (3) less than 5 cm with fewer variations
    (4) either less or more than 5 cm

ZOOLOGY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

136. Natural selection is based on certain observations which are factual. Which of following is not one of them?
    (1) Populations are stable in size except for seasonal fluctuations
    (2) Members of a species vary in characteristics & most of variations are inherited
    (3) Natural resources are limited
    (4) Struggle for existence

137. Which of the following is not an example of evolution by anthropogenic action?
    (1) DDT resistance in mosquitoes
    (2) Industrial melanism
    (3) Darwin's finches
    (4) Herbicide resistance in plants

138. **Statement-I :** Lichens can be used as industrial pollution indicators.
    Statement-II : Lichens grow in polluted as well as non polluted areas.
    (1) Both statement-I and statement-II are correct
    (2) Both statement-I and statement-II are incorrect
    (3) Statement-I is correct but statement-II is incorrect
    (4) Statement-I is incorrect but statement-II is correct

139. Find incorrect match
    (1) Darwin　　– origin of species
    (2) Malthus　　– principle of population
    (3) Wallace　　– principle of geology
    (4) Oparin　　– origin of life

140. Postulates of Lamarkism include
    (1) continuity of germplasm
    (2) natural selection
    (3) use and disuse of organs
    (4) reproductive isolation

141. Match the scientists in column-I with their contributions in column-II.

	Column I		Column II
a.	Lamark	p.	Natural selection
b.	Darwin	q.	Internal vital force
c.	August Weismann	r.	Mutations
d.	Hugo de vries	s.	Theory of continuty of germplasm

    (1) a−p; b−q; c−r; d−s
    (2) a−q; b−p; c−r; d−s
    (3) a−q; b−p; c−s; d−r
    (4) a−p; b−q; c−s; d−r

142. In a storm, sparrows with abnormally long or short wings were killed. Those which survived possessed normal wings and normal body proportion. The type of selection operating here is

143. Given : 1 = Inheritance of useful variations, 2 = variations ,3 = survival of the fittest; 4 = struggle for existence. According to Darwinism, which of the following represents the correct sequence of events in speciation?
    (1) 1, 2, 3, 4　　(2) 2, 3, 1, 4
    (3) 3, 4, 1, 2　　(4) 4, 2, 3, 1

144. **Assertion :** Genetic drift results in reduction in genetic variability of the population.

Reason : Sampling errors often leads to the elimination of certain alleles and fixation of others.
   (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
   (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
   (3) Assertion is true statement but Reason is false
   (4) Assertion is false

145. Postulates of "Modern theory" of evolution is/are
   (1) Mutations
   (2) Genetic recombination
   (3) Natural selection
   (4) All the above

146. How many of the following can lead to gene recombinations?
   a. Dual parentage
   b. Random union of gametes
   c. Chance seperation of chromosomes
   d. Crossing over during gametogenesis
   (1) 4   (2) 3
   (3) 2   (4) 1

147. When we describe story of life on earth we treat evolution as a
   (1) process
   (2) as a consequence of process called natural selection
   (3) end result of unknown process
   (4) divergence

148. Higher frequency of antibiotic resistant bacteria and DDT resistance in some insects are examples of
   (1) genetic drift
   (2) stabilizing selection
   (3) directional selection
   (4) disruptive selection

149. Which of the following is the first step in allopatric speciation?
   (1) Genetic drift
   (2) Hybridization
   (3) Geographical isolation
   (4) Formation of reproductive barrier

150. Due to clean air legislation in England, white moths are increasing in number.
   What is true for this in the light of industrial metanism?
   (1) White moths are coming out of their hiding places
   (2) No variant in a mixed population is wiped out
   (3) Changed background has caused development of mutations in moth
   (4) Now there is no competition between melanic and white moths

BOTANY : SECTION-A

All questions are compulsory in section A

151. The entire collection of plants/seeds having all the diverse alleles for all genes in a given crop is called
   (1) genome
   (2) germplasm collection
   (3) genetic variation
   (4) quarantine measures

152. Which of the following step of plant breeding is crucial to the success of breeding objective?
   (1) Collection of variability
   (2) Evaluation and selection of parents
   (3) Selection of superior recombinants among the progeny of hybrids
   (4) Testing of cultivar

153. A short sequence of DNA where the repressor binds preventing RNA polymerase from moving, is
   (1) regulator gene   (2) operator gene
   (3) promoter gene   (4) structural gene

154. 'y' gene of lac operon codes for the synthesis of the enzyme
   (1) β-galactosidase
   (2) transacetylase
   (3) lactose permease
   (4) tryptophan synthetase

155. How many structural genes are present in trp operon and lac operon respectively?
   (1) 3 and 3   (2) 5 and 3
   (3) 5 and 1   (4) 1 and 5

156. The product of regulator gene in trp operon is
   (1) a protein which directly binds to operator gene
   (2) an inactive protein
   (3) a protein which binds to promotor gene
   (4) broken down into glucose and galactose

157. *Lac* operon
   a. is a repressible operon
   b. is an inducible operon
   c. has polycistronic structural gene controlled by a common promoter
   d. is responsible for metabolism of lactose
   (1) b & d only   (2) a, b & c
   (3) a, b, c & d   (4) b, c & d

158. Identify the transversion substitution
   (1) $GC \rightarrow AT$ (2) $AT \rightarrow GC$
   (3) $AT \rightarrow CG$ (4) $AC \rightarrow GT$

159. Which genetic basis of proof about codons was proved by frame shift mutation?
   (1) Codons are triplet and read in a contiguous manner
   (2) Codons are universal
   (3) Degeneracy of codons
   (4) Unambiguous nature of codons

160. How many of the following mutagens induce mutations during replicating stages of DNA?
Nitrous acid, EES, Acridine, 5-Bromouracil, 5-iodouracil, DES
(1) 3   (2) 5
(3) 6   (4) 4

161. Which is the inducer of *lac* operon?
(1) Maltose   (2) Galactose
(3) Allolactose   (4) Glucose

162. Sickle cell anaemia is an example of
a. Point mutation   b. Transition
c. Transversion   d. Frame shift mutation
(1) a, c   (2) b, c
(3) a, b   (4) c, d

163.

Identify A, B, C, D & E respectivley from the above given diagram.
(1) Active repressor, monocistronic RNA, β-galactosidase, permease, transacetylase
(2) Inactive repressor, monocistronic RNA, β-galactosidase, permease, transacetylase
(3) Active repressor, polycistronic RNA, β-galactosidase, permease, transacetylase
(4) Inactive repressor, polycistronic RNA, β-galactosidase, permease, transacetylase

164. **Statement- I** : Plant breeding is purposeful manipulation of the plant species in order to create desired plant types
Statement- II : Better management practices and increase in acreage can increase yield but only to a limited extent,
(1) Both statement-I and statement-II are correct
(2) Both statement- I and statement-II are incorrect
(3) Statement-I is correct but statement-II is incorrect
(4) Statement-I is incorrect but statement-II is correct

165. Jacob and Monod first elucidated
(1) *Lac*-operon in *E.Coli*
(2) *Trp*-operon in *E.Coli*
(3) *Ara*-operon in *Streptococcus*
(4) *His*-operon

166. If *E. coli* is growing in culture medium which contain lactose but not glucose
(1) lac-operon remain switched off completely
(2) the synthesis of permease increases
(3) repressor protein remains attached with operator
(4) RNA polymerase stops transcription due to presence of lactose

167. Match the following

Column-I		Column-II	
a.	β-particles	i.	Frameshift mutation
b.	Alkylating agents	ii.	5 bromouracil
c.	Base analogues	iii.	Ethyl Ethane Sulphonate
d.	Acridine dyes	iv.	Physical mutagen

(1) a–i, b–iii, c–ii, d–iv   (2) a–iv, b–iii, c–ii, d–i
(3) a–iv, b–ii, c–iii, d–i   (4) a–i, b–ii, c–iv, d–iii

168. "Repressor of lac-operon is synthesised ___a___ from ___b___ . The Repressor protein binds to the operater region of operon and ___c___ RNA polymerase from transcribing the operon. Repressor is inactivated by interaction with ___d___ .
In the above paragrpah, what is a, b, c & d respectively?
(1) Non-constitutively, i gene, prevents, Inducer
(2) Constitutively, i gene, prevents, Inducer
(3) Constitutively, o gene, prevents, Inducer
(4) Constitutively, i gene, initiate, Inducer

169. The effect of mutation is minimum when
(1) one nucleotide is lost
(2) two nucleotides are lost
(3) one nucleotide is added
(4) complete codon is added

170. **Assertion :** Split-gene is a characteristic feature of eukaryotes.
Reason : The split-gene arrangement complicates the definition of a gene in terms of DNA segment.
(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Assertion is false

171. Identify the correct statement
(1) Regulation of lac operon is like regulation of enzyme synthesis by its own product
(2) In an operon, repressor binds to promoter and prevents RNA polymerase to bind
(3) β–galactosidase enzyme breaks galactose sugar
(4) Inactive repressor does not bind to operator

172. Sequence of structural genes in *E coli* – lac – operon is
    (1) ZYA
    (2) YZA
    (3) YAZ
    (4) ZAY
173. Which of the following statement is incorrect?
    (1) Cistron is segment of DNA coding for a polypeptide
    (2) Structural genes in a transcription unit are monocistronic in prokaryotes
    (3) Exons are said to be those sequences that appear in mature or processed mRNA
    (4) Non-constitutive genes can be inducible or repressible
174. **Statement- I :** *Trp* operon operates in catabolic pathway.
    Statement- II : It is involved with biosynthesis of tryptophan.
    (1) Both statement-I and statement-II are correct
    (2) Both statement- I and statement-II are incorrect
    (3) Statement-I is correct but statement-II is incorrect
    (4) Statement-I is incorrect but statement-II is correct
175. In prokaryotes, predominant site for regulation of gene expression is
    a. transcriptional level
    b. processing level (regulation of splicing)
    c. translational level
    d. transport of mRNA from nucleus to cytoplasm
    (1) a
    (2) b & d
    (3) a, b & d
    (4) a, b, c & d
176. How many statements are true?
    a. House keeping genes are those which are constantly expressing themselves
    b. Luxury genes are those which are switched on or off according to requirement of cellular activities
    c. In a transcription unit, the activity of RNA polymerase at a given promoter is in turn regulated by interaction with accessory proteins
    d. The accessibility of promoter regions of prokaryotic DNA is in many cases regulated by the interaction of proteins with operator
    (1) 4
    (2) 3
    (3) 2
    (4) 1
177. Find the incorrect match
    (1) Point mutation   – change in single base pair
    (2) Transition   – purine replaced by pyrimidine
    (3) Transversion   – pyrimidine replaced by purine
    (4) Frame shift mutation   – Insertion or deletion of one or two nucleotides

178. 'i-gene' in *lac* operon
    (1) codes for the repressor
    (2) is non-constitutive gene
    (3) refer to inducer
    (4) gives binding site to RNA polymerase
179. If there are 333 bases in an RNA that codes for a protein with 111 amino acids, and the base at position 301 is deleted such that the length of the RNA becomes 332 bases, how many codons will be altered?
    (1) 11
    (2) 33
    (3) 333
    (4) 1
180. Which of the following statements is incorrect?
    (1) A very low level of expression of lac operon has to be present in bacterial cell all the time
    (2) The development & differentiation of embryo into adult organism are a result of coordinated regulation & expression of several sets of gene
    (3) Genes which share certain common base sequences are called overlapping genes
    (4) Gene mutations were first recorded by Seth Wright in *Drosophila*
181. DNA template, TAC CAG GAT consists of 9 bases and 3 codons. Assume that 6th base 'G' is substituted by 'C'; the resulting mRNA and the polypeptide will show
    (1) change in one codon and one amino acid
    (2) change in one codon but not the amino acid
    (3) change in two codons and two amino acids
    (4) frame shift mutation
182. Lac operon is under negative regulation with respect to role of
    (1) Lactose
    (2) Allolactose
    (3) Repressor
    (4) Activator protein
183. Split genes are present in
    (1) *E.Coli*
    (2) λ -phage
    (3) *Drosophila*
    (4) TMV
184. **Assertion :** Sometimes the regulatory sequences are loosely defined as regulatory genes, even though these sequence do not code for any RNA or protein.
    Reason : Inheritance of a character is also affected by promoter and regulatory sequence of a structural gene.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false
185. For how many growing season is the selected plant material tested in farmer's field in different locations in the country ?
    (1) 3
    (2) 2
    (3) 1
    (4) 5

BOTANY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

186. Intron begins with _____ and end up with___
    (1) AG, GU
    (2) GA, GU
    (3) GU, AG
    (4) GU, GA

187. **Assertion :** Regulator gene of *Lac* operon produces active repressor.
    Reason : *Lac* operon shows both positive and negative regulation.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

188. In *trp* operon, the co-repressor is
    (1) tryptophan
    (2) lactose
    (3) β-galactoside
    (4) glucose

189. Chemical mutagen which can bring about alkylation of nitrogenous bases
    (1) nitrous acid
    (2) proflavin
    (3) DES
    (4) base analogue

190. When *E. Coli* is grown on a nutrient medium in which both glucose and lactose are added, then
    (1) lac-operon is switched on immediately
    (2) lac-operon remains switched off
    (3) lac-operon uses glucose only
    (4) bacteria uses both glucose and lactose

191. Mutations are characterised by all except
    (1) Change in the base sequence of cistron in reverse order is called inversion
    (2) Induced mutations arise due to certain intracellular factors
    (3) Smallest portion of a gene that can mutate is called muton
    (4) Inheritable change in mutant type to convert it into wild type is called reverse mutation

192. **Assertion :** In plant breeding programmes, usually only one in few hundred to a thousand crosses show the desirable combination.
    Reason : Sexual reproduction involves reshuffling of parental genes due to crossing over , independent assortment of chromosomes and random fertilization
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

193. The number of single base substitutions that can occur in the codon, ACA, are
    (1) 9
    (2) 5
    (3) 27
    (4) 6

194. What are introns?
    (1) Intervening sequence that do not appear in mature RNA
    (2) Introns are coding sequences
    (3) Non essential regions
    (4) Both (1) & (3)

195. Which of the following statements is false?
    (1) Apo-repressor of tryptophan operon is non-proteinaceous
    (2) Any physical or chemical factor which can cause mutation is called mutagen
    (3) Mutation can change DNA
    (4) Errors in replication causes spontaneous mutation

196. An inheritable change in original wild type is known as
    (1) forward mutation
    (2) backward mutation
    (3) reverse mutation
    (4) both (2) and (3)

197. Process of cross hybridisation does not involve
    (1) emasculation
    (2) selection of parents
    (3) bagging
    (4) exposure to gamma rays

198. Which of the following statement is incorrect w.r.t. *lac* operon?
    (1) *Lac* operon is switched on in the presence of lactose in the medium
    (2) *Lac* operon has its specific operator and specific repressor
    (3) β-galactosidase pumps lactose into the cell
    (4) The *lac* regulator gene, i gene, codes for a repressor that switches off the operon

199. Transposons are
    (1) segment of DNA which can move from one place to another in genome
    (2) discovered by Mc Clintock in maize
    (3) jumping genes
    (4) all are correct

200. Following is a constitutive gene
    (1) Lactose system in *E.Coli*
    (2) Tryptophan system in *E.Coli*
    (3) Nitrate reductase gene in plants
    (4) ATP-ase gene

Dated :
28-08-2022

M.L. Syal's Helix Institute

S.C.O. 343-345, Top Floor, Sector 34-A, Chandigarh. Ph : 0172-2623155

XII cum Competition Course for Medical – Test - 10

1.	(3)	51.	(3)	101.	(2)	151.	(2)
2.	(4)	52.	(3)	102.	(4)	152.	(3)
3.	(3)	53.	(1)	103.	(3)	153.	(2)
4.	(1)	54.	(4)	104.	(3)	154.	(3)
5.	(1)	55.	(4)	105.	(3)	155.	(2)
6.	(2)	56.	(2)	106.	(3)	156.	(2)
7.	(4)	57.	(3)	107.	(4)	157.	(4)
8.	(3)	58.	(4)	108.	(2)	158.	(3)
9.	(3)	59.	(1)	109.	(4)	159.	(1)
10.	(3)	60.	(2)	110.	(4)	160.	(3)
11.	(1)	61.	(1)	111.	(2)	161.	(3)
12.	(4)	62.	(4)	112.	(2)	162.	(1)
13.	(3)	63.	(1)	113.	(4)	163.	(4)
14.	(3)	64.	(4)	114.	(4)	164.	(1)
15.	(3)	65.	(1)	115.	(1)	165.	(1)
16.	(3)	66.	(1)	116.	(2)	166.	(2)
17.	(4)	67.	(2)	117.	(3)	167.	(2)
18.	(1)	68.	(4)	118.	(4)	168.	(2)
19.	(4)	69.	(1)	119.	(4)	169.	(4)
20.	(4)	70.	(2)	120.	(2)	170.	(2)
21.	(3)	71.	(3)	121.	(1)	171.	(4)
22.	(3)	72.	(2)	122.	(4)	172.	(1)
23.	(3)	73.	(4)	123.	(2)	173.	(2)
24.	(4)	74.	(4)	124.	(2)	174.	(4)
25.	(2)	75.	(1)	125.	(3)	175.	(1)
26.	(4)	76.	(4)	126.	(1)	176.	(1)
27.	(2)	77.	(1)	127.	(4)	177.	(2)
28.	(1)	78.	(1)	128.	(2)	178.	(1)
29.	(2)	79.	(1)	129.	(3)	179.	(1)
30.	(2)	80.	(4)	130.	(3)	180.	(4)
31.	(3)	81.	(4)	131.	(3)	181.	(2)
32.	(2)	82.	(2)	132.	(4)	182.	(3)
33.	(3)	83.	(2)	133.	(2)	183.	(3)
34.	(4)	84.	(4)	134.	(4)	184.	(1)
35.	(3)	85.	(3)	135.	(1)	185.	(1)
36.	(1)	86.	(3)	136.	(4)	186.	(3)
37.	(3)	87.	(4)	137.	(3)	187.	(2)
38.	(2)	88.	(3)	138.	(3)	188.	(1)
39.	(1)	89.	(3)	139.	(3)	189.	(3)
40.	(3)	90.	(1)	140.	(3)	190.	(2)
41.	(2)	91.	(2)	141.	(3)	191.	(2)
42.	(3)	92.	(4)	142.	(4)	192.	(1)
43.	(3)	93.	(4)	143.	(4)	193.	(1)
44.	(2)	94.	(1)	144.	(1)	194.	(4)
45.	(3)	95.	(2)	145.	(4)	195.	(1)
46.	(2)	96.	(1)	146.	(1)	196.	(1)
47.	(3)	97.	(4)	147.	(2)	197.	(4)
48.	(1)	98.	(1)	148.	(3)	198.	(3)
49.	(1)	99.	(4)	149.	(3)	199.	(4)
50.	(3)	100.	(1)	150.	(2)	200.	(4)

M.L. Syal's Helix Institute

S.C.O. 343-345, Top Floor, Sector 34-A, Chandigarh. Ph : 0172-2623155

Test Booklet Code

A

Name of Candidate : …………………………

Signature ……………

Roll No. : …………………………………

Batch : ………………

MM : 720

XII cum Competition Course for Medical
Test - 11

Time : 3 hrs. 20 min

|		
PHYSICS	:	ATOMS AND NUCLEI
CHEMISTRY	:	ALDEHYDES, KETONES & CARBOXYLIC ACIDS
ZOOLOGY	:	HUMAN EVOLUTION, PRINCIPLES AND PROCESSES OF BIOTECHNOLOGY-I
BOTANY	:	STRATEGIES FOR ENHANCEMENT IN FOOD PRODUCTION, ORGANISMS AND POPULATIONS-I

PHYSICS : SECTION-A

All questions are compulsory in section A

1. Rutherford's experiments on scattering of alpha-particle by thin foils established that
   a. most of the mass of an atom is located in its nucleus
   b. the nucleus of an atom has a positive charge
   c. the nucleus of an atom contains protons and neutrons
   d. the electrons revolve around the nucleus of an atom
   (1) both a & b
   (2) a, b, c & d
   (3) a, b & d but not c
   (4) a only

2. Rutherford's experiments suggested the size of the nucleus to be about
   (1) 10^{-15} m to 10^{-14} m
   (2) 10^{-18} m to 10^{-16} m
   (3) 10^{-24} m to 10^{-21} m
   (4) 10^{-12} m to 10^{-9} m

3. In a hydrogen atom, the binding energy of the electron in the n^{th} state is E_n, then the frequency of revolution of the electron in the nth orbits is:
   (1) $\dfrac{2E_n}{nh}$
   (2) $\dfrac{2nE_n}{h}$
   (3) $\dfrac{E_n}{nh}$
   (4) $\dfrac{nE_n}{h}$

4. If the electron in a hydrogen atom jumps from the fourth orbit to the second orbit, the emitted radiation has wavelength (R is the Rydberg's constant)
   (1) $\dfrac{36}{5R}$
   (2) $\dfrac{16}{5R}$
   (3) $\dfrac{6}{5R}$
   (4) $\dfrac{16}{3R}$

5. The half-life of ^{131}I is 8 days. Given a sample of ^{131}I at time $t = 0$, we can assert that
   (1) no nucleus will decay before $t = 4$ days
   (2) no nucleus will decay before $t = 8$ days
   (3) all nuclei will decay before $t = 16$ days
   (4) a given nucleus may decay at any time after $t = 0$

6. **Statement-I :** Energy spectrum of β-particles emitted in radioactive decay is continuous.
   Statement-II : A radioactive nucleus emits a beta particle. The parent and daughter nuclei are isobars.
   (1) Statement-I is incorrect but statement-II is correct
   (2) Both statement- I and statement-II are incorrect
   (3) Statement-I is correct but statement-II is incorrect
   (4) Both statement-I and statement-II are correct

7. Rest mass of the deuteron is equivalent to an energy of 1876 MeV, rest mass of a proton is equivalent to 939 MeV and that of a neutron to 940 MeV. A deuteron may disintegrate to a proton and a neutron if it
   (1) emits a γ - ray photon of energy 2 MeV
   (2) captures a γ - ray photon of energy 2 MeV
   (3) emits a γ - ray photon of energy 3 MeV
   (4) captures a γ - ray photon of energy 3 MeV

8. In reactors, reaction rate is controlled through control rods made out of neutron-absorbing material
   a. iron   b. heavy water
   c. cadmium
   (1) c only   (2) both a & b
   (3) a, b & c   (4) both b & c

9. Which of the following is correct regarding the binding energy per nucleon E_{bn}?
   (1) It is practically independent of the atomic number for nuclei of middle mass number $(30 < A < 170)$
   (2) E_{bn} is lower for both light and heavy nuclei
   (3) E_{bn} of the fused heavier nuclei is more than that of the lighter nuclei
   (4) All of these

10. The age of a rock containing lead and uranium is equal to 1.5×10^9 yrs. The uranium is decaying into lead with half life equal to 4.5×10^9 yrs. Find the ratio of lead to uranium present in the rock, assuming initially no lead was present in the rock. (Given $2^{1/3} = 1.259$)
    (1) 0.259   (2) 0.206
    (3) 0.145   (4) 0.102

11.
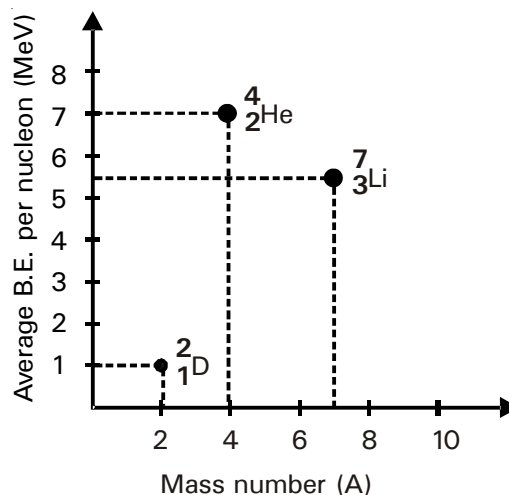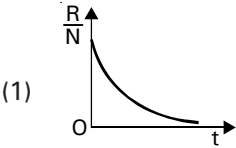
The positions of $^2_1$D, $^4_2$He and $^7_3$Li are shown on the binding energy curve as shown in figure. The energy released in the fusion reaction
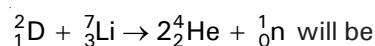
$^2_1\text{D} + ^7_3\text{Li} \rightarrow 2\,^4_2\text{He} + ^1_0\text{n}$ will be
    (1) 20 MeV   (2) 15.5 MeV
    (3) 8 MeV   (4) 4 MeV

12. The half life of $^{238}_{92}$U undergoing α-decay is 1.39×10^{17} second. What is the approximate activity of 0.1kg sample of $^{238}_{92}$U ?
    (1) 1.5×10^4 Bq   (2) 2.5×10^4 Bq
    (3) 2.25×10^6 Bq   (4) 1.25×10^6 Bq

13. **Statement-I** : Fusion reaction takes place at high temperature so that kinetic energy is high enough to overcome electrostatic repulsion between nuclei.
Statement-II : The process by which a heavy nucleus splits into light nuclei is known as fusion.
   (1) Statement-I is correct but statement-II is incorrect
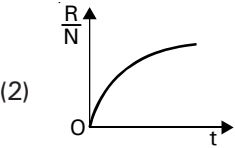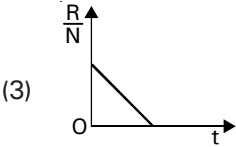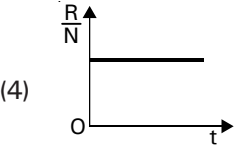   (2) Both statement- I and statement-II are incorrect
   (3) Both statement-I and statement-II are correct
   (4) Statement-I is incorrect but statement-II is correct

14. Graph of ratio of activity to the number of active nuclide in a radioactive sample versus time is


   (1)   (2)

   (3)   (4)

15. A radioactive material has mean lives of 1200 year and 400 year for α and β emission respectively.

   Material decays by both α and β emission. Approximate time in which 1/8th of material remains intact is
   (1) 420 year   (2) 720 year
   (3) 840 year   (4) 625 year

16. The electron in a hydrogen atom makes a transition from an excited state to the ground state. Which of the following statements is true?
   (1) Its kinetic energy increases and its potential and total energies decreases
   (2) Its kinetic energy decreases, potential energy increases & its total energy remains same
   (3) Its kinetic and total energies decrease and its potential energy increases
   (4) Its kinetic, potential and total energies decrease

17. Which of the following statements is true?
   (1) In Bohr model of the hydrogen atom, the lowest orbit corresponds to maximum energy.
   (2) In an atom, acceleration of electron in $n = 2$ orbit is less than that in $n = 1$ orbit.
   (3) With the increase in principle quantum number, the energy difference between the two successive energy levels increases.
   (4) Size of an atom in Thomson's model is greater than that in Rutherford's model.

18. Neutron decay in free space is given as follows
   $$_0n^1 \rightarrow {_1}H^1 + {_{-1}}e^0 + [\ ]$$
   Then the particle in the bracket is
   (1) neutrino   (2) photon
   (3) anti-neutrino   (4) graviton

19. Half-life of a radioactive sample is 15 minutes. Difference between times when it is 20% disintegrated and 80% disintegrated is
   (1) 45 min   (2) 60 min
   (3) 30 min   (4) 15 min

20. **Assertion** : Rutherford planetary model for atom didn't consider wave nature of electron. Still theoretical results for α-scattering experiments matched with experimental results.
   Reason : The energy of α-particles in α-scattering was such that wave nature of α-particles was not significant.
   (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
   (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
   (3) Assertion is true statement but Reason is false
   (4) Assertion is false

21. Electron emitted in beta radiation originates from
   (1) inner orbits of atoms
   (2) free electrons existing in nuclei
   (3) decay of a neutron in a nucleus
   (4) photon escaping from the nucleus

22. A radioactive material of half-life T was produced in a nuclear reactor at different instants, the quantity produced second time was twice of that produced first time. If now their present activities are A_1 and A_2 respectively then their age difference equals

(1) $\dfrac{T}{\ln 2}\left|\ln\dfrac{A_1}{A_2}\right|$ (2) $T\left|\ln\dfrac{A_1}{2A_2}\right|$

(3) $\dfrac{T}{\ln 2}\left|\ln\dfrac{A_2}{2A_1}\right|$ (4) $T\left|\ln\dfrac{A_2}{2A_1}\right|$

23. In an α-decay the kinetic energy of α-particle is 39 MeV and Q-value of the reaction is 40 MeV. The mass number of the mother nucleus is: (Assume that daughter nucleus is in ground state)
(1) 196   (2) 80
(3) 160   (4) 200

24.
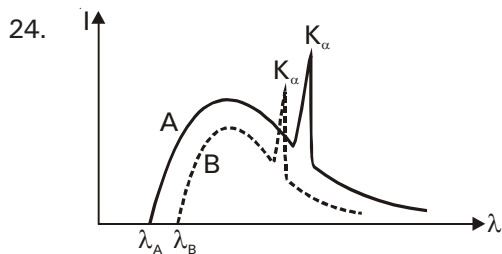
Two Coolidge tubes are operated on different voltages V_A and V_B using different target materials of atomic numbers Z_A and Z_B. From the intensity versus wavelength graphs shown, which of the following is correct?

(1) $V_A > V_B$; $Z_A < Z_B$ (2) $V_A > V_B$; $Z_A > Z_B$
(3) $V_A < V_B$; $Z_A > Z_B$ (4) $V_A = V_B$; $Z_A < Z_B$

25. Nuclear forces are
(1) Charge dependent   (2) Spin independent
(3) Charge independent (4) Long-range

26. If potential energy in ground state of hydrogen atom is taken to be zero, then, for this atom
(1) Potential energy in the first excited state would be 25.4 eV
(2) Total energy in the first excited state would be 23.8 eV
(3) Kinetic energy in the first excited state would be 30.6 eV
(4) Total energy in ground state would be zero

27. Wavelength of K_α line for an element of atomic number 57 is λ. Then the wavelength of K_α line for an element of atomic number 85 is

(1) $\dfrac{2}{3}\lambda$ (2) $\dfrac{57}{85}\lambda$

(3) $\dfrac{9}{4}\lambda$ (4) $\dfrac{4}{9}\lambda$

28. In a hypothetical atom, if transition from $n = 4$ to $n = 3$ produces visible light then the possible transition to obtain infrared radiation is
(1) $n = 5$ to $n = 3$ (2) $n = 4$ to $n = 2$
(3) $n = 3$ to $n = 1$ (4) none of these

29. de-Broglie wavelength of an electron in the nth Bohr orbit is λ_n and the angular momentum is J_n, then:

(1) $J_n \propto \lambda_n$ (2) $\lambda_n \propto \dfrac{1}{J_n}$

(3) $\lambda_n \propto J_n^2$ (4) none of these

30. Molybdenum is used as a target element for production of X-rays because it is
(1) a heavy element and can easily absorb high velocity electrons
(2) a heavy element with a high melting point
(3) an element having high thermal conductivity
(4) heavy and can easily deflect electrons

31. The radius of Ge nuclide is measured to be twice the radius of $_4Be^9$. The number of nucleons in Ge are
    (1) 72   (2) 73
    (3) 74   (4) 75

32. Match the transition in column-I with their representations in column-II

	column-I		column-II
a.	$n = \infty$ to 3	(i)	2^{nd} member of Brackett series
b.	$n = 2$ to 1	(ii)	1^{st} member of Balmer series
c.	$n = 6$ to 4	(iii)	Series limit of Paschen series
d.	$n = 3$ to 2	(iv)	1^{st} member of Lyman series

    (1) a-(iii), b-(iv), c-(i), d-(ii)
    (2) a-(iii), b-(ii), c-(i), d−(iv)
    (3) a-(i), b-(iv), c-(iii), d−(ii)
    (4) a-(ii), b-(iv), c-(i), d−(iii)

33. Assume that the nuclear binding energy per nucleon (B/A) versus mass number (A) is as shown in the figure. Use this plot to choose the correct choice(s) given below
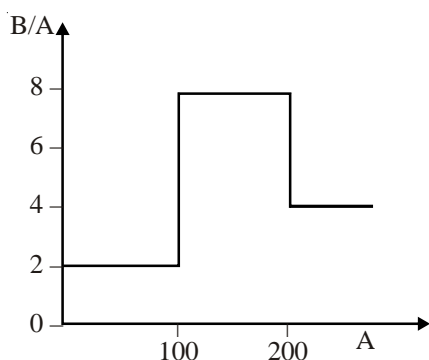
    a. Fusion of two nuclei with mass numbers lying in the range of $1 < A < 50$ will release energy
    b. Fusion of two nuclei with mass numbers lying in the range of $51 < A < 100$ will release energy
    c. Fission of a nucleus lying in the mass range of $100 < A < 200$ will release energy when broken into two equal fragments
    d. Fission of a nucleus lying in the mass range of $200 < A < 260$ will release energy when broken into two equal fragments
    (1) both a and b   (2) both b and c
    (3) both b and d   (4) both a and d

34. The binding energy per nucleon for deuteron ($_1^2H$) and helium ($_2^4He$) are 1.1 MeV and 7.0 MeV. The energy released when deuterons fuse to form a helium nucleus is
    (1) 2.2 MeV   (2) 23.6 MeV
    (3) 28.0 MeV   (4) 30.2 MeV

35. $_{92}U^{238}$ decays to stable nucleus of $_{82}Pb^{206}$. In this process number of α and β^- particles emitted are respectively
    (1) 8 and 6   (2) 6 and 8
    (3) 7 and 7   (4) 8 and 4

PHYSICS : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

36. Speed of an electron in ground state of hydrogen atom is _____ times velocity of light in vacuum.

    (1) $\dfrac{2e^2}{\varepsilon_0 hc}$ (2) $\dfrac{e^2}{2\pi\varepsilon_0 \hbar c}$

    (3) $\dfrac{e^2}{4\varepsilon_0 hc}$ (4) $\dfrac{e^2}{4\pi\varepsilon_0 \hbar c}$

37. Which of the following statements is true?
    (1) The energy equivalent of 1 kilogram of matter is about 1 MeV.
    (2) Nuclear binding energy is equivalent to mass of nucleus.
    (3) Boron rods in nuclear reactor are used as a control rods.
    (4) ^{235}U is fissionable by fast neutrons.

38. In reactors, light nuclei (moderators) are provided along with the fissionable nuclei for slowing down fast neutrons. Which of the following is not the moderator commonly used?
    (1) Water   (2) Heavy water
    (3) Graphite   (4) Sodium

39. Match the type of radioactive decay in column I with the emissions in column II.

	Column I		Column II
a.	α-decay	(i)	electrons or positrons
b.	β-decay	(ii)	high energy photons
c.	γ-decay	(iii)	helium nucleus $_2^4He$

    (1) a-(ii), b-(iii), c-(i)   (2) a-(iii), b-(ii), c-(i)
    (3) a-(i), b-(ii), c-(iii)   (4) a-(iii), b-(i), c-(ii)

40. The binding energies of the nuclei of elements A & B are E_a & E_b respectively. Three nuclei of the element B fuse to give one nucleus of element A. This fusion process is accompanied by release of energy 'e'. Then E_a, E_b are related to each other as
   (1) $E_a + e = 3E_b$
   (2) $E_a = 3E_b$
   (3) $E_a - e = 3E_b$
   (4) $E_a + 3E_b + e = 0$

41. **Assertion :** Atomic hydrogen gas excites to third excited state. The number of spectral lines in emission spectrum obtained is 6.
   Reason : Third excited level corresponds to $n = 4$.
   (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
   (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
   (3) Assertion is true statement but Reason is false
   (4) Assertion is false

42. If a nucleus $^A_Z x$ emits an α particle & a β^- particle, then the daughter nucleus will have which of the following configurations ?
   (1) A - 4 nucleons
   (2) A - Z - 3 neutrons
   (3) both 1 & 2
   (4) neither 1 nor 2

43. According to Bohr's theory, the radius of the nth orbit of an atom of atomic number Z is proportional to
   (1) $\dfrac{n^2}{Z^2}$
   (2) $\dfrac{n^2}{Z}$
   (3) $\dfrac{n}{Z}$
   (4) $n^2 Z^2$

44. **Statement-I :** Half life of radioactive element depends upon temperature and pressure.
   Statement-II : Decay constant λ of a radioactive sample is independent of the age.
   (1) Both statement-I and statement-II are correct
   (2) Both statement- I and statement-II are incorrect
   (3) Statement-I is correct but statement-II is incorrect
   (4) Statement-I is incorrect but statement-II is correct

45. The frequency of revolution of electron in n^{th} Bohr orbit of hydrogen atom is v_n. The graph between $\log n$ and $\log \left(\dfrac{v_n}{v_1} \right)$ is best represented by


46. An X-ray tube produces a continuous spectrum of radiation with shortest wavelength $1\,Å$. Approximately what accelerating voltage for electrons is required in such a tube?
   (1) 12.5 kV
   (2) 15 kV
   (3) 10 kV
   (4) 25 kV

47. If a star can convert all the He nuclei completely into oxygen nuclei. The energy released per oxygen nuclei is : [Mass of the He nucleus is 4.0026 amu and mass of oxygen nucleus is 15.9994]
(1) 7.5 MeV
(2) 56.12 MeV
(3) 10.24 MeV
(4) 23.4 MeV

48. A beam of fast moving alpha particles were directed towards a thin film of gold. The parts A', B' and C' of the transmitted and reflected beams corresponding to the incident parts A, B and C of the beam, are shown in the adjoining diagram. The number of alpha particles in
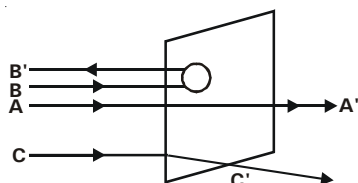
(1) B' will be minimum and in C' maximum
(2) A' will be maximum and in B' minimum
(3) A' will be minimum and in B' maximum
(4) C' will be minimum and in B' maximum

49. Order of magnitude of density of uranium nucleus is
(1) 10^{20} kg/m^3
(2) 10^{17} kg/m^3
(3) 10^{14} kg/m^3
(4) 10^{11} kg/m^3

50. γ decay takes place because
(1) nucleus formed after α or β decay is generally travelling very fast
(2) nucleus formed after α or β decay is generally formed in the excited state
(3) positrons emitted in the β decay get anhilated
(4) none of these

CHEMISTRY : SECTION-A

All questions are compulsory in section A

51. The acid formed when propyl magnesium bromide is treated with carbon dioxide is-
(1) C_3H_7COOH
(2) C_2H_5COOH
(3) Both
(4) None

52. B + (O) $\xrightarrow{\text{PCC}}$ RCHO + H$_2$O
B in the above reaction is a
(1) 3° alcohol
(2) alkenes
(3) 2° alcohol
(4) 1° alcohol

53.

Compounds A and B can be distinguished by
(1) 2, 4-DNP
(2) Fehling solution
(3) Lucas reagent
(4) NaHSO$_3$

54. The reaction

$$PhCHO + (CH_3CO)_2O \xrightarrow[\text{(ii) H}_2\text{O}]{\text{(i) CH}_3\text{COONa}}$$

$$C_6H_5CH=CH-COOH$$
$$+$$
$$CH_3-COOH$$
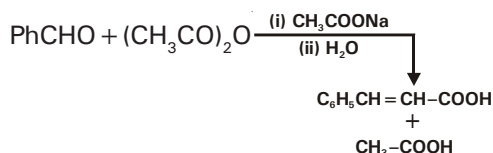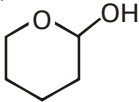
is called
(1) cannizaro reaction
(2) Tischenko reaction
(3) Perkin reaction
(4) Claisen Schmidt reaction

55. Tischenko reaction involves 'A' as catalyst. A here is
(1) sodium formate
(2) aluminium tertiary butoxide
(3) aluminium iso propoxide
(4) aluminium ethoxide

56. Oxidation of 4-methylacetophenone using $KMnO_4/KOH$ followed by acidification forms
    (1) 4-methylbenzoic acid
    (2) Benzene-1, 4 dicarboxylic acid
    (3) Ethanoic acid
    (4) Benzoic acid

57. **Assertion** : Bisulphite addition products can be used for separation and purification of aldehydes.
    Reason : Bisulphite addition products are water soluble can be converted back to original carbonyl compounds.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
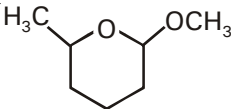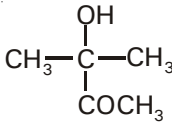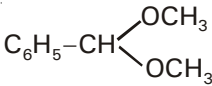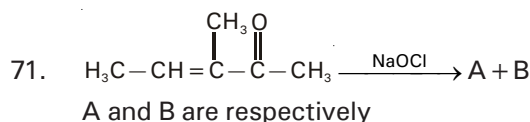   (4) Assertion is false

58. The conversion which may be brought about under Wolf Kishner reduction condition is
    (1) benzaldehyde to benzyl alcohol
    (2) cyclohexanol to cyclohexanone
    (3) cyclohexanone to cyclohexanol
    (4) benzophenone to diphenylmethane

59. Cyanohydrins undergo hydrolysis to form
    (1) α–hydroxy acid
    (2) α–hydroxy ester
    (3) β–hydroxy acids
    (4) β–hydroxy esters

60. During Fehling's test, a reddish brown ppt is obtained mainly due to the formation of
    (1) $CuSO_4$
    (2) Cu_2O
    (3) CuO
    (4) Cu

61. Which of the following structures contains a hemiacetal group?

    (1)
    (2)

    (3)
    (4)

62. **Statement- I** : The formation of 3-Hydroxy butanal from acetaldehyde in presence of dilute NaOH is called aldol condensation
    Statement- II : α H-atom in acetaldehyde is acidic in nature
    (1) Both statement-I and statement-II are correct
    (2) Both statement- I and statement-II are incorrect
    (3) Statement-I is correct but statement-II is incorrect
    (4) Statement-I is incorrect but statement-II is correct

63. $CH_3CHO + HCN \xrightarrow{H_3O^+} A$

    In the above reaction, the product A is

    (1) $20\%d + 80\%$ ℓ-isomer of cyanohydrin
    (2) $20\%d + 80\%$ ℓ-isomer of lactic acid
    (3) 50% d + 50% ℓ-isomer of lactic acid
   (4) 50% d + 50% ℓ-isomer of cyanohydrin

64. The product formed on reaction of mesityl oxide with acetone in presence of dry HCl is
    (1) 2,6-dimethyl heptan-4-ol
    (2) 2,6-dimethyl heptan-4-one
    (3) 2-methylpentane
    (4) 2-methyl pent-3-en-2-one

65. Which of the following will not give a silver mirror with Tollen's reagent?
    (1) CH_3CHO
    (2) C_6H_5CHO
    (3) $CH_3-\overset{\overset{O}{\|}}{C}-CH_2OH$
    (4) $CH_3-\overset{\overset{O}{\|}}{C}-\overset{\overset{CH_3}{|}}{\underset{\underset{OH}{|}}{C}}-CH_3$

66. The reagents used during Clemenson reduction are
    (1) $LiAlH_4/H_3O^+$
    (2) Zn-Hg/HCl
    (3) NH_2-NH_2, KOH, Glycol
    (4) $(CH_3)_2CHOH/[(CH_3)_2C-O]_3Al$

67. Identify the mismatch w.r.t reactant in column-I with the maximum number of moles of formaldehyde which will react with one mole of reactant in presence of base

	Column-I		Column-II
(1)	Acetaldehyde	–	4
(2)	Propionaldehyde	–	3
(3)	Benzaldehyde	–	1
(4)	Butyraldehyde	–	2

68. X on reacting with 2 moles of RMgX yielded a 2° alcohol. X is
    (1) ester of formic acid
    (2) propanone
    (3) ester of acetic acid
    (4) propanaldehyde

69. What is the order of boiling points
    (1) $CH_3CH_2CH_2OH < CH_3CH_2CHO$
        $< CH_2CH_2CH_2CH_3 < CH_3COCH_3$
    (2) $CH_3COCH_3 < CH_3CH_2CH_2OH$
        $< CH_3CH_2CHO < CH_3CH_2CH_2CH_3$
    (3) $CH_3CH_2CH_2CH_3 < CH_3CH_2CHO$
        $< CH_3COCH_3 < CH_3CH_2CH_2OH$
    (4) $CH_3CH_2CH_2CH_3 < CH_3CH_2CHO$
        $= CH_3COCH_3 < CH_3CH_2CH_2OH$

70. The smallest ketone and its next higher homologue are treated separatly with hydroxylamine. The total number of different products formed are
    (1) 1
    (2) 2
    (3) 3
    (4) 4

71. $H_3C-CH=\overset{\overset{CH_3}{|}}{C}-\overset{\overset{O}{\|}}{C}-CH_3 \xrightarrow{NaOCl} A+B$
    A and B are respectively
    (1) $H_3C-CH=\overset{\overset{CH_3}{|}}{C}-COONa$ and $CHCl_3$
    (2) $H_3C-CH=\overset{\overset{CH_3}{|}}{C}-COOH$ and $HCOOH$
    (3) $H_3C-CH=\overset{\overset{CH_3}{|}}{C}-CH_2-OH$ and CH_3OH
    (4) none of these

72. Gem di-alkoxy compound is formed by the reaction of aldehyde with
    (1) carboxylic acid
    (2) ester
    (3) alcohol
    (4) ketone
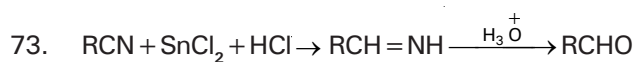
73. $RCN + SnCl_2 + HCl \rightarrow RCH=NH \xrightarrow{H_3\overset{+}{O}} RCHO$
    The above reaction is
    (1) Rosenmund reduction
    (2) Etard reaction
    (3) Stephen reaction
    (4) Gattermann Koch reaction

74. **Statement-I :** 2,4 DNP derivatives are yellow, orange or red solids.
    Statement-I : The reaction with 2,4 DNP involves nucleophilic addition followed by elimination of water.
    (1) Statement-I is incorrect but statement-II is correct
    (2) Both statement-I and statement-II are incorrect
    (3) Statement-I is correct but statement-II is incorrect
    (4) Both statement-I and statement-II are correct
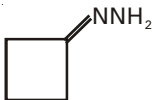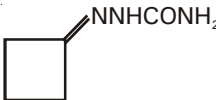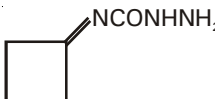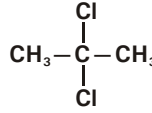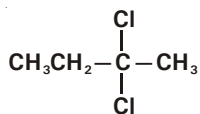
75. $RCOCl \xrightarrow[\text{Pd/BaSO}_4]{H_2} Product$
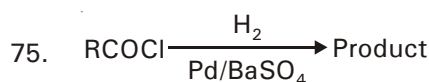
    Incorrect statement for the above reaction is that
    (1) it is called Rosenmund's reduction
    (2) $BaSO_4$ acts as catalytic poison for the Pd catalyst
    (3) this reaction can be used to prepare all aldehydes
    (4) this reaction is partial reduction of acid chloride

76. Calcium formate on dry distillation will give
    (1) Methanol (2) Methanal
    (3) Methanoic acid (4) Methyl methanoate

77. Mixture of HCHO and $(CH_3)_3C-CHO$ on reaction with concentrated NaOH give the mixture of
    (1) CH_3OH and $(CH_3)_3C - CH_2OH$
    (2) HCOONa and $(CH_3)_3C - CO\bar{O}\overset{+}{N}a$
    (3) CH_3OH and $(CH_3)_3C-C-OONa$
    (4) HCOONa and $(CH_3)_3C - CH_2OH$

78. Match the reactants in column-I with the type of reaction that they can undergo in column-II

Column-I	Column-II
a. CH_3CHO	(i) Aldol reaction
b. C_6H_5CHO	(ii) Tollens test
c. $C_6H_5CH_2CHO$	(iii) Cannizaro reaction
d. C_6H_5COMe	(iv) Fehling's test
	(v) Cyanohydrin formation

    (1) a−(ii),(iii),(v); b−(i),(ii),(iv),(v); c−(i),(ii),(iv),(v); d−(i)
    (2) a−(i),(ii),(iv),(v); b−(ii),(iii),(v); c−(i),(ii),(iv),(v); d−(i)
    (3) a−(i),(ii),(iv),(v); b−(i); c−(i),(ii),(iv),(v); d−(ii),(iii),(v)
    (4) a−(i),(ii),(iv),(v); b−(i),(ii),(iv),(v); c−(ii),(iii),(v); d−(i)

79. The semicarbazone of cyclobutanone has structure

    (1) [square with =NNH$_2$]   (2) [square with =NNHCONH$_2$]

    (3) [square with =NCONHNH$_2$]   (4) none of these

80. Gattermann-Koch reaction is similar to
    (1) Rosenmund reduction
    (2) Clemmenson reduction
    (3) Perkin reaction
    (4) Friedal Craft's acylation

81. Which of the following gem dihalides on hydrolysis will yield acetaldehyde?

    (1) $CH_3-\underset{\underset{Cl}{|}}{\overset{\overset{Cl}{|}}{C}}-CH_3$ (2) CH_3CHCl_2

    (3) $CH_2ClCH_2CH_2Cl$ (4) $CH_3CH_2-\underset{\underset{Cl}{|}}{\overset{\overset{Cl}{|}}{C}}-CH_3$

82. **Assertion** : Isobutyraldehyde can show Cannizaro reaction.
    Reason : It contains one α-hydrogen.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

83. The reactivities of the carbonyl compounds formaldehyde (I), acetaldehyde (II) and acetone (III) towards nucleophiles decrease in the order
    (1) I > II > III (2) III > II > I
    (3) II > I > III (4) III > I > II

84. Ozonolysis of but-2-ene gives
    (1) 2 moles CH_3CHO
    (2) 2 moles HCHO
    (3) mixture of CH_3CHO and CH_3COCH_3
    (4) CH_3CH_2CHO

85. In Etard reaction, benzaldehyde is prepared by oxidation of toluene by using
    (1) Acidic $KMnO_4$ (2) Acidic $K_2Cr_2O_7$
    (3) CrO_2Cl_2/CCl_4 (4) $CrO_3/(AcO)_2O$

CHEMISTRY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

86. The conversion of CH_3OH to CH_3COOH can be brought in by
    (1) $K_2Cr_2O_7/H^+$
    (2) $CO + Rh$
    (3) $KMnO_4$
    (4) H_3PO_4

87. $CH_3C\equiv CH \xrightarrow[\text{1\% HgSO}_4]{\text{40\% H}_2\text{SO}_4} A \xrightarrow{\text{Isomerisation}} CH_3COCH_3$

    Structure of 'A' and type of isomerism in the above reaction are respectively
    (1) Prop–1–en–2–ol, metamerism
    (2) Prop-1-en-1-ol, tautomerism
    (3) Prop-2-en-2-ol, geometrical isomerism
    (4) Prop-1-en-2-ol, tautomerism

88. During Tollen's reagent test, change in oxidation state of Ag is
    (1) $+1$ to $+2$
    (2) $+2$ to $+1$
    (3) $+1$ to zero
    (4) no change in oxidation state of Ag

89. The intermediate formed during aldol condensation is
    (1) carboxylate ion
    (2) enolate ion
    (3) phenoxide ion
    (4) hydroxide ion

90. o-xylene when oxidised in presence of acidified $KMnO_4$, the product formed is
    (1) acetic acid
    (2) benzoic acid
    (3) phenyl acetic acid
    (4) phthalic acid

91. Match the reagents with the transformations

Transformations	Reagent
a. Hexanol → Hexanal	i. DIBAL–H
b. Ethanenitrile → Ethanal	ii. O_3/H_2O-Zn dust
c. But-2-ene → ethanal	iii. PCC
d. p-Flourotoluene → p-flourobenzaldehyde	iv. CrO_2Cl_2 & H_2O

    (1) a-i, b-iii, c-ii, d-iv
    (2) a-iii, b-i, c-ii, d-iv
    (3) a-iv, b-ii, c-i, d-iii
    (4) a-iv, b-ii, c-iii, d-i

92. Carboxylic acids can not be prepared by the hydrolysis of
    (1) Acid amides
    (2) Acid chlorides
    (3) Acid halide
    (4) Alkyl halides

93. $+ CO + DCl \xrightarrow{AlCl_3}$
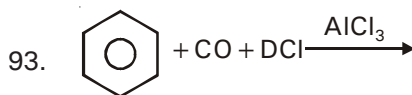
    In the Gatterman Koch reaction, the product is
    (1) C_6H_5CHO
    (2) C_6H_5CDO
    (3)
    (4)
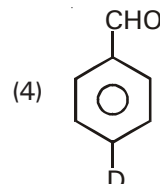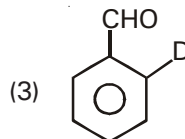
94. **Statement- I** : Carboxylic acid is formed in better yield from primary alcohol by oxidation using $KMnO_4$ in alkaline medium rather than in acidic medium.
    Statement- II : The primary alcohols are easily oxidised to carboxylic acids with $KMnO_4$ in acidic, basic or neutral medium
    (1) Both statement-I and statement-II are correct
    (2) Both statement- I and statement-II are incorrect
    (3) Statement-I is correct but statement-II is incorrect
    (4) Statement-I is incorrect but statement-II is correct

95. For obtaining ethyl methyl ketone from acetyl chloride which of the following reagent can be used?
    (1) Grignard reagent
    (2) DIBAL–H
    (3) H_2, Pd/BaSO$_4$
    (4) Reaction with $(C_2H_5)_2$ Cd in the presence of dry ether
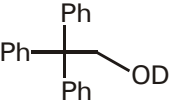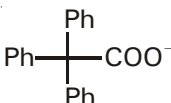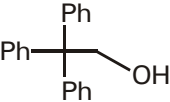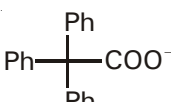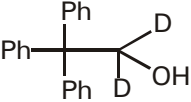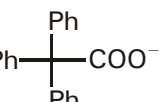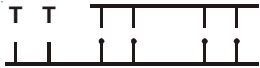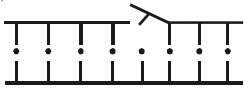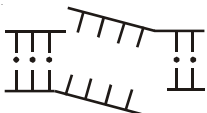
96. Cinnamon has a very pleasant fragrance due to the presence of cinnamaldehyde. The IUPAC name of cinnamaldehyde is
   (1) 2-hydroxy benzaldehyde
   (2) 3-methoxy-4-hydroxy benzaldehyde
   (3) 3-phenyl prop-2-enal
   (4) benzaldehyde

97. Haloform reaction is given by
   (1) CH_3COCH_3 (2) CH_3COCl
   (3) CH_3CONH_2 (4) All of these

98.
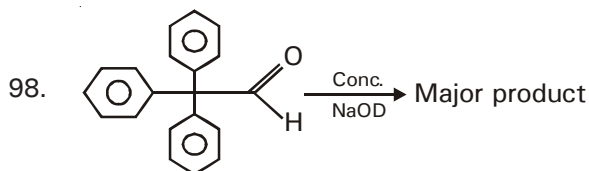
   In the above equation, the major products are

   (1) and

   (2) and

   (3) and

   (4) none of these

99. **Assertion** : Acetal & ketal formation can be used to protect the carbonyl group in reactions of basic medium.
   Reason : Acetals & ketals get hydrolysed back to parent compound in basic medium .
   (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
   (2) Assertion is true statement but Reason is false
   (3) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
   (4) Assertion is false

100. $(CH_3)_2CO \xrightarrow{\text{Mg–Hg}} A$
   The product A is called
   (1) pinacolone   (2) glycerol
   (3) aldol   (4) pinacol

ZOOLOGY : SECTION-A

All questions are compulsory in section A

101. The enzyme of restriction modification system in bacterial cells that ensures safety of self DNA is
   (1) Restriction endonuclease
   (2) DNA ligase
   (3) Methylase
   (4) DNA polymerase

102. Ceremonial burial of dead was observed in
   (1) *Homo sapiens neanderthalensis*
   (2) *Homo erectus erectus*
   (3) *Homo erectus pekinesis*
   (4) *Homo erectus heidelbergensis*

103. Molecular scissors
   (1) used in genetic engineering separate terminal nucleotide from DNA
   (2) cut the recognition sequence away from centre always
   (3) creates sticky ends if cut palindromic sequence at centre
   (4) cut each of two strands in sugar-phosphate backbone

104. In the action of 4 different nucleases on DNA, which of these is/are used for genetic engineering?

   A.

   B.

   C.

   D.

   (1) A & D   (2) B & C
   (3) C only   (4) C & D

105. In *Cla* I, *Sal* I, *Pst* I; *la*, *al* and *st* is derived from respectively
   (1) *Caryophanon*, *Streptomyces, Providencia*
   (2) *latum*, *albus*, *stuartii*
   (3) *latum*, *alnus*, *stuartii*
   (4) *lactobacillus*, *albus*, *stuartii*

106.

X → Homohabilis → Homoerectus ─┐
          Java man ──┐   │
        Peking man ──┤   │
              Y ──┴──┘   Z ◄──┘
Homosapiens sapiens ◄ Homosapiens fossilis ◄
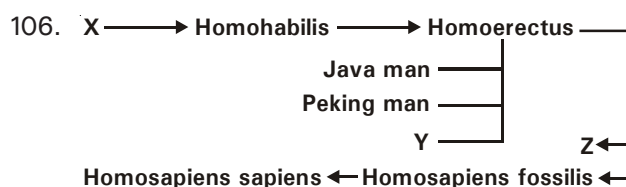
In the above schematic representation of evolution of man 'X', 'Y' and 'Z' correctly represents

(1) *Ramapithecus*, Peking man, Cromagnon
(2) *Australopithecus*, Heidelberg man, Neanderthal
(3) *Ramapithecus*, Heidelberg, Cromagnon
(4) *Austrolopithecus*, Heidelberg, Cromagnon

107. Identify the event in biotechnology correctly matched to the year in which it occured

a. restriction modification system in *E.coli*   i. 1972
b. first instance of construction of an artificial r-DNA molecule   ii. 1963
c. studies by Boyer on a couple of restriction enzymes of *E.coli*   iii. 1969

(1) a-iii, b-i, c-ii
(2) a-ii, b-iii, c-i
(3) a-i, b-ii, c-iii
(4) a-ii, b-i, c-iii

108. Identify the following skulls and find out the correct option

a.

b.

c.
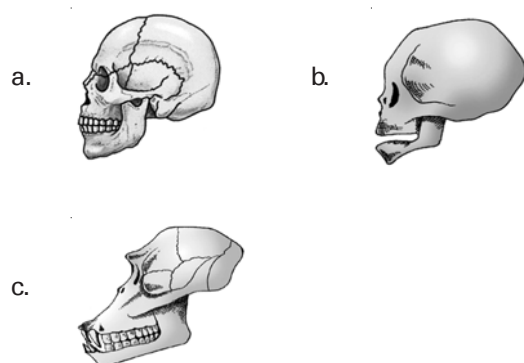
(1) a-Adult chimpanzee, b-Adult human
(2) a-Adult chimpanzee, c-baby chimpanzee
(3) a-Adult human, c-baby chimpanzee
(4) a-Adult human, b-baby chimpanzee

109. How many of the following are applicable to Restriction enzymes ?

Proteins,Nucleases, Class-III, Lyases, Micromolecules, Proteases, Present in protozoans, Molecular scissors

(1) Five
(2) Three
(3) Four
(4) Two

110. **Assertion :** Same restriction enzyme is used to cut vector and insert for rDNA formation.

Reason : Restriction enzymes have fixed recognition sequence and they create complementary overhangs in vector and foreign DNA.

(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true but Reason is false
(4) Assertion is false

111. Match the hominids with their correct brain size :

(a) *Homo habilis*   (i) 900 cc
(b) *Homo neanderthalensis*   (ii) 1350 cc
(c) *Homo erectus*   (iii) 650-800 cc
(d) *Homo sapiens*   (iv) 1400 cc

Select the correct option.

	(a)	(b)	(c)	(d)
(1)	(iii)	(i)	(iv)	(ii)
(2)	(iii)	(ii)	(i)	(iv)
(3)	(iii)	(iv)	(i)	(ii)
(4)	(iv)	(iii)	(i)	(ii)

112. For gene cloning, alien DNA must gets integrated into __(i)__ or __(ii)__ DNA and they must possess __(iii)__

(1) (i)– cytoplasm, (ii)– genomic, (iii)–restriction site
(2) (i)– genomic, (ii)– extra genomic, (iii)–Ori
(3) (i)– genomic, (ii)– extra genomic, (iii)–vital genes
(4) (i)– extra genomic, (ii)– genomic, (iii)–antibiotic resistant gene

113. There are four samples of DNA - A, B,C & D. After treating them with enzymes, they were subjective to electrophoresis. Based on clues, select the lane which has A, B, C & D samples respectively

Wells
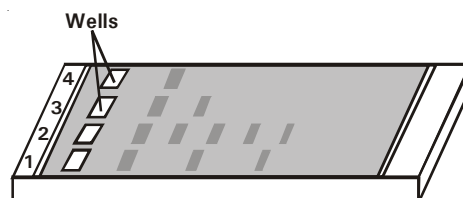
A. Linear DNA was given two cuts with EcoR1
B. Circular DNA was given two cuts
C. Linear DNA was treated with RNAase
D. Circular DNA was given five cuts

(1) Lane 2-A, Lane 3-B, Lane 4-C,Lane 1-D
(2) Lane 1-A, Lane 3-B, Lane 4-C,Lane 2-D
(3) Lane 1-A, Lane 2-B, Lane 3-C,Lane 4-D
(4) Lane 2-A, Lane 4-B, Lane 3-C,Lane 1-D

114. If the following stages in human evolution are arranged in correct sequential order as these existed, which would be third?

Homo habilis, *Homo sapiens*, *Ramapithecus*, *Homo erectus*

(1) *Homo habilis*　　(2) *Ramapithecus*
(3) *Homo erectus*　　(4) *Homo sapiens*

115. Which of the following is a part of 'old biotechnology'?
(1) Production of insulin using gene technology
(2) Formation of yoghurt and cheese from milk
(3) Genetic improvement of pharmaceutical microbes
(4) Production of engerix

116. **Statement-I** : In 1969, Boyer developed method of removing and reinserting plasmids into cell.
Statement-II : For formation of r-DNA, linking of passenger gene with plasmid vector became possible with the help of restriction enzyme.
(1) Both statement-I and statement-II are correct
(2) Both statement-I and statement-II are incorrect
(3) Statement-I is correct but statement-II is incorrect
(4) Statement-I is incorrect but statement-II is correct

117. A recombinant DNA molecule was created by ligating a gene to a linear DNA. By mistake, an exonulease was added to tube containing recombinant DNA. How does this affect next step in the experiment?
(1) Experiment will proceed to completion
(2) Experiment will stop
(3) Experiment speed will increase
(4) No effect on the experiment

118. REs cuts DNA at specific sites and rest of cellular DNA is not damaged as
(1) RE susceptible sites are coated with proteins
(2) RE susceptible sites are catalyzed by particular enzymes
(3) they cleave DNA only at very limited and specific sites
(4) rest of DNA is methylated

119. **Statement-I** : Blunt ends of DNA can be converted into the sticky ends by the use of terminal transferase.
Statement-II : The construction of the first recombinant DNA was done by using the native plasmid of *Salmonella typhimurium*.
(1) Both statement-I and statement-II are correct
(2) Both statement-I and statement-II are incorrect
(3) Statement-I is correct but statement-II is incorrect
(4) Statement-I is incorrect but statement-II is correct

120. A, B, C, D are DNA fragments
A = 19 bp long　　　　B = 90 bp long
C = 600 bp long　　　　D = 200 bp long
Which will be at a maximum distance in the gel if we are observing from the side opposite to wells?
(1) A　　(2) B
(3) C　　(4) D

121. Which of the two R.Es will generate blunt ends
(1) *Eco* RV & *Hind* III　(2) *Eco* RV and *Hind* II
(3) *Sal* I & *Hind* II　　(4) *Eco*RI and *Hind* II

122. If a plasmid vector and linear DNA are given 5 cuts each with different REs, how many bands of DNA will be observed on Gel electrophoresis after completion of process?

	Plasmid	Linear DNA
(1)	5	5
(2)	5	6
(3)	6	5
(4)	6	6

123. **Statement-I** : About 3-4 bya, Australopithecus were found in east african grassland.
Statement-II : The first prehistoric man to make use of fire for hunting, defence and cooking was Java Man.
(1) Both statement-I and statement-II are incorrect
(2) Both statement-I and statement-II are correct
(3) Statement-I is correct but statement-II is incorrect
(4) Statement-I is incorrect but statement-II is correct

124. Which of the following sequences does not correctly represent the action of restriction enzyme?

a. $3'$G T C G A C$5'$
$5'$C A G C T G$3'$

b. $5'$G G C G T T$3'$
$3'$T T C A G G$5'$

c. $5'$A T C G A T$3'$
$3'$T A G C T A$5'$

d. $5'$G A A A A C$3'$
$3'$C T T T T G$5'$

(1) a & c
(2) b, c & d
(3) c only
(4) a, b & d

125. Which of the following is not a source of restriction endonuclease?
(1) *Haemophilus influenzae*
(2) *Escherichia coli*
(3) *Entamoeba coli*
(4) *Bacillius amyloliquefaciens*

126. 'Restriction' in Restriction enzyme refers to:
    (1) Cleaving of phosphodiester bond in DNA by the enzyme
    (2) Cutting of DNA at specific position only
    (3) Prevention of the multiplication of bacteriophage in bacteria
    (4) All of the above

127. **Assertion** : DNA ligases are known as molecular glue.

    Reason : DNA ligases join the two fragments of DNA by forming both phosphodiester and hydrogen bonds.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

128. Which of the following is incorrect statement
    (1) Genetic engineering and maintenance of sterile environment are two core techniques in biotechnology
    (2) Discovery of restriction enzymes laid the foundation of modern biotechnology
    (3) Genetic engineering and conventional hybridisation share common limitation of inclusion and multiplication of undesirable genes with desirable ones
    (4) Definition of Biotechnology given by EFB includes both traditional view and modern molecular biotechnology

129. In a restriction digestion experiment, the sticky ends of vector DNA can rejoin to form a circular vector without insert.

    Which enzyme can be used to eliminate this possibility?
    (1) DNA ligase   (2) DNA polymerase
    (3) Alkaline phosphatase (4) RNA polymerase

130. How DNA is dis-similar to enzymes ?
    (1) Both are biomacromolecules
    (2) Work in hydrous conditions
    (3) Obtained in retentate fraction
    (4) DNA is bigger than enzymes

131.

Alien DNA

Vector DNA
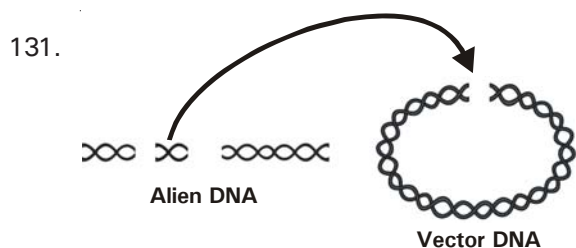
    Most commonly used enzyme for facilitating the above process is sourced from
    (1) *Salmonella*   (2) *E.coli*
    (3) Virus   (4) Fungus

132. If during the action of restriction endonucleases, cut is given in DNA sequence as illustrated, then how many unpaired over hangs are formed and at which end?

A   B
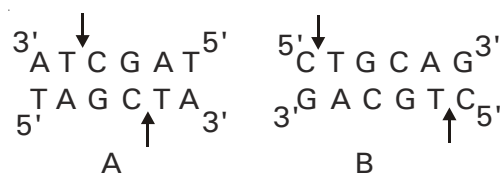
    (1) 2 unpaired over hangs at 5' end in A and 4 unpaired over hangs at 3' end in B
    (2) 4 unpaired over hangs at 3' end in A and 2 unpaired over hangs at 5' end in B
    (3) 2 unpaired over hangs at 3' end in A and 4 unpaired over hangs at 5' end in B
    (4) 4 unpaired over hangs at 3' end in A and 4 unpaired over hangs at 5' end in B

133. Which of the following principles of biotechnology is responsible for growth of only desired microbes in larger quantities?
    (1) Genetic engineering
    (2) Bioprocessing engineering
    (3) Maintenance of sterile ambience during the process
    (4) Both (2) & (3)

134. In recent years, DNA sequences of mt-DNA & Y-chromosomes were considered for study of human evolution because they
    (1) can be studied from samples of fossil remains
    (2) are small & thus easy to study
    (3) are uniparental in origin & do not take part in recombination
    (4) their structure is known in greater detail.

135. What is true for Gel electrophoresis ?
    a. DNA fragments are negatively charged particles, so move towards positively charged electrode
    b. Force responsible for movement of DNA fragments through gel is electric field
    c. Largest DNA fragment covers maximum distance under electric field
    d. Pore size can be managed by changing the concentration of agarose
    (1) a only   (2) b, c and d
    (3) a, b and d   (4) c and d

ZOOLOGY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

136. The linking of alien DNA to plasmid vector is possible after cutting the plasmid with
    (1) Exonucleases   (2) DNA ligase
    (3) Endonuclease   (4) Both (1) and (3)

137. Which of the following enzyme can be used to cleave cell wall of bacteria?
    (1) Lysozyme (2) Cellulase
    (3) Chitinase (4) Any of these

138. Human evolution is
    (1) adaptive convergence as well as phyletic speciation
    (2) phyletic evolution, adaptive convergence
    (3) phyletic evolution and progresive evolution
    (4) phyletic evolution and retrogressive evolution

139. **Statement- I** : All restriction endonucleases always break phosphodiester bond between the same two nitrogen bases on the two strands.
    Statement- II : R.E II may cut little away from centre of pallindromic sequence on the strand of DNA.
    (1) Both statement-I and statement-II are correct
    (2) Both statement-I and statement-II are incorrect
    (3) Statement-I is correct but statement-II is incorrect
    (4) Statement-I is incorrect but statement-II is correct

140. Both a wine maker (A) and a molecular biologist who had developed a recombinant vaccine (B) claim to be biotechnologist. Who is correct?
    (1) A is biotechnologist
    (2) B is biotechnologist
    (3) Both A and B are biotechnologist
    (4) None of them

141. Most preferable restriction endonuclease for biotechnological practices is
    (1) RE type I that creates blunt ends
    (2) RE type II that creates blunt ends
    (3) RE type III that creates sticky ends
    (4) RE type II that creates sticky ends

142. A mixture of DNA fragments A, B, C and D, with size and molecular weights of $A + C = B$, $C < A$ and $D > B$ position of these fragments from anode to cathode sides of the gel would be
    (1) C, A, B, D (2) B, A, C, D
    (3) D, C, A, B (4) B, A, D, C

143. The biological activity in anhydrous state in DNA
    (1) is absent (2) is increased
    (3) depends on pH state (4) is decreased

144. Palindrome in DNA is a sequence of base pairs that reads same on the two strands
    (1) when orientation of reading is kept opposite
    (2) when orientation of reading is kept same
    (3) of one is read from 5-3 and other is from 3-5
    (4) both (1) and (3)

145. A. Elution of DNA bands
    B. Use of ethidium bromide
    C. Restriction digestion
    D. Running gel electrophoresis
    E. Ligation
    Arrange the above proper sequence as these are done for r-DNA technology
    (1) C–E–A–B–D (2) C–B–A–D–E
    (3) C–D–B–A–E (4) E–C–B–A–D

146. Find the correct match
    a. Agriculture - 10,000 years ago
    b. Human settlement - 18,000 years ago
    c. Prehistoric cave art - 18,000 years ago
    d. *Homo sapiens* arose - 75,000-10,000 years ago
    e. Neanderthal man - 100,000-40,000 years ago
    (1) a, c, d, e (2) a, b, c, d, e
    (3) a, c, d (4) a, e, d

147. **Assertion** : With the help of genetic engineering, a completely new trait can be introduced in an organism.
    Reason : During genetic engineering, variations are introduced during pachytene stage of meiosis-I.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Assertion is true statement but Reason is false
    (3) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (4) Assertion is false

148. Match the columns
	Column-I		Column-II
a.	RE	i.	Class 6
b.	Alkaline phosphatase	ii.	poly 'A' Tail
c.	DNA ligase	iii.	Prevents self ligation of vector
d.	Terminal transferase	iv.	class 3
    (1) a–(iii), b–(iv), c–(ii), d–(i)
    (2) a–(ii), b–(iv), c–(iii), d–(i)
    (3) a–(iv), b–(iii), c–(i), d–(ii)
    (4) a–(i), b–(iv), c–(ii), d–(iii)

149. Foreign DNA is also called
    (1) vehicle DNA (2) passenger DNA
    (3) r-DNA (4) vector DNA

150. As compared to *Dryopithecus*, the *Ramapithecus*
    (1) was more ape - like
    (2) was hairy and had erect posture
    (3) existed about 40 mya
    (4) was more man - like

BOTANY : SECTION-A

All questions are compulsory in section A

151. A branch of ecology that studies the relationship between plant and animal communities and their environment is known as
    (1) Autecology
    (2) Synecology
    (3) Physiological ecology
    (4) Population ecology

152. Regional and local variations within each biome lead to the formation of variety of
    (1) Habitats   (2) Climate
    (3) Seasons   (4) Weather

153. Which of following statements is true ?
    (1) Abiotic components alone characterize the habitat of an organism completely
    (2) Temperature is the least ecologically relevant environmental factor
    (3) Heat loss or heat gain is a function of surface area
    (4) Life on earth originated in water but is sustainable without water

154. Micropropagation is used for
    (1) Rapid clonal multiplication of haploid plants
    (2) Rapid vegetative multiplication of ornamental plants only
    (3) Rapid vegetative multiplication of ornamental plants and fruit trees using small sized explants
    (4) Rapid clonal multiplication of embryos.

155. Which of the following is incorrect with respect to organisms and biome distribution?
    (1) Annual variations in temperature alongwith precipitation account for formation of major biomes such as desert, rain forest and tundra
    (2) In aquatic environment, the sediment characteristics often determine the type of benthic animals that can live there
    (3) On planet Earth life exists only in a few favourable habitats
    (4) Over a period of time, the organism has evolved adaptations to optimise its survival and reproduction in its habitat

156. **Statement-I** : Thermoregulation is energetically expensive process.
    Statement-II : 99% of animals and nearly all plants cannot maintain their internal environment.
    (1) Both statement-I and statement-II are correct
    (2) Both statement-I and statement-II are incorrect
    (3) Statement-I is correct but statement-II is incorrect
    (4) Statement-I is incorrect but statement-II is correct

157. Evolutionary biologists believe that the success of mammals is largely due to their ability to
    (1) change their body temperature with the ambient temperature
    (2) escape in time (suspend)
    (3) migration to more hospitable areas
    (4) maintain a constant body temperature

158. Select the correct match of different aquatic medium with their salt concentrations(measured as salinity in parts per thousand)
    (1) Inland waters - 50 ppt
    (2) Hyper saline - < 5 ppt
    (3) Sea - 30-35 ppt
    (4) Fresh water - 10 ppt

159. Observe the diagram given below and on the basis of mean annual precipitation (cm) and mean annual temperature identify a pair of correct biomes.
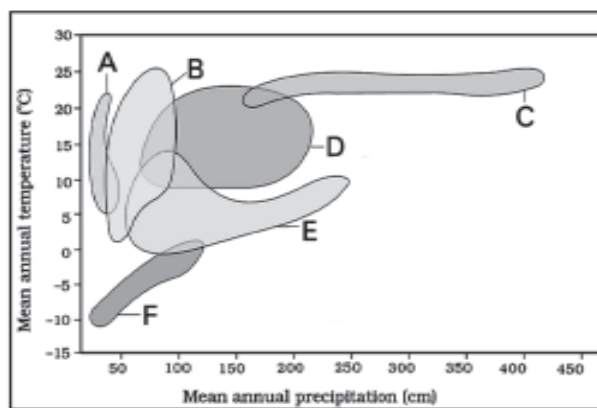
    (1) (A-desert), (B-temperate forest)
    (2) (C-tropical forest),(D-coniferous forest)
    (3) (A-desert),(E-coniferous forest)
    (4) (B-arctic), (F-grass land)

160. Pick the wrong match
    (1) Wheat – Sonalika , Atlas 66
    (2) Rice – Jaya, IR^{36}
    (3) Maize – Ratna, Pusa Lerma
    (4) Okra – Pusa sawani, Parbhani kranti

161. Which of the following statements are correct?
    a. Fresh water protozoans have contractile vacuoles whereas majority of marine organisms lack them
    b. Presence or absence of contractile vacuoles is related to osmoregulation
    c. Marine organisms excrete salt to maintain homeostasis
    (1) a and b only
    (2) b and c only
    (3) a and c only
    (4) a, b and c

162. **Assertion** : We cannot control environment neither do we have any control on pathogen genotype.
    Reason : The best method to produce disease resistance in plants is to produce a disease resistant cultivar.
    (1) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (2) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

163. Pusa Lerma and Sharbati Sonora are
    (1) imported mexican varieties
    (2) mutants of mexican varieties
    (3) improved Indian varieties got through hybridisation with imported varieties
    (4) mutants of Indian varieties

164. How many of the following statements are correct?
    a. Snow leopards are not found in Kerala forest
    b. The level of thermal tolerance of different species determines to a large extent their geographical distribution
    c. A sugarcane farmer generally looks for thick stem, long internodes, high sugar content and disease resistance
    d. Productivity of plants is dependent on water
    (1) Three
    (2) Four
    (3) One
    (4) Two

165. Many zooplanktons under unfavourable conditions show
    (1) dormancy
    (2) aestivation
    (3) spore formation
    (4) diapause

166. Study the diagrammatic representation of organismic response to temperature and choose the best examples for organisms of 'A' and 'C' type
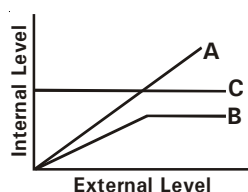
    (1) A-plants, C-human being
    (2) A-snakes, C-lizards
    (3) A-birds, C-frog
    (4) A-human being, C-birds

167. Pick the false statement
    (1) Several south Indian states raise 2-3 crops of rice annually because of early yielding rice varieties.
    (2) Solid stems in wheat lead to non preference by the stem saw fly
    (3) IARI has developed many vegetable crops that are rich in minerals and vitamins
    (4) Soil compostion, grain size and aggregation determine the percolation but not the water holding capacity of the soil

168. In the given diagram A, B, C, D, G, P, Q, R, S are species. What do figure a, b and c represent
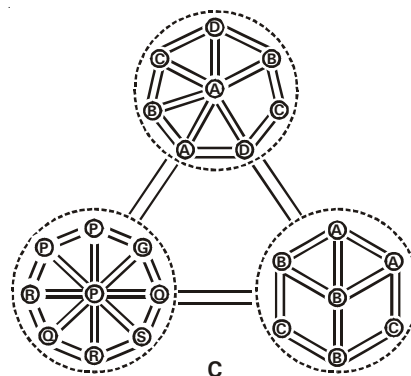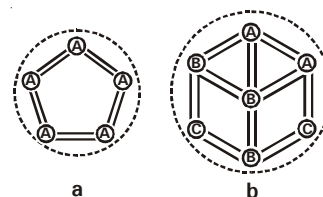
    (1) a–biome, b–population,c–community
    (2) a–population, b–biome, c–community
    (3) a–population, b–community, c–biome
    (4) a–community, b–biome, c–population

169. Which research institute is wrongly matched?
    (1) IRRI– Phillipines
    (2) ICAR – New Delhi
    (3) Sugarcane breeding institute – Mumbai
    (4) IARI– New Delhi

170. Which of the following hormone is mostly used in culture medium for inducing morphogenesis?
    (1) auxins and cytokinins
    (2) auxins and GA
    (3) auxins and ABA
    (4) ABA and GA

171. Match Column-I with Column -II
Column-I		Column-II
a. Rain soaked Megahalaya	i.	Lichen
b. High mountain tops	ii.	*Bacillus*
c. Stinking compost pits	iii.	*Dipterocarpus*
d. Boiling thermal springs	iv.	Archaebacteria

    (1) a–ii,b–i,c–iii,d–iv   (2) a–iii,b–i,c–ii,d–iv
    (3) a–i,b–ii,c–iii,d–iv   (4) a–iii,b–ii,c–i,d–iv

172. Explant is
(1) plant collected after harvesting
(2) exploited part of a plant
(3) small part of the plant meant for tissue culture
(4) uprooted for transplantation

173. **Statement-I** : In mung bean, resistance to yellow mosaic virus and powdery mildew were induced by mutations.
   Statement-II : Somaclonal variations are caused due to recombination during meiosis.
   (1) Both statement-I and statement-II are correct
   (2) Statement-I is correct but statement-II is incorrect
   (3) Both statement-I and statement-II are incorrect
   (4) Statement-I is incorrect but statement-II is correct

174. Most common physical mutagen used in plant breeding is
   (1) α-rays   (2) β-rays
   (3) γ-ray   (4) UV rays

175. The basic level of ecological hierarchy is
   (1) ecosystem
   (2) biosphere
   (3) organism
   (4) biome

176. The most important abiotic factor which is the cause of physical and chemical condition of different habitats is
   (1) Pathogens
   (2) Predators
   (3) Temperature
   (4) All

177. Choose the correct statements
   a. Under favourable condition many zooplanktons in lakes, ponds undergo diapause
   b. Every summer, Rajasthan hosts thousands of migratory birds from Siberia
   c. In higher plants seeds serve as means to tide over period of stress
   (1) a & c
   (2) a, b & c
   (3) a & b
   (4) only c

178. Biofortification is
   (1) strengthening living organisms against diseases
   (2) developing crop plants with higher levels of vitamins, proteins and minerals
   (3) using living organisms for the protection of crop plants
   (4) all of these

179. How many of the following statements about temperature is /are correct?
   a. Average temperature on land varies seasonally
   b. It decreases progressively from the equator to the poles
   c. It decreases progressively from plains to the mountains
   d. Unique habitats such as thermal springs and deep sea hydrothermal vents have average temperatures exceeding $100^{\circ}C$
   e. A vast majority of organisms can tolerate and thrive in a wide range of temperature (i.e. eurythermal) but, a few are restricted to narrow range of temperature (i. e. stenothermal)
   (1) one   (2) two
   (3) four   (4) three

180. Which of the following leads to resistance to maize stem borers?
   (1) High aspartic acid
   (2) Low nitrogen content
   (3) Low sugar content
   (4) All of these

181. **Statement-I** : SCP reduces the pressure on agriculture production for the supply of the required protein.
   Statement-II : Short duration sugarcane has been produced by somaclonal variations.
   (1) Both statement-I and statement-II are correct
   (2) Both statement-I and statement-II are incorrect
   (3) Statement-I is correct but statement-II is incorrect
   (4) Statement-I is incorrect but statement-II is correct

182. Many species of small plants (herbs and shrubs) are adapted to low light intensities because these are
   (1) overshadowed by big trees
   (2) not photosynthetic
   (3) chemoautotrophs
   (4) heterotrophs

183. **Assertion** : Temperature affects kinetics of enzymes and through it the basal metabolism and physiological functions of the organisms.
   Reason : Temperature greatly affects living organism.
   (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
   (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
   (3) Assertion is true statement but Reason is false
   (4) Assertion is false

184. Those organisms which live in tropical regions are known as
    (1) Megatherm   (2) Mesotherm
    (3) Microtherm   (4) Hekistotherm
185. The term 'Totipotency' refers to the capacity of a
    (1) cell to generate whole plant
    (2) nucleus to generate whole plant
    (3) seed to germinate
    (4) cell to enlarge in size

BOTANY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

186. When two unrelated individuals or lines are crossed, the performance of F_1 hybrid is often superior to both its parents. The phenomenon is called
    (1) splicing   (2) metamorphosis
    (3) heterosis   (4) transformation
187. Pick the incorrect match
    (1) *E.coli* –Human intestine
    (2) *Opuntia* -Torrential stream
    (3) *Artemesia*–Eurythermal
    (4) Palm– Stenothermal
188. What will happen to a well growing herbaceous plant in forest if it is transplanted outside forest in a park?
    (1) It will grow normally
    (2) It will grow well because it is planted in the same locality
    (3) It may not survive because of change in its micro climate
    (4) It grows very well because plant gets more sunlight
189. **Statement-I** : Organisms living in ocean, lake or river should not face any water related problem.
    Statement-II : Some organism can tolerate wide range of salinities.
    (1) Both statement-I and statement-II are correct
    (2) Both statement-I and statement-II are incorrect
    (3) Statement-I is correct but statement-II is incorrect
    (4) Statement-I is incorrect but statement-II is correct
190. Embryoid is
    (1) nonzygotic embryo
    (2) nonfunctional embryo
    (3) parthenogenetic embryo
    (4) an early stage in callus differentiation
191. The phase of Green Revolution started in mid
    (1) 1970s   (2) 1960s
    (3) 1947   (4) 1980s

192. Name the plant obtained in in the given process

Tomato cell   Potato cell

Cellulase, Pectinase

Fusion

?
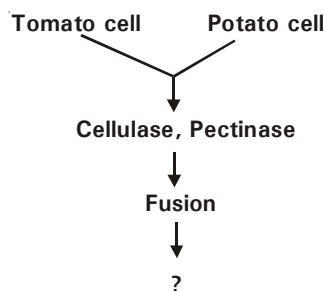
    (1) *Triticale*   (2) Bomato
    (3) Pomato   (4) *Raphanobrassica*
193. Match Column-I with Column -II

	Column -I		Column -II
a.	Himgiri	i.	Cow pea resistant to bacterial blight
b.	Pusa shubra	ii.	Cauliflower resistant to Black rot
c.	Pusa Gaurav	iii.	*Brassica* resistant to aphids
d.	Pusa komal	iv.	Wheat resistant to hill bunt

    (1) a–ii,b–i,c–iii,d–iv
    (2) a–iii,b–i,c–ii,d–iv
    (3) a–iv,b–ii,c–iii,d–i
    (4) a–iii,b–ii,c–i,d–iv
194. The technique of tissue culture was first suggested by
    (1) Gottleib Haberlandt
    (2) Guha and Maheshwari
    (3) Steward
    (4) Norman Borlaug
195. **Assertion** : The wild species related to the crop species should be included in the germplasm collection during plant breeding.
    Reason : Several wild relatives of different cultivated species have been shown to have disease resistance or other desirable characters .
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
   (4) Assertion is false

196. Three water bodies A, B and C were tested for salinity of water. Water body A showed salt concentration as 4 parts per thousand, B showed 32 parts per thousand and C showed 108 parts per thousands salinity. Select the correct option regarding this
    (1) A can be a hyper saline lagoon
    (2) B can be a sea
    (3) C can be an inland river
    (4) A can be a sea

197. Select the incorrect statement
    (1) Ecology at the organismic level is essentially physiological ecology
    (2) Annual variations in temperature and precipitation account for the formation of major biomes
    (3) Nature and properties of soil in different places vary
    (4) Conventional breeding is often constrained due to availability of large number of disease resistant genes that are present in various crop varieties or wild relatives

198. In one day, 250 g of *Methylophilus methylotrophus*, because of its high rate of biomass production and growth, can be expected to produce
    (1) 25 tonnes of protein
    (2) 10 tonnes of protein
    (3) 15 tonnes of protein
    (4) 5 tonnes of protein

199. Which of the following does not represent an effect of light on organisms?
    (1) Pigmentation in animals
    (2) Presence of green algae to maximum depth
    (3) Photoperiodism
    (4) Timing foraging

200. Embryo culture is used for
    (1) establishing seed dormancy
    (2) recovery of interspecific hybrids
    (3) somatic hybridisation
    (4) haploid production

Dated :
13-09-2022

M.L. Syal's Helix Institute
S.C.O. 343-345, Top Floor, Sector 34-A, Chandigarh. Ph : 0172-2623155

Code-A

XII cum Competition Course for Medical – Test - 11

#	Ans	#	Ans	#	Ans	#	Ans
1.	(3)	51.	(1)	101.	(3)	151.	(2)
2.	(1)	52.	(4)	102.	(1)	152.	(1)
3.	(1)	53.	(2)	103.	(4)	153.	(3)
4.	(4)	54.	(3)	104.	(4)	154.	(3)
5.	(4)	55.	(4)	105.	(2)	155.	(3)
6.	(4)	56.	(2)	106.	(2)	156.	(1)
7.	(4)	57.	(1)	107.	(4)	157.	(4)
8.	(1)	58.	(4)	108.	(4)	158.	(3)
9.	(4)	59.	(1)	109.	(3)	159.	(3)
10.	(1)	60.	(2)	110.	(1)	160.	(3)
11.	(2)	61.	(1)	111.	(3)	161.	(4)
12.	(4)	62.	(4)g	112.	(2)	162.	(1)
13.	(1)	63.	(3)	113.	(2)	163.	(2)
14.	(4)	64.	(2)	114.	(3)	164.	(2)
15.	(4)	65.	(4)	115.	(2)	165.	(4)
16.	(1)	66.	(2)	116.	(2)	166.	(1)
17.	(2)	67.	(4)	117.	(2)	167.	(4)
18.	(3)	68.	(1)	118.	(3)	168.	(3)
19.	(3)	69.	(3)	119.	(1)	169.	(3)
20.	(1)	70.	(3)	120.	(3)	170.	(1)
21.	(3)	71.	(1)	121.	(2)	171.	(2)
22.	(3)	72.	(3)	122.	(2)	172.	(3)
23.	(3)	73.	(3)	123.	(4)	173.	(2)
24.	(1)	74.	(4)	124.	(4)	174.	(3)
25.	(3)	75.	(3)	125.	(3)	175.	(3)
26.	(2)	76.	(2)	126.	(3)	176.	(3)
27.	(4)	77.	(4)	127.	(3)	177.	(4)
28.	(4)	78.	(2)	128.	(3)	178.	(2)
29.	(1)	79.	(2)	129.	(3)	179.	(3)
30.	(2)	80.	(4)	130.	(4)	180.	(4)
31.	(1)	81.	(2)	131.	(3)	181.	(1)
32.	(1)	82.	(2)	132.	(3)	182.	(1)
33.	(3)	83.	(1)	133.	(4)	183.	(2)
34.	(2)	84.	(1)	134.	(3)	184.	(1)
35.	(1)	85.	(3)	135.	(3)	185.	(1)
36.	(4)	86.	(2)	136.	(3)	186.	(3)
37.	(3)	87.	(4)	137.	(1)	187.	(2)
38.	(4)	88.	(3)	138.	(3)	188.	(3)
39.	(4)	89.	(2)	139.	(4)	189.	(4)
40.	(3)	90.	(4)	140.	(3)	190.	(1)
41.	(2)	91.	(2)	141.	(4)	191.	(2)
42.	(3)	92.	(4)	142.	(1)	192.	(3)
43.	(2)	93.	(2)	143.	(1)	193.	(3)
44.	(4)	94.	(1)	144.	(2)	194.	(1)
45.	(3)	95.	(4)	145.	(3)	195.	(1)
46.	(1)	96.	(3)	146.	(1)	196.	(2)
47.	(3)	97.	(1)	147.	(2)	197.	(4)
48.	(2)	98.	(4)	148.	(3)	198.	(1)
49.	(2)	99.	(2)	149.	(2)	199.	(2)
50.	(2)	100.	(4)	150.	(4)	200.	(2)

Dated :
28-9-2022

M.L. Syal's **Helix Institute**
S.C.O. 343-345, Top Floor, Sector 34-A, Chandigarh. Ph : 0172-2623155

XII cum Competition Course for Medical
Test - 12

MM : 720

Time : 3 hrs. 20 min

PHYSICS	:	SEMICONDUCTOR DEVICES AND EM WAVES
CHEMISTRY	:	CARBOXYLIC ACIDS-II, NITROGEN CONTAINING COMPOUNDS
ZOOLOGY	:	PRINCIPLES & PROCESSES OF BIOTECHNOLOGY-II, APPLICATION OF BIOTECHNOLGY -I
BOTANY	:	ORGANISMS AND POPULATIONS, ECOSYSTEM-I

PHYSICS : SECTION-A

All questions are compulsory in section A

1.
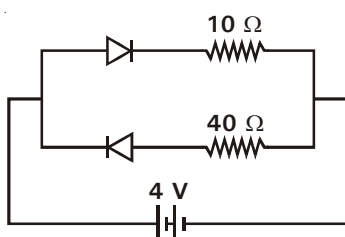
In the above figure, the current supplied by the battery is
(1)   0.1 A
(2)   0.3 A
(3)   0.5 A
(4)   0.4 A

2. A piece of copper and the other of germanium are cooled from the room temperature to 80 K, then which of the following would be a correct statement?
(1)   Resistance of each increases
(2)   Resistance of each decreases
(3)   Resistance of copper increases while that of germanium decreases
(4)   Resistance of copper decreases while that of germanium increases

3. The ratio of electron and hole current in a semiconductor is $\dfrac{7}{4}$ and the ratio of drift velocities of electrons and holes is $\dfrac{5}{4}$, then ratio of concentrations of electrons and holes will be
(1) $\dfrac{5}{7}$
(2) $\dfrac{7}{5}$
(3) $\dfrac{25}{49}$
(4) $\dfrac{49}{25}$

4. Let a pure Si crystal has 4×10^{28} atoms/m^3. If it is doped with 1 ppm concentration of pentavalent impurity, the number of holes will be approximately (Given that $n_i = 1 \times 10^{16}$ m^{-3})
(1) 4.25×10^9 m^{-3}
(2) 4.5×10^3 m^{-3}
(3) 2.25×10^9 m^{-3}
(4) 2.5×10^9 m^{-3}

5. The amplifiers X, Y and Z are connected in series. If the voltage gains X, Y and Z are 10, 20 and 30, respectively and the input signal is 1 mV peak value, then. What is the output signal voltage (peak value) if dc supply voltage is 10 V?
(1)   1 V
(2)   5 V
(3)   6 V
(4)   10 V

6.
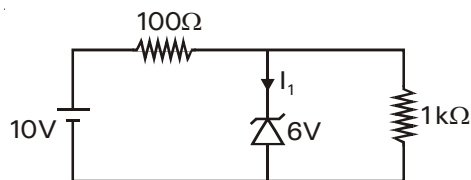
Current flowing through the zener diode in the circuit shown is

(1) 10 mA   (2) 16 mA
(3) 34 mA   (4) 24mA

7. In CB configuration, the output characteristics of the transistor are shown by plots of
   (1) i_C versus V_{CB} for constant values of I_E
   (2) i_B versus V_{CB} for constant values of I_E
   (3) i_E versus V_{CE} for constant values of I_B
   (4) i_C versus V_{CE} for constant values of I_B

8. Which one is reverse-biased?
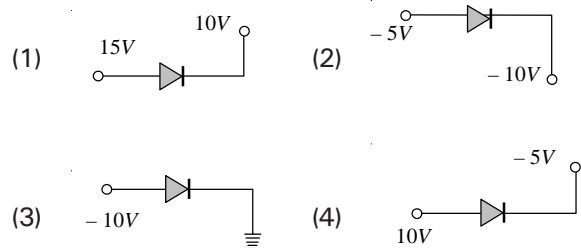
9. Peak value of electric field in an electromagnetic wave is E_0. Then peak value of magnetic field is

(1) $E_0 \sqrt{\mu_0 \varepsilon_0}$ (2) $E_0 \sqrt{\dfrac{\mu_0}{\varepsilon_0}}$

(3) $0.5\, E_0 \sqrt{\mu_0 \varepsilon_0}$ (4) $E_0 \sqrt{\dfrac{1}{\mu_0 \varepsilon_0}}$

10.
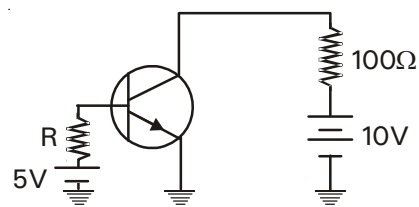
In the circuit shown, $R = 10000\,\Omega$, $V_{BE} = 2$ volt, $\beta = 100$. Then $V_{CE} =$

(1) 10V   (2) 7V
(3) 5V   (4) 6V

11.

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

The truth table corresponds to

(1) AND   (2) OR
(3) NOT   (4) None of these

12. The part of electromagnetic spectrum absorbed by the ozone layer is
    (1) infrared radiations
    (2) ultraviolet radiations
    (3) X-rays
    (4) γ-rays

13. An oscillator is an amplifier with
    (1) positive feed back
    (2) large gain
    (3) no feedback
    (4) negative feedback

14. When a p-n junction diode is forward biased, then
    (1) the depletion region is reduced and barrier height is increased
    (2) the depletion region is widened and barrier height is reduced
    (3) both the depletion region and barrier height are reduced
    (4) both the depletion region and barrier height are increased

15.
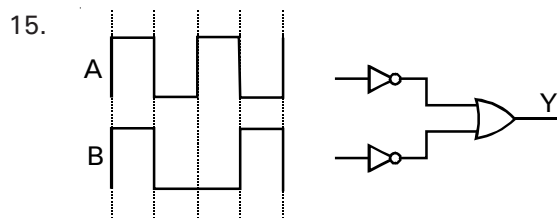
In the circuit shown, two input waveforms A and B are applied simultaneously. The output waveform Y is
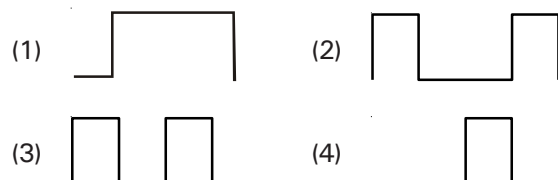
16. Match the types of solids in column-I with their energy band differences in column-II

Column-I		Column-II

a. Semi-conductor   p.

b. Insulator   q.

c. Metal   r.

    (1) a-p, b-q, c-r   (2) a-q, b-r, c-p
    (3) a-r, b-p, c-q   (4) a-q, b-p, c-r

17. In the circuit given below, the value of the current is
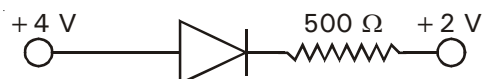
    (1) zero   (2) 1mA
    (3) 12mA   (4) 4mA

18. Which of the following statements is true?
    (1) In p-type semiconductors, the dopant atom of p-type material can be treated as core of one positive charge along with its associated hole.
    (2) When current through the zener diode varies over a wide range, the zener voltage increases.
    (3). Photodiodes are preferably used in the reverse bias condition for measuring light intensity, even though current in forward bias is more than current in reverse bias.
    (4) In a transistor, all three segments have same thickness.

19.
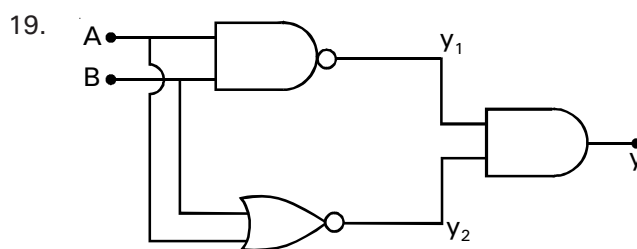
The above circuit represents a/an
    (1) AND   (2) OR
    (3) NOR   (4) NAND

20. A full-wave rectifier circuit along with the output is shown in the figure below. The contribution(s) from the diode 1 is (are)

    (1) C   (2) A, C
    (3) B, D   (4) A, B, C, D

21.
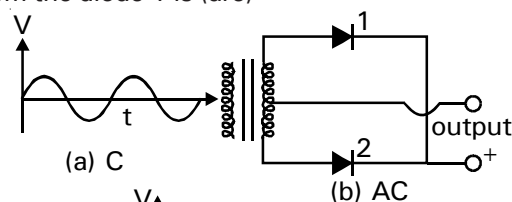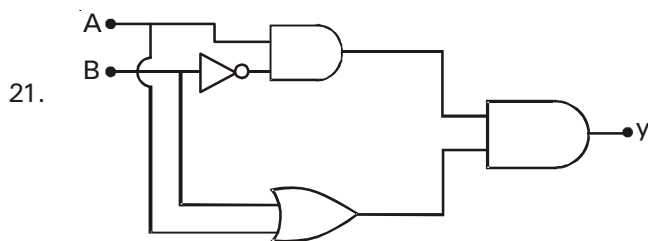
The circuit shown will produce an output Y = 1 if input is

(1) A = 0, B = 0   (2) A = 1, B = 0

(3) A = 0, B = 1   (4) A = 1, B = 1

22. **Statement-I** : Electric field and magnetic field in an EM wave vibrate in phase.

    Statement-II : Energy of an EM wave resides in electric field only.

    (1) Both statement I & II are correct

    (2) Both statement I & II are incorrect

    (3) Statement I is correct, II is incorrect

    (4) Statement I is incorrect, II is correct

23. In a n-p-n transistor circuit, the collector current is 8 mA. If 95% of the electrons emitted reach the collector, then the emitter current is

    (1) 7.86 mA   (2) 9.21 mA

    (3) 8.21 mA   (4) 8.42 mA

24. Which of the following in not known as Maxwell's equation?

    (1) $\oint_s \vec{E}.\vec{ds} = \dfrac{Q}{\varepsilon_0}$ (2) $\oint_c \vec{E}.\vec{dl} = -\dfrac{d\phi_B}{dt}$

    (3) $\oint_s \vec{B}.\vec{ds} = 0$ (4) $\oint_c \vec{B}.\vec{dl} = \mu_0 I_C$

25.
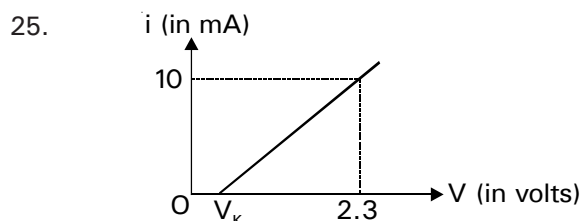
    Dynamic resistance of the germanium junction diode shown above for an applied bias above the knee voltage ($V_K = 0.3$ V) is

    (1) 400 Ω   (2) 200 Ω

    (3) 250 Ω   (4) 600 Ω

26. In a transistor ($\beta = 50$), the voltage across $1\,k\Omega$ load resistance in collector circuit is 2V. The base current is

    (1) 20 μA   (2) 40 μA

    (3) 40 mA   (4) 20 mA

27. Carbon, silicon and germanium have four valence electrons each. These are characterised by valence and conduction bands separated by energy band gap respectively equal to $(E_g)_C$, $(E_g)_{Si}$ and $(E_g)_{Ge}$. Which of the following statements is true?

    (1) $(E_g)_{Si} < (E_g)_{Ge} < (E_g)_C$ (2) $(E_g)_C < (E_g)_{Ge} > (E_g)_{Si}$

    (3) $(E_g)_C = (E_g)_{Si} = (E_g)_{Ge}$ (4) $(E_g)_C > (E_g)_{Si} > (E_g)_{Ge}$

28. **Assertion** : Electric and magnetic field vectors in an em wave oscillate perpendicular to each other.

    Reason : em waves are transverse.

    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion

    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion

    (3) Assertion is true statement but Reason is false

    (4) Assertion is false

29. If an n-p-n transistor is biased to work as an amplifier, then
    (1) its emitter-base junction is forward-biased and collector base junction reverse-biased
    (2) both junctions are forward-biased
    (3) both the junctions are reverse-biased
    (4) it is immaterial whether the junctions are biased or not

30.
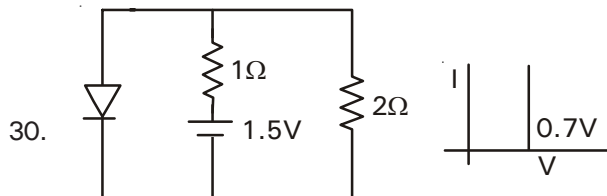
    Assuming I–V graph of diode to be as shown, current through the diode is
    (1) zero   (2) 1.5 A
    (3) 0.8A   (4) 0.45A

31. Electromagnetic waves used for studying crystal structure are
    (1) X-rays   (2) Microwaves
    (3) Gamma   (4) Ultra-violet

32. $Y = \overline{A}.B + A.\overline{B}$ represents
    (1) OR Gate   (2) XOR Gate
    (3) NAND Gate   (4) none of these

33. Light emitting diode
    a. is a heavily doped p-n junction which under forward bias emits spontaneous radiation
    b. is biased such that the light emitting efficiency is maximum
    c. has low (~5 V) reverse breakdown voltage
    (1) Both a & b   (2) a, b & c
    (3) both b & c   (4) both a & c

34. The important criteria for the selection of a material for solar cell fabrication are
    (a) band gap (~ 1.0 to 1.8 eV)
    (b) low optical absorption (~ 10 cm^{-1})
    (c) availability of raw material
    (d) electrical conductivity
    (1) a, b, d but not c   (2) b, c, d but not a
    (3) a, c, d but not b   (4) a, b, c & d

35. Average magnetic energy density in an em wave is 2 μ J/m³ . The intensity of the wave is
    (1) 2000 W/m²
    (2) 600 W/m²
    (3) 1200 W/m²
    (4) zero

PHYSICS : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

36. Find the conductivity of intrinsic silicon at 300 K. It is given that intrinsic concentration at 300 K in silicon is 1.5×10^{10}/cm³ and the mobilities of electrons and holes in silicon are 1300 cm²/V-s and 500 cm²/V-s respectively.
    (1) 4.32×10^{-6} mho/cm
    (2) 2.3×10^{-6} mho/cm
    (3) 1.2×10^{-6} mho/cm
    (4) 6.42×10^{-6} mho/cm

37. In the circuit, the voltage drop on the p-n junction is 0.7 V. The current flowing in the circuit is (diodes are ideal)
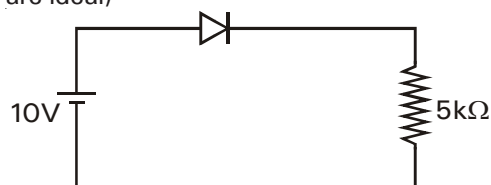
    (1) 1.86 mA   (2) 2.11 mA
    (3) 1.92 mA   (4) 2.04 mA

38. In an amplifier circuit with feedback, apparent gain is 20% more than real gain. To get an apparent gain 40% more than real gain, feeback factor has to be increased by about
    (1) 50%   (2) 33%
    (3) 60%   (4) 70%

39. **Statement-I** : Electric room heaters emit mainly microwaves .
    Statement-II : Microwaves produce heating effect in water.
    (1) Both statement **I** & **II** are correct
    (2) Both statement **I** & **II** are incorrect
    (3) Statement **I** is correct, **II** is incorrect
    (4) Statement **I** is incorrect, **II** is correct

40. Let n_h and n_e be the number of holes and conduction electrons respectively in an intrinsic semiconductor. Then

   (1) $n_h > n_e$ (2) $n_h < n_e$

   (3) $n_h = n_e$ (4) $n_e >> n_h$

41.
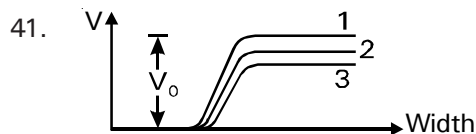
   Figure shows barrier potential for p-n junction diode under forward bias. Graphs 1, 2 & 3 are
   (1) high voltage battery, low battery voltage, without battery respectively
   (2) without battery, low battery voltage, high voltage battery respectively
   (3) without battery, high battery voltage, low voltage battery respectively
   (4) none of these

42. Light with an energy flux of 20 W/cm^2 falls on a perfect reflector normally. If the surface area is 20 cm^2, then average force exerted is
   (1) 2.7×10^{-6} N   (2) 1.4×10^{-16} N
   (3) 16×10^{-15} N   (4) 8×10^{-5} N

43. **Assertion** : Net charge on an n-type semiconductor is zero.
   Reason : Atoms are electrically neutral.
   (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
   (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
   (3) Assertion is true statement but Reason is false
   (4) Assertion is false

44. Zener breakdown takes place if
   (1) doped impurity is low
   (2) doped impurity is high
   (3) less impurity in N-type
   (4) less impurity in P-type

45. Two P-N junctions can be connected in series by three different methods as shown in the figure. If the potential difference in the junctions is the same, then the correct connections will be in circuit

   (i)   (ii)

   (iii)
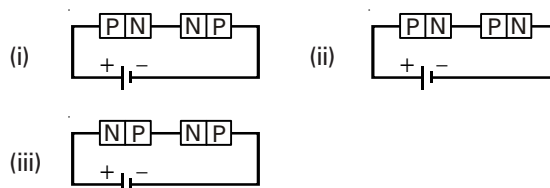
   (1) (i) and (ii)   (2) (ii) and (iii)
   (3) (i) and (iii)   (4) (i) only

46. If $\vec{E}$ and $\vec{B}$ are the electric and magnetic field vectors of E.M. waves then the direction of propagation of E.M. wave is along the direction of
   (1) $\vec{E}$ (2) $\vec{B}$
   (3) $\vec{E} \times \vec{B}$ (4) $\vec{B} \times \vec{E}$

47. Which of the following statements is false?
   (1) In an extrinsic semiconductor doped with pentavalent impurity, electrons become majority carriers and holes minority carriers.
   (2) Diffusion current in an isolated PN junction is zero.
   (3) When E_c & E_v are drawn as straight lines in a figure, they should be respectively taken simply as bottom of conduction band energy level and top of valence band energy level.
   (4) Input characteristic graphs of a transistor in CE configuration resemble I-V graphs of a PN junction.

48. A n-p-n transistor is connected in common emitter configuration in which collector supply is 8 V and the voltage drop across resistance R_C connected in the collector circuit is 0.5 V. The value of $R_C = 800 \, \Omega$. If $\alpha = 0.96$, the collector-emitter voltage and base current is
   (1) 7.5 V and 0.026 mA
   (2) 7.5 V and 0.018 mA
   (3) 8 V and 0.625 mA
   (4) 8.5 V and 0.018 μA

49.
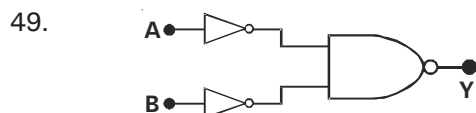
The above circuit acts as

(1) OR gate   (2) NAND gate

(3) AND gate   (4) NOT gate

50. $\overline{(\overline{X \cdot Y}) \cdot X} =$

(1) $\overline{X \cdot Y}$ (2) $X + Y$

(3) $\overline{X + Y}$ (4) X

CHEMISTRY : SECTION-A

All questions are compulsory in section A

51. Which of the following will be most stable diazonium salt?

(1) $CH_3N_2^+X^-$ (2) $C_6H_5N_2^+X^-$

(3) $CH_3CH_2N_2^+X^-$ (4) $C_6H_5CH_2N_2^+X^-$

52. Rate of the reaction

$$R-\overset{O}{\overset{\|}{C}}-Z + \overset{\ominus}{Nu} \longrightarrow R-\overset{O}{\overset{\|}{C}}-Nu + \overset{\ominus}{Z}$$
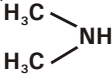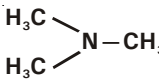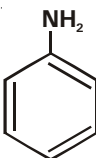
is fastest when Z is

(1) Cl   (2) $OCOCH_3$

(3) OC_2H_5 (4) NH_2
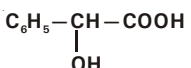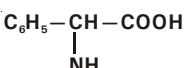
53. The number of sp³ hybridised carbon in an acyclic neutral compound with molecular formula C_4H_5N is

(1) 1   (2) 2

(3) 3   (4) 4

54. The least reactive amine towards dilute hydrochloric acid is

(1) CH_3-NH_2 (2) $\begin{array}{c} H_3C \\ H_3C \end{array}\!\!\!\diagdown NH$

(3) $\begin{array}{c} H_3C \\ H_3C \end{array}\!\!\!\diagdown N-CH_3$ (4) $C_6H_5-NH_2$ (aniline structure)

55. Which of the following carboxylic acids undegro decarboxylation easily?

(1) $C_6H_5COCH_2COOH$ (2) $C_6H_5COCOOH$

(3) $C_6H_5-\underset{OH}{\underset{|}{CH}}-COOH$ (4) $C_6H_5-\underset{NH_2}{\underset{|}{CH}}-COOH$

56. Which is the correct match for the products formed in the following reaction?

$$CH_3CH_2I \xrightarrow{NaCN} X \xrightarrow[\substack{partial \\ hydrolysis}]{OH^-} Y \xrightarrow[NaOH]{Br_2} Z$$
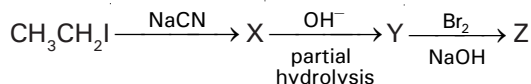
Column-I		Column-I	
a.	X	(i)	$CH_3CH_2NH_2$
b.	Y	(ii)	CH_3CH_2COOH
c.	Z	(iii)	CH_3CH_2CN
		(iv)	$CH_3-CH_2-\overset{O}{\overset{\|}{C}}-NH_2$

(1) a–(iii), b–(iv), c–(i)

(2) a–(iii), b–(i), c–(iv)

(3) a–(iv), b–(iii), c–(i)

(4) a–(i), b–(ii), c–(iii)

57. Ketoximes on reduction with $LiAlH_4$ or Na/C_2H_5OH give

(1) 1° Amines   (2) 2° Amines

(3) 3° Amines   (4) Quarternary salts

58. Among the following compounds which is expected to behave as a weakest base

(1) $C_6H_5NH_2$ (2) $C_6H_5CONH_2$

(3)

(4) $CH_3CH_2NH_2$
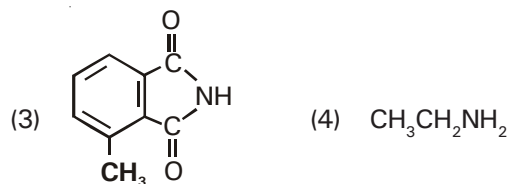
59. **Statement-I :** 1°, 2° and 3° amines with same molecular formula are isomers to each other.

Statement-II : 1°, 2° and 3° amines have different functional groups.

(1) Both statement-I and statement-II are correct

(2) Both statement-I and statement-II are incorrect

(3) Statement-I is correct but statement-II is incorrect

(4) Statement-I is incorrect but statement-II is correct

60. Which of the following acids has highest dissociation constant?

(1) $CH_3CHFCOOH$ (2) FCH_2CH_2COOH

(3) $BrCH_2CH_2COOH$ (4) $CH_3CHBrCOOH$

61. $\left[\underset{\text{N}^+}{\overset{\displaystyle}{}}\right] \text{I}^- \xrightarrow[\text{H}_2\text{O}]{\text{Ag}_2\text{O}} \text{A} \xrightarrow{\text{400K}} \text{X} + \text{Y}.$
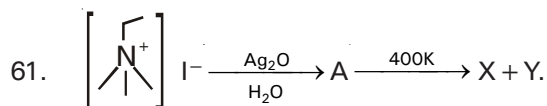
Product X and Y are

(1) $CH_2 = CH_2$ and $(CH_3)_2CHCN$
(2) CH_3CH_2CN and $C_2H_5NH_2$
(3) $CH_2 = CH_2$ and Me_3N
(4) $Me_2C = CH_2$ and NH_3

62. $CH_3CH_2COOH \xrightarrow[\text{Re dP}]{\text{Cl}_2} A \xrightarrow[\text{KOH}]{\text{alc}} B$
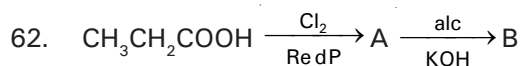
(1) CH_3CH_2CHO
(2) CH_3CH_2CHO
(3) $CH_2 = CH - COOH$
(4) $Cl - CH_2CH_2COOH$

63. **Assertion :** The nitration of 2−methyl acetanilide gives mainly the 4−nitro derivative.
Reason : If a benzene derivative contains CH_3 and $NHCOCH_3$ (both being o−and p−directing), then $NHCOCH_3$ exerts a stronger influence than CH_3.

(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Assertion is false

64. Which of the following amines give carbylamine reaction

(1) aniline
(2) N-methylaniline
(3) N, N-dimethylamine
(4) dimethylamine

65. An organic compound A on reaction with NH_3 followed by heating gives compound B. B on further strong heating gives compound C $[C_8H_5NO_2]$. Compound C on sequential reaction with ethanolic KOH, alkyl chloride and hydrolysis with alkali gives a primary amine. The compound A is

(1) [benzene ring with CHO and CHO (ortho)]
(2) [benzene ring with CHO and COOH (ortho)]
(3) [benzene ring with COOH and COOH (ortho)]
(4) [benzene ring with CHO and OH (ortho)]
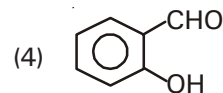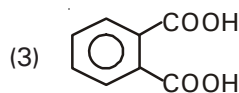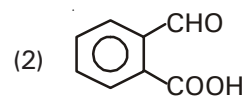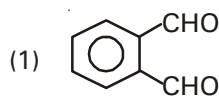
66. Benzoic acid when treated with Br_2 /$FeBr_3$ will give

(1) p-bromobenzoic acid
(2) o-bromobenzoic acid
(3) 2, 4-dibromobenzoic acid
(4) m-bromobenzoic acid

67. An aliphatic amine on treatment with alcoholic carbon disulphide and mercuric chloride forms ethyl isothiocyanate, the reaction is known as

(1) Hoffmann's elimination
(2) Hoffmann's rearrangement
(3) Hoffmann's bromamide degradation reaction
(4) Hoffmann's mustard oil reaction

68. **Assertion :** Aniline on nitration yields ortho, meta and para nitro derivatives of aniline.
Reason : Ortho nitro aniline is the minor product in this reaction.

(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Assertion is false

69. Which of the following will not give HVZ reaction?

(1) $C_2H_5-CH-COOH$
         $|$
         OH

(2) $(CH_3)_3CCOOH$

(3) $C_2H_5-CH_2-COOH$

(4) $(CH_3)_2CHCOOH$

70.
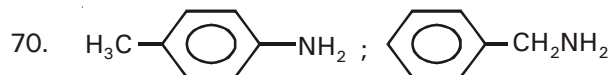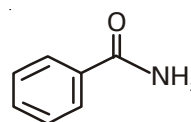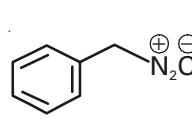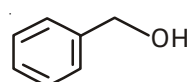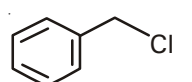
Which of the following reagents will be useful to distinguish between the above?

(1) Dilute HCl

(2) $C_6H_5SO_2Cl$ & OH^-/H_2O

(3) HONO (0 to 5° C) then β-naphthol

(4) $AgNO_3$ in H_2O

71. The product formed from the following reaction sequence is

(1)   (2)

(3)   (4)

72.
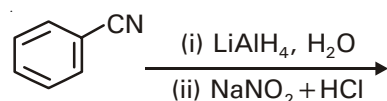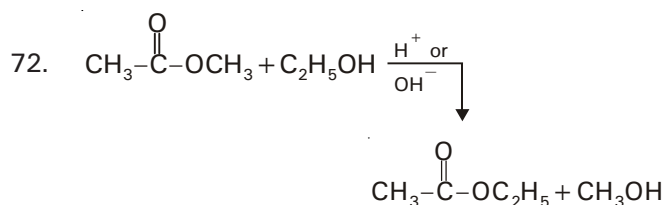
The above reaction is called

(1) Claisen Schmidt reaction

(2) Esterification

(3) Tischenko reaction

(4) Trans-esterification

73. Which of the following can't be prepared by Gabriel Phthalimide synthesis ?

(1) $C_6H_5NH_2$ (2) $C_6H_5CH_2NH_2$

(3) CH_3NHCH_3 (4) Both (1) and (3)

74. **Statement-I** : Methylamine in water reacts with ferric chloride to precipitate hydrated ferric oxide.
Statement-II : Methyl amine has higher boiling point than dimethyl amine.

(1) Both statement-I and statement-II are correct

(2) Both statement-I and statement-II are incorrect

(3) Statement-I is correct but statement-II is incorrect

(4) Statement-I is incorrect but statement-II is correct

75. The reagents that can be used to convert benzenediazonium chloride to benzene are

(1) $SnCl_2/HCl$ (2) CH_3CH_2OH

(3) H_3PO_2 (4) both (2) & (3)

76. $C_6H_5NH_2 \xrightarrow[273-278K]{NaNO_2/HCl} A \xrightarrow{HBF_4} B \xrightarrow[Cu,\Delta]{NaNO_2} C$
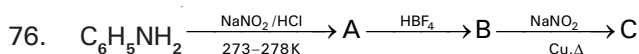
The product C is

(1) Aniline

(2) Nitrobenzene

(3) Phenol

(4) Benzene diazonium chloride

77. In which of the following reaction the organic product formed is soluble in alkali

(1) $RNH_2 + PhSO_2Cl \rightarrow$

(2) $R_2NH + PhSO_2Cl \rightarrow$

(3)
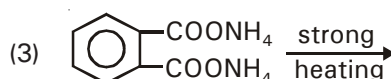
(4) both (1) and (3)

78. Which of the following amines can not form hydrogen bonds within themselves?

(1) CH_3NH_2 (2) $(CH_3)_2NH$

(3) $(CH_3)_3N$ (4) none of these

79. Amongst the following, the strongest base in aqueous medium is

(1) CH_3NH_2 (2) $NCCH_2NH_2$

(3) $(CH_3)_2 NH$ (4) $C_6H_5NHCH_3$

80. $C_4H_{11}N \xrightarrow{\text{HONO}}$ Yellow oily compound
    (X)
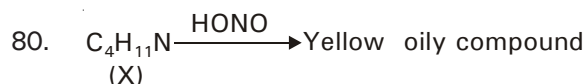
    In the above reaction X is

    (1) $C_3H_6NH_2$
    (2) $CH_3CH_2N(CH_3)_2$
    (3) $CH_3CH_2NHCH_2CH_3$
    (4) $CH_3CH(NH_2)CH_2CH_3$

81. Which of the following is a tertiary amine?

    (1) Ethylene diamine   (2) Dimethyl amine
    (3) Trimethyl amine   (4) N-methyl aniline

82. The reaction

    $Ar\overset{+}{N_2}Cl^- \xrightarrow{\text{Cu/HCl}} ArCl + N_2 + CuCl$ is named as
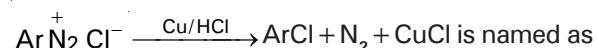
    (1) Sandmeyer reaction
    (2) Gatterman reaction
    (3) Claisen reaction
    (4) Carbylamine reaction

83. The number of moles of KOH and Br_2 used up per mole of the amide in Hoffmann bromamide reaction respectively are

    (1) 1, 1   (2) 1, 4
    (3) 2, 4   (4) 4, 1

84. Which of the following is not suitable for Hoffmann's ammonolysis?

    (1) C_2H_5Cl (2) CH_3Cl
    (3) $CH_3-CH_2-CH_2Cl$ (4) C_6H_5I

85. Which of the following compound will not undergo azo coupling reaction with benzene diazonium chloride.

    (1) Aniline   (2) Phenol
    (3) Anisole   (4) Nitrobenzene

CHEMISTRY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

86. Identify the mismatch

    (1) Benzene sulphonyl chloride : Hinsberg reagent
    (2) Aryl diazonium salts   : Dyes
    (3) Alkyl diazonium salts   : Dyes
    (4) Suphanilic acid   : Zwitter ion

87. **Assertion :** pK_b of aniline is more than that of methyl amine.
    Reason : Lone pair on aniline is involved in delocalisation, hence weak base.

    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

88. The final major product of the following reaction is

    $$Ph-\underset{H}{\overset{OH}{C}}-\underset{NH_2}{CH}-CH_3 \xrightarrow[+HCl]{NaNO_2}$$

    (1) $Ph-\underset{H}{\overset{OH}{C}}-\underset{OH}{CH}-CH_3$

    (2) $PhCOCH_2CH_3$

    (3) $Ph-\overset{O}{\overset{\diagup\diagdown}{CH-CH}}-CH_3$

    (4) $Ph-CH(OH)-CH_2-CH_2OH$
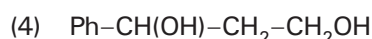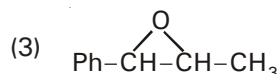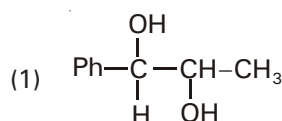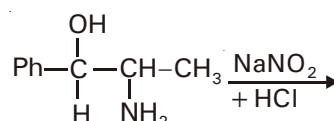
89. On heating aniline with fuming sulphuric acid at 180°C , the compound formed will be
    (1) aniline disulphate
    (2) aniline 2,4,6-trisulphonic acid
    (3) sulphanilic acid
    (4) anilinium hydrochloride

90. When $CH_2=CH-CH_2-COOH$ is reduced with $LiAlH_4$, the compound obtained will be
    (1) $CH_2=CH-CH_2-CH_2OH$
    (2) $CH_3-CH_2-CH_2-CH_2OH$
    (3) $CH_3-CH_2-CH_2-CHO$
    (4) $CH_3-CH_2-CH_2-COOH$

91. The major product of reaction of acetanilide with bromine and followed by hydrolysis
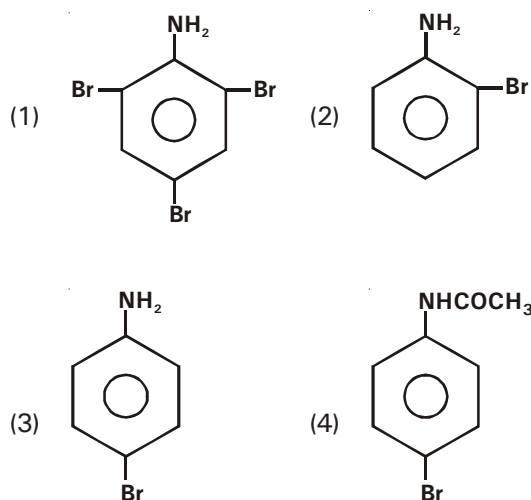
92. Which of the following is optically inactive but non-superimposable on its mirror image?
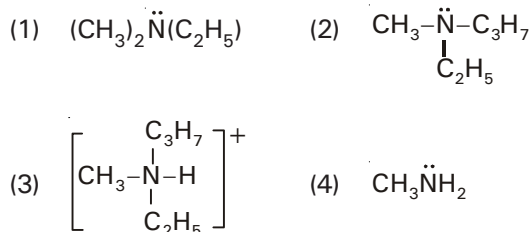
93. The basic characters of the given substituted anilines (I to IV)
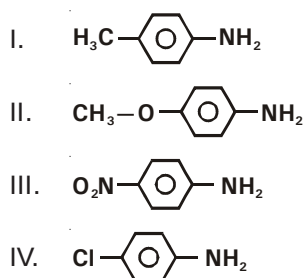
    are such that
    (1) I > II > III > IV
    (2) I > II > IV > III
    (3) II > I > III > IV
    (4) II > I > IV > III

94. Which of the following cannot be prepared by Sandmeyer's reaction?
    (1) Chlorobenzene
    (2) Fluorobenzene
    (3) Iodobenzene
    (4) both (2) & (3)

95. $CH_3CH_2CN \xrightarrow{Na + C_2H_5OH} X.$

    Product X and name of the reaction is
    (1) $C_2H_5CONH_2$,Hoffmann Bromamide reaction
    (2) $C_3H_7NH_2$, mendius reaction
    (3) C_3H_8 , mendius reaction
    (4) $CH_3CH_2NHCH_3$, ammonoylisis reaction

96. The pri., sec. and ter. amines can be distinguished by
    (1) Hinsberg's reagent
    (2) Grignard reagents
    (3) Fehling's solution
    (4) Tollen's reagent

97. **Assertion :** Aniline does not undergo Friedal crafts reaction.
    Reason : It forms salt with $AlCl_3$, so nitrogen acquires positive charge.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
   (4) Assertion is false

98. Which of the following cannot be acetylated?
    (1) CH_3NH_2
    (2) $(CH_3)_2NH$
    (3) $(CH_3)_3N$
    (4) $(CH_3)_2CHNH_2$

99. A primary amine on oxidation with $KMnO_4$ forms nitro compound. The primary amine can be

    (1) NH_2
    (2) NH_2
    (3) NH_2
    (4)
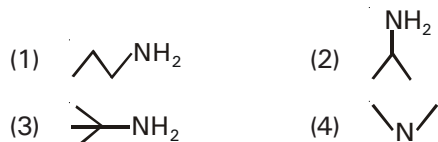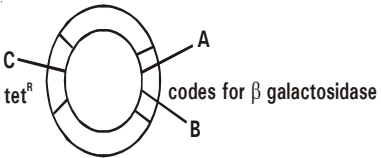
100. An optically active compound 'X' having molecular formula $C_4H_8O_3$ evolves CO_2 with $NaHCO_3$. X on reaction with $LiAlH_4$ give achiral compound. X is

    (1)
    (2) —COOH
    (3)
    (4)
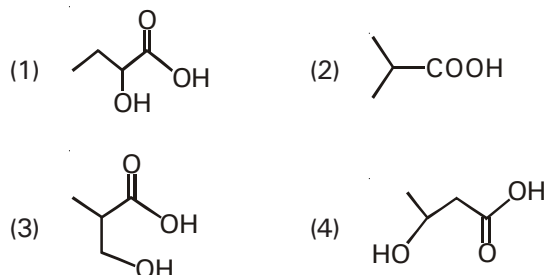
ZOOLOGY : SECTION-A

All questions are compulsory in section A

101. During the process of in vitro gene amplification, lowest temperature is maintained at which of the following steps?
    (1) Annealing
    (2) Extension
    (3) Denaturation
    (4) Ligation

102. How many of the following is/are not an application(s) of PCR ?
    a. Prenatal diagnosis
    b. Gene amplification
    c. Purification of isolated protein
    d. Detection of gene mutation
    e. Tracing phylogeny
    f. Detection of pathogens
    (1) One
    (2) Two
    (3) Four
    (4) Three

103. 5'–GGATCC–3'
    3'–CCTAGG–5
    The above sequence is found in a certain plasmid and cutting at this sequence leads to loss of resistance to antibiotic, tetracycline by *E.coli* if it is containing that plasmid. The enzyme responsible for this is
    (1) Pst I
    (2) Xho I
    (3) Pvu II
    (4) Bam HI

104. What is true for primers used in PCR?
    a. Large segments of DNA
    b. Contain Adenine, guanine, cytosine but not uracil
    c. 2 sets used are complementary to each other
    d. Single stranded & anneal at 3' end of template DNA
    (1) a, b, c & d
    (2) b, c & d
    (3) b & d
    (4) a & c

105. Which of the following stimulate the formation of erythrocytes for patients suffering from anaemia during kidney dialysis?
    (1) Calcitonin
    (2) Chronic gonadotropin
    (3) Erythropoietin
    (4) Hirudin

106. How many of the following are the enzymes required to isolate DNA in pure form from bacterial cells?
    a. Chilled ethanol   b. Ribonuclease
    c. Lysozyme   d. Chitinase
    e. Protease
    (1) two
    (2) three
    (3) four
    (4) five

107. **Statement-I** : Treating a bacterial cell with divalent cations increases effeciency of DNA entering through pores in its cell wall.
    Statement-II : Cells treated with divalent cations can be placed on ice with r-DNA and then exposed to heat shock facilitating DNA entry into cells.
    (1) Both statement-I and statement-II are incorrect
    (2) Both statement-I and statement-II are correct
    (3) Statement-I is correct but statement-II is incorrect
    (4) Statement-I is incorrect but statement-II is correct

108. Plasmid pBR322 has Sal I restriction enzyme site within gene tet^R that confers tetracycline resistance. If this enzyme is used for inserting a c-DNA encoding Calcitonin and the recombinant plasmid is inserted in an *E.coli* strain
    (1) it will not be able to confer tetracycline resistance to the host cell
    (2) the transformed cells will have the ability to resist tetracycline and produce Calcitonin
    (3) it will produce Calcitonin
    (4) Both (1) &(3)

109. For expression of a gene to produce proteins, genes can be introduced in cells that can
    a. be grown in tissue culture
    b. be cultured in bioreactors
    c. create a GMO
    (1) a, b & c   (2) a & b only
    (3) c only   (4) a & c only

110. Choose the incorrect match
    (1) Microinjection — direct injection of r-DNA in nucleus
    (2) Biolistic — bombardment of microparticles with DNA
    (3) Gene gun — transfer of disarmed pathogen
    (4) PCR — multiple copies of DNA *in vitro*

111. **Assertion** : Amp^R & tet^R genes are suitable selectable markers for cloning vectors used in *E.coli*.
    Reason : Natural *E.coli* are sensitive to ampicillin and tetracycline.
    (1) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (2) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

112. In the cloning vector pBR-322, insert is ligated at Pvu II site. Which of the following statement is true w.r.t. this ligation?
   (1) the r-plasmid will lose resistance to ampicillin
    (2) the site coding for proteins involved in replication of the plasmid will be lost
    (3) copy number of plasmid will decrease
    (4) it will result in insertional inactivation of β -galactosidase

113. How many of these are applicable to the DNA segment transferred to host cell by the "natural genetic engineer"?
    Virulence gene, ori, Tumor inducing genes, independent replication in host cell, gene encoding chemicals required by pathogen
    (1) Two   (2) Three
    (3) Four   (4) Five

114. Two different bacterial populations A and B were used to induce transformation with desired DNA. r-plasmids obtained after ligation in amp^R and in tet^R genes were introduced in population A and B respectively. Identify the correct statements.
    a. All transformants in A and B will be selected by growing on same antibiotic
    b. Recombinants in A and non-recombinants in B will be able to grow on same antibiotic
    c. Non-transformants in A and B will be sensitive to both ampicillin and tetracycline media
    d. Recombinants in B wil be resistant to the antibiotic to which recombinants in A are sensitive.
    (1) a, b, c and d   (2) b,c and d
    (3) a, b and d   (4) a, c and d

115. Match column-I and column-II and select the correct answer :

	Column-I		Column-II
a.	Chitinase	i.	protein
b.	Pvu I	ii.	Fungicide
c.	Taq polymerase	iii.	*Proteus vulgaris*
d.	Ti plasmid	iv.	Ori

    (1) a–ii, b–iii, c–iv, d–i   (2) a–ii, b–iii, c–i, d–iv
    (3) a–iv, b–i, c–ii, d–iii   (4) a–iii, b–i, c–ii, d–iv

116. How many statements are true for the given plasmid vector if desired DNA is introduced at C and host cells are cultured in the presence of tetracycline and chromogenic substrate?

    a. All transformants will yield blue colonies
    b. Recombinants will be sensitive to tetracycline
    c. Non recombinants will produce blue colonies and are tolerant to tetracyline in medium
    d. Non-transformants will form white colonies
    (1) One
    (2) Two
    (3) Three
    (4) Four

117. If, spooling is $\boxed{X}$; Elution is $\boxed{Y}$, then
    (1) $\boxed{X}$ is used to collect DNA
    (2) $\boxed{Y}$ is not related to gel electrophoresis
    (3) $\boxed{X}$ always follows $\boxed{Y}$
    (4) $\boxed{Y}$ is a technique that digests the DNA strands

118. In an experiment pBR322 is used and desired DNA is ligated to it after using Pst-I restriction enzyme. To select transformants the bacteria should be grown on a medium containing
    (1) ampicillin, as amp^R has been inactivated
    (2) tetracycline, as tet^R has been inactivated
    (3) tetracycline, as tet^R will function as selectable marker
    (4) ampicillin, as amp^R will function as selectable marker

119. Separation and purification of the product is called
    (1) downhill processing
    (2) downreactor processing
    (3) downstream processing
    (4) downstrand processing

120. How many among the following are true w.r.t *Agrobacterium tumefaciens*?

a. Natural genetic engineer

b. Infects soyabean, cotton

c. Harburs megaplasmid

d. Directly enters plant cells

e. Causes crown gall tumour

f. T-DNA of Ti plasmid has Virulence genes

(1) 6   (2) 5

(3) 4   (4) 3

121. In the given diagram of the bioreactor, what are the functions of A and E respectively.

Sterile Air
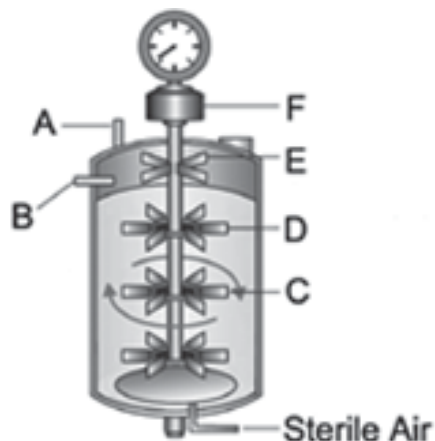
(1) A– sterilizes the material, E– facilitates even mixing of contents

(2) E– breaks the forming foam while A– represents acid/base for pH control.

(3) A– provides increased surface area for oxygen transfer while E– provides temperature control

(4) E– removes small volumes of culture while A– rotates the culture broth.

122. A bacterial cell was transformed with a recombinant DNA that was generated using a human gene. However, the transformed cells did not produce the desired protein. Reasons could be

(1) Human gene may have intron which bacteria cannot process

(2) Amino acid codons for humans and bacteria are different

(3) Human protein is formed but degraded by bacteria

(4) All of the above

123. **Statement-I** : Insertional inactivation of a gene prevents its expression resulting in non production of protein it codes for.

Statement-II : An antibiotic resistance gene codes for protein that makes a particular antibioitic ineffective.

(1) Both statement-I and statement-II are incorrect

(2) Statement-I is correct but statement-II is incorrect

(3) Both statement-I and statement-II are correct

(4) Statement-I is incorrect but statement-II is correct

124. Blood stains are found at the site of a murder. If DNA profiling technique is to be used for identifying the criminal, which of the following is ideal for use?

(1) Leucocytes   (2) Platelets

(3) Serum   (4) Erythrocytes

125. All statements are correct regarding bioreactors except one i.e.

(1) Agitator system helps in uniform distribution of oxygen and nutrients throughout the vessel

(2) Addition of antibiotic to bioreactor prevents growth of other bacteria in the medium

(3) Sampling port is for addition of raw material to the culture to maintain exponential growth of host cells

(4) Optimum conditions can be maintained in the culture medium by pH and temperature control system

126. What is true for fed-batch bioreactor?

a. Substrate is added more than once

b. is also called semibatch bioreactor

c. Products remain in it till end of run

d. Effective for production of antibiotics

e. Stationary phase of growth is prolonged
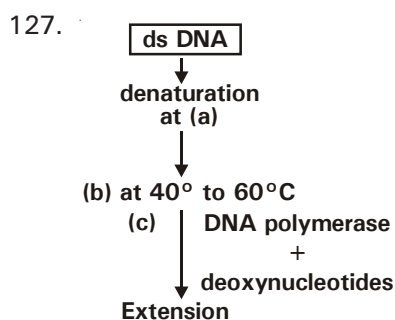
(1) a,b,c, d & e

(2) a, b & c but not d & e

(3) c, d & e but not a & b

(4) b, c d & e but not a

127.

Identify a, b and c in above flowchart regarding PCR

(1) 94°C; primer annealing; Mg^{2+}

(2) 96°C; primer extension; Zn^{2+}

(3) 94°C; primer extension; Mg^{2+}

(4) 96°C; primer annealing; Zn^{2+}

128. Foreign gene that codes for enzyme which can convert the substrate into orange colour was introduced in a plasmid. After introduction of plasmid in bacteria present in the petridish containing substrate.
    (1) recombinants will give orange colour and non-recombinants will give white colour
    (2) recombinants and non-recombinants both produced white colour
    (3) recombinants and non-recombinants both produced orange colour
    (4) recombinants will give white colour and non-recombinants will give orange colour

129. Palaeontologists unearthed a human skull during excavation, A small fragment of the scalp tissue was still attached to it. Only little DNA could be extracted from it. If the genes of the ancient man need to be analysed, the best way of getting sufficient amount of DNA from this extract is
    (1) subjecting the DNA to gel electrophoresis
    (2) treating the DNA with restriction endonucleases
    (3) hybridising the DNA with a DNA probe
    (4) subjecting the DNA to polymerase chain reaction

130. **Statement-I** : Humans have learnt the art of delivering genes into foreign cells from bacteria and viruses..
    Statement-II : We have successfully transformed tools of pathogens into useful vectors for delivering genes of interest.
    (1) Both statement-I and statement-II are incorrect
    (2) Both statement-I and statement-II are correct
    (3) Statement-I is correct but statement-II is incorrect
    (4) Statement-I is incorrect but statement-II is correct

131. A plasmid without a selectable marker was chosen as vector for cloning a gene. How does this affect the experiment.
    (1) Reaction will not occur
    (2) Identification of recombinants is not possible
    (3) Transformation will not take place
    (4) Product will be formed in less amount

132. **Assertion** : PCR requires a thermostable DNA polymerase for primer extension.
    Reason : DNA polymerase must be able to retain its 3D native structure even during the first step of PCR .
    (1) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (2) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

133. The following steps of genetically modifying an organism, are given below. Arrange them chronologically?
    A = Introduction of alien DNA into host
    B = Maintenance of introduced DNA in host
    C = Identification of DNA with desirable genes
    (1) A → B → C   (2) B → A → C
    (3) C → A → B   (4) C → B → A

134. Match the column-I with column-II using the correct options

	Column-I		Column-II
a.	Gene gun	(i)	Electric field
b.	Protoplast fusion	(ii)	Introduction of r-DNA into nucleus
c.	Micro-injection	(iii)	Gold particles
d.	Electroporation	(iv)	Chemical meditated

    (1) a–(iii), b–(iv), c–(ii), d–(i)
    (2) a–(ii), b–(iv), c–(iii), d–(i)
    (3) a–(iii), b–(ii), c–(iv), d–(i)
    (4) a–(i), b–(iv), c–(ii), d–(iii)

135. What is true for a reporter gene?
    a. Helps identify whether a gene has been picked up by host
    b. Functions as selectable marker
    c. Produces a visually identifiable character
    d. Codes for a phenotype not already exhibited by the host
    (1) a, b, c and d   (2) a, b and c only
    (3) a, c and d only   (4) b and d only

ZOOLOGY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

136. Which of the following is a mismatch ?
    (1) Engerix – Treatment of Hepatitis B
    (2) Interleukines – Enhancing action of immune system
    (3) Tissue plasminogen activator – Dissolving blood clots
    (4) α -interferon – Treatment of Hepatitis C

137. In genetic engineering, antibiotic resistance is often cloned into a vector to
    (1) kill bacteria
    (2) select for cells what cannot grow
    (3) enhance the survival of cloned cell
    (4) make direct selection of transformant/ recombinant possible

138. How many of the following are vectorless methods of gene transfer?
    Biolistics, AGE, Electroporation, Microinjection, Ti plasmid.
    (1) three   (2) four
    (3) five   (4) six

139. What would happen when one grows a recombinant bacterium in a bioreactor but forget to add antibiotic to medium in which recombinant was growing?
    (1) Nothing will happen
    (2) There will be pressure on bacteria to retain plasmid
    (3) Resisitance will not be developed in bacteria
    (4) As maintaining high copy number of plasmid is a metabolic burden to bacterial cells, they will tend to lose the plasmid

140. How many are applicable to PCR?
    DNA amplification , thermal cycling, in-vivo, labor intensive, automated, low error probability
    (1) Six   (2) Five
    (3) Four   (4) Three

141. **Statement-I** : Vectors like pBR322 have been genetically engineered.
    Statement-II : Cloning vector developed provide easy linking of foreign DNA and identification of recombinants.
    (1) Both statement-I and statement-II are incorrect
    (2) Statement-I is correct but statement-II is incorrect
    (3) Both statement-I and statement-II are correct
    (4) Statement-I is incorrect but statement-II is correct

142. Which part of a bioreacter does not match with its function?
    (1) Stirrer - facilitates even mixing and oxygen availability in the bioreactor
    (2) Gas entrainment - Provide optimum pH and temperature for formation of products
    (3) Sampling ports - Allow periodic withdrawl of culture
    (4) Foam control system-Breaks the foam forming during the process

143. Consider following statements
    a. Plasmid vector with two selectable markers for X and Y antibiotics is taken
    b. Alien DNA is ligated at restriction site within the gene for X and rDNA is induced to enter host cell.
    The addition of only antibiotic Y to the medium will help to identify the
    (1) Recombinant   (2) Non-recombinant
    (3) Transformant   (4) All of the above

144. Match the columns
Column-I	Column-II
a. Transduction	i. BAC
b. Shuttle vector	ii. YEp
c. Artificial vector to carry insert with size maximum upto 300 kb	iii. Bacteriophage

    (1) a–i, b–ii, c–iii   (2) a–iii, b–i, c–ii
    (3) a–ii, b–i, c–iii   (4) a–iii, b–ii, c–i

145. What is the step for the extraction of DNA which removes protein and RNA from sample?
    (1) Lysing the cell wall
    (2) Treating the sample with Protease and Ribonuclease
    (3) Chilled ethanol
    (4) Spooling of DNA
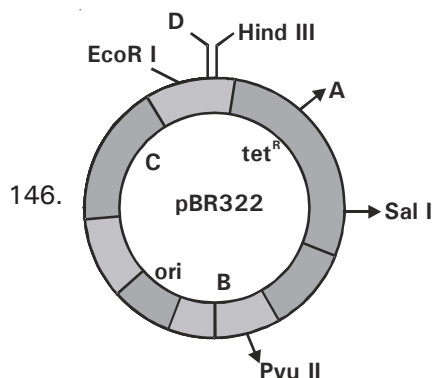
146.

In the above given figure of plasmid pBR 322, A–D are respectively?
    (1) Cla I , rop, tet^R,BamH I
    (2) tet^R, Cla I, BamH I, rop
    (3) Hind II, tet^R, Kan^R, Cla I
    (4) BamH I, rop, amp^R, Cla I

147. The plasmid vector which can replicate in *E.coli* as well as eukaryote is
    a. shuttle vector
    b. Ti plasmid
    c. pBR322
    (1) a and b only   (2) b and c only
    (3) a and c only   (4) a, b and c

148. In order to be ready for marketing, a product has to undergo _____(i)_____ processing. Latter involves _____(ii)_____ and _____(iii)_____ . Suitable preservatives are used for formulating a product and such formaulation has to undergo through _____(iv)_____
    in case of _____(v)_____.
    What are i-v respectively?
    (1) Upstream, purification, seperation, biosynthetic stage, proteins
    (2) Bioreactor, filtration, sedimentation, biosynthetic stage, alcohol
    (3) Downstream processing, separation, purification, clinical trials, drugs
    (4) Bioreactor, separation, purification, biosynthetic stage, drugs
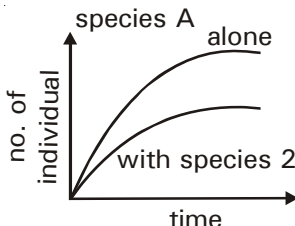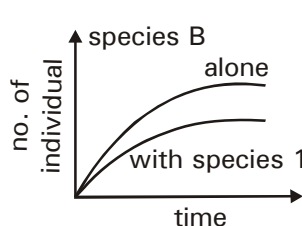
149. **Assertion** : Most of the commonly used vectors contain unique recognition sites for different restriction enzymes.
    Reason : Presence of different restriction endonucleases in a vector provides choice of enzyme to be used .
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

150. If the given steps for separation of genetic material are arranged in chronological sequence which will be fourth step?
    a. Removal of RNA
    b. Purified DNA in chilled ethanol
    c. Treatment with chitinase
    d. Spooling
    e. Collection of fine threads in suspension
    (1) d   (2) e
    (3) c   (4) b

BOTANY : SECTION-A

All questions are compulsory in section A

151. **Statement- I** : Producers of large aquatic ecosystems are microphytes. .
    Statement- II : Shallow water ecosystem such as pond has all biotic and abiotic components.
    (1) Both statement-I and statement-II are correct
    (2) Both statement- I and statement-II are incorrect
    (3) Statement-I is correct but statement-II is incorrect
    (4) Statement-I is incorrect but statement-II is correct

152. In any growing population, most of the contribution is of
    (1) post-reproduction members
    (2) reproductive members
    (3) pre-reproductive members
    (4) all of the above

153. How many of the following statements are correct?
    a. In 1981, the r value for human population in India was 0.0205
    b. In nature populations do not have unlimited resources at their disposal
    c. Size of population for any species is actually a static parameter
    d. Each organism has an invariably defined range of conditions that it can tolerate
    (1) two   (2) three
    (3) four   (4) four

154. Highest value in g/m^2/yr in grassland ecosystem is found in
    (1) gross primary production
    (2) net primary production
    (3) secondary production
    (4) tertiary production

155. **Assertion**: Secondary consumers are herbivores.
    Reason: Net primary productivity is available biomass to herbivores .
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

156. Observe the age pyramid given below and answer the question respectively

    a. What is growth status of population?
    b. What does broad dark base represent?
    (1) a- declining, b-pre-reproductive males
    (2) a-stable, b-reproductive females
    (3) a-expanding, b-pre-reproductive females
    (4) a-expanding, b-pre-reproductive males and females

157. Which scientist is correctly linked to his contribution in ecology?
    a. Allen - larger body size of mammals of cold regions
    b. MacArthur - Resource partitioning
    c. Gause - competitive release
    d. Ram deo Misra - father of ecology in India
    (1) a & b   (2) b & c
    (3) c & d   (4) b & d

158. Which of the following equation explains rate of growth according to logistic growth form?
    (1) $\dfrac{dN}{dt} = rN$ (2) $\dfrac{dN}{dt} = (b - d) \times N$

    (3) $\dfrac{dN}{dt} = rN\dfrac{(K - N)}{K}$ (4) $Nt = N_0 e^{rt}$

159. Suppose all the bacteria and fungi are destroyed. What will happen?
    (1) There will be no disease and death
    (2) No antibiotics would become available
    (3) Dead bodies and excretions will pile up
    (4) Soil will become depleted of all nutrients

160. **Statement- I** : For competition to occur, resources always need not be limiting.
Statement- II : Competition is best defined as a process in which the fitness of one species is significantly lower in the presence of another species .
    (1) Both statement- I and statement-II are incorrect
    (2) Statement-I is correct but statement-II is incorrect
    (3) Both statement-I and statement-II are correct
    (4) Statement-I is incorrect but statement-II is correct

161. Main reason for low productivity of ocean is
    (1) Low nutrient concentration especially nitrogen
    (2) Very few decomposers
    (3) Large number of phytoplanktons
    (4) Large number of zooplanktons

162. Vertical distribution of different species occupying different levels in an ecosystem is called
    (1) stratification
    (2) species composition
    (3) standing crop
    (4) standing state

163. **Assertion**: Abingdon tortoise in the Galapagos island became extinct within a decade after goats were introduced on the island .
Reason: Extinction of tortoise occurs due to greater browsing efficiency of these goats.
    (1) Assertion is true statement but Reason is false
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (4) Assertion is false

164. Three values of productivities are given
    A – 40,000 kcal m^{-2} yr^{-1}
    B – 20,000 kcal m^{-2} yr^{-1}
    C – 50,000 kcal m^2/year
    Which of these could be a value of secondary productivity, gross primary productivity and net primary productivity respectively?
    (1) A, B, C   (2) A, C, B
    (3) B, C, A   (4) C, B, A

165. Which one of the following is not a functional characteristic of an ecosystem ?
    (1) Stratification   (2) Energy flow
    (3) Decomposition   (4) Productivity

166. In Batesian Mimicry
    (1) mimic is palatable and model unpalatable
    (2) both mimic and model are unpalatable
    (3) both mimic and model are palatable
    (4) mimic is unpalatable and model is palatable

167. People who have migrated from the plains to an area adjoining Rohtang Pass about six months back
    (1) Have the usual RBC count but their haemoglobin has very high binding affinity of O_2
    (2) Have more RBCs and their haemoglobin has a lower binding affinity of O_2
    (3) Are not physically fit to play games like football
    (4) Suffer from altitude sickness with symptoms like nausea, fatigue, etc

168. In laboratory experiments, two species of a protozoan (species A and B) were grown alone and in the presence of the other species. The following graph shows growth of species A and species B, both alone and when in a mixed culture with other species.

    Which of the following conclusions can be drawn from the graph?
    (1) competitive exclusion occured in these experiments
    (2) both species are affected by interspecific competition but species A is affected less
    (3) both species are affected by interspecific competition but species B is affected less
    (4) both species are affected equally by interspecific competition

169. Two closely related species competing for the same resource can not coexist indefinitely, so competitively inferior one will be eliminated eventually'. This is in accordance to
    (1) Competitive release principle
    (2) Gause's competitive exclusion principle
    (3) MacArthurs competitive exclusion principle
    (4) Resource partitioning

170. Which is wrongly matched?
    (1) Substrate for decomposition – detritus
    (2) Secondary consumer – parasite
    (3) Primary carnivore – secondary consumer
    (4) Humus – dark, amorphous and colloidal in nature

171. Which will have highest productivity among the given options?
    (1) desert
    (2) savannah
    (3) coral reef
    (4) temperate deciduous forest

172. Detrivore is
    (1) animal feeding on plants
    (2) animal feeding on dead organic matter
    (3) animal feeding on another animal
    (4) plant feeding on animals.

173. In which of the following interactions both the species suffer?
    (1) Predation   (2) Parasitism
    (3) Competition   (4) Amensalism

174. Consider the following four conditions (a - d) and select the correct pair of them as adaptation to environment in desert lizards.
    The conditions
    (a) Burrowing in soil to escape high temperature
    (b) Losing heat rapidly from the body during high temperature
    (c) Bask in sun when temperature is low
    (d) Insulating body due to thick fatty dermis
    (1) (a), (b)   (2) (c), (d)
    (3) (a), (c)   (4) (b), (d)

175. A biologist studied the population of rats in a barn. He found that the average natality was 500, average mortality 480, immigration 40 and emigration 60. The net increase in population is
    (1) zero   (2) 10
    (3) 15   (4) 5

176. Select the correct statement
    (1) Prey and predators in nature are prudent
    (2) Nearly 75% of all insects are known to be phytophagous (feeding on plant sap or other parts of plants)
    (3) *Calotropis* produces highly poisonous cardiac glycosides
    (4) Monarch butterfly is highly tasteful to its predator

177. A high density of elephant population in an area can result in
    (1) intra specific competition
    (2) inter specific competition
    (3) predation on one another
    (4) mutualism.

178. Biotic components of an ecosystem are
    (1) producers, consumers and decomposers
    (2) producers and consumers
    (3) producers only
    (4) consumers only

179. Niche is
    (1) all the biological factors in the organism's environment
    (2) the physical space where an organism lives
    (3) the functional role played by the organism where it lives
    (4) the range of temperature that the organism needs to live

180. The amount of nutrients present in soil at any given time is
    (1) standing crop   (2) standing state
    (3) productivity   (4) retention

181. Match List-I with List-II

	List-I	List-II
a.	Allen's Rule	i. Kangaroo rat
b.	Physiological adaptation	ii. Desert lizard
c.	Behavioural adaptation	iii. Marine fish at depth
d.	Biochemical adaptation	iv. Polar seal

Choose the correct answer from the options given below :
    (1) a–iv, b–ii, c–iii, d–i   (2) a–iv, b–i, c–iii, d–ii
    (3) a–iv, b–i, c–ii, d–iii   (4) a–iv, b–iii, c–ii, d–i

182. A successful parasite is one which
    (1) grows rapidly
    (2) reproduces fast
    (3) sticks to host for long
    (4) makes minimum demands from its host

183. In relation to Gross primary productivity and Net primary productivity of an ecosystem, which one of the following statements is correct?
    (1) Gross primary productivity is always more than net primary productivity
    (2) Gross primary productivity and Net primary productivity are one and same
    (3) There is no relationship between gross primary productivity and Net primary productivity
    (4) Gross primary productivity is always less than net primary productivity

184. Which statement about predators/predation is not true?
    i. Predation act as conduits for energy transfer across trophic levels.
    ii. Predators keep prey populations under control thus not allowing them to achieve high population densities.
    iii. Biological control methods adopted in agricultural pest control are based on the ability of the predator to regulate prey population.
    iv. An inferior competitor can expand its distributional range even in presence of superior competitor.
    (1) All are true
    (2) All except iv are true
    (3) All except ii are true
    (4) All except i are true

185. Two opposite forces operate in the growth and development of every population. One of them is related to the ability to reproduce at a given rate. The opposite force is called
    (1) Natality
    (2) Mortality
    (3) Environmental resistance
    (4) Biotic control

BOTANY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

186. **Assertion**: Predators play an important role in maintaining species diversity.
    Reason: Predation helps in minimising competition in different species .
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

187. Primary productivity of an ecosystem doesn't depend on
    (1) Plant species inhabiting a particular area
    (2) Availability of nutrients and variety of environmental factors
    (3) Photosynthetic capacity of plants
    (4) Food chains and food webs

188. Which of the following contributes to an decrease in population density?
    a. Natality   b. Mortality
    c. Immigration   d. Emigration
    (1) a, b and c   (2) a and b
    (3) a and c   (4) b and d

189. Fill in the blanks

Species A	Species B	Type of interaction	Example
+	−	a	tiger-deer
+	+	b	d
−		c	competition	dog-dog

	a	b	c	d
(1)	predation	mutualism	+	lichens
(2)	parasitism	commensalism	−	lichens
(3)	predation	mutualism	−	mycorhiza
(4)	commensalism	predation	−	mycorhiza

190. Consider the following four statements (a - d) about certain desert animals such as kangaroo rat.
    (a) They have dark colour and high rate of reproduction and excrete solid urine
    (b) They do not drink water, breathe at a slow rate to conserve water and have their body covered with thick hairs
    (c) They feed on dry seeds and do not require drinking water
    (d) They excrete very dilute urine and do not use water to regulate body temperature
    Which two of the above statements for such animals are true?
    (1) a and b   (2) c and d
    (3) b and c   (4) c and a

191. **Statement- I** : Key industry organisms in an ecosystem are herbivores. .
    Statement- II : The herbivores help in converting plant biomass to animal biomass.
    (1) Both statement- I and statement-II are incorrect
    (2) Both statement-I and statement-II are correct
    (3) Statement-I is correct but statement-II is incorrect
    (4) Statement-I is incorrect but statement-II is correct

192. Which of the following is potent force in organic evolution
    (1) Interspecific competition
    (2) Intraspecific competition
    (3) Predation
    (4) Parasitism

193. In an field experiment on the American pacific coast, removal of predator *Pisaster* resulted in the extinction of more than 10 invertebrate species. It occurred because of
    (1) increased predation amongst species
    (2) more interspecific competition
    (3) more intraspecific interaction
    (4) small population of invertebrate speceis

194. In a given population of 400, 160, birth and 250 death were reported over a given period of time. Which of the following graphs will correspond to it?

    (1)   (2)

    (3)   (4)
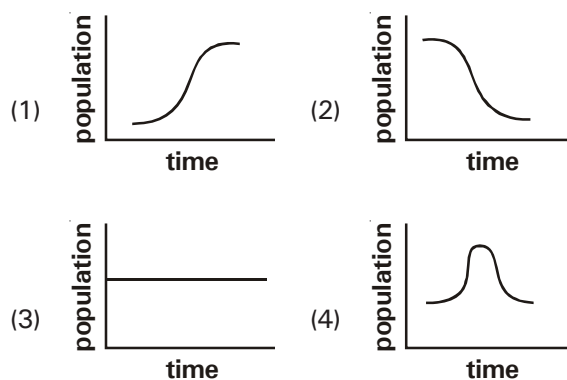
195. **Assertion**: Rate of decomposition is greatly reduced when detritus is rich in lignin and chitin.
    Reason: Lignin and chitin are insoluble substances.
    (1) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (2) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

196. Productivity is the rate of production of biomass/ energy expressed in terms of

 i. $(kcal\ m^{-3})$
 ii. $gm/m^2/yr$
 iii. $g\ yr^{-1}$
 iv. $(kcal\ m^{-2})\ yr^{-1}$

 (1) ii
 (2) iii
 (3) ii and iv
 (4) i and iii

197. The prickly pear cactus *Opuntia* became unusually abundant after its introduction into Australia, because it
 (1) had no natural herbivore/predator
 (2) has no secondary compound
 (3) formed new mycorrhizal associations
 (4) lost its spines

198. In a population showing logistic growth
 a. resources are limited
 b. at carrying capacity, N becomes equal to K
 c. when N (number of individuals) is large, r declines
 d. when N value is closer to carrying capacity growth is slow
 (1) a, b and c are correct
 (2) a and b are correct
 (3) a, b and d are correct
 (4) b, c and d are correct

199. If a population growing exponentially, doubles in size in 3 years, what is the intrinsic rate of increase of the population?
 (1) 2.8 %
 (2) 27 %
 (3) 23 %
 (4) 1.9 %

200. **Statement- I** : Under normal conditions, immigration may contribute more significantly to population growth than birth rates.
 Statement- II : If new habitat is just being colonised, birth and deaths are the most important factors influencing population density..
 (1) Both statement-I and statement-II are correct
 (2) Both statement- I and statement-II are incorrect
 (3) Statement-I is correct but statement-II is incorrect
 (4) Statement-I is incorrect but statement-II is correct

Dated : 28-9-2022

M.L. Syal's Helix Institute

S.C.O. 343-345, Top Floor, Sector 34-A, Chandigarh. Ph : 0172-2623155

XII cum Competition Course for Medical – Test -12

1.	(4)	51.	(2)	101.	(1)	151.	(1)
2.	(4)	52.	(1)	102.	(1)	152.	(3)
3.	(2)	53.	(1)	103.	(4)	153.	(2)
4.	(4)	54.	(4)	104.	(3)	154.	(1)
5.	(3)	55.	(1)	105.	(3)	155.	(4)
6.	(3)	56.	(1)	106.	(2)	156.	(4)
7.	(1)	57.	(1)	107.	(2)	157.	(4)
8.	(3)	58.	(3)	108.	(4)	158.	(3)
9.	(1)	59.	(1)	109.	(1)	159.	(3)
10.	(2)	60.	(1)	110.	(3)	160.	(3)
11.	(2)	61.	(3)	111.	(2)	161.	(1)
12.	(2)	62.	(3)	112.	(2)	162.	(1)
13.	(1)	63.	(1)	113.	(1)	163.	(3)
14.	(3)	64.	(1)	114.	(2)	164.	(3)
15.	(1)	65.	(3)	115.	(2)	165.	(1)
16.	(2)	66.	(4)	**116.**	**(2)**	166.	(1)
17.	(4)	67.	(4)	117.	(1)	167.	(2)
18.	(3)	68.	(2)	118.	(3)	168.	(3)
19.	(3)	69.	(2)	119.	(3)	169.	(2)
20.	(3)	70.	(3)	120.	(3)	170.	(2)
21.	(2)	71.	(3)	121.	(2)	171.	(3)
22.	(3)	72.	(4)	122.	(1)	172.	(2)
23.	(4)	73.	(4)	123.	(3)	173.	(3)
24.	(4)	74.	(3)	124.	(1)	174.	(3)
25.	(2)	75.	(4)	125.	(3)	175.	(1)
26.	(2)	76.	(2)	126.	(1)	176.	(3)
27.	(4)	77.	(4)	127.	(1)	177.	(1)
28.	(2)	78.	(3)	128.	(1)	178.	(1)
29.	(1)	79.	(3)	129.	(4)	179.	(3)
30.	(4)	80.	(3)	130.	(2)	180.	(2)
31.	(1)	81.	(3)	131.	(2)	181.	(3)
32.	(2)	82.	(2)	132.	(2)	182.	(4)
33.	(2)	83.	(4)	133.	(3)	183.	(1)
34.	(3)	84.	(4)	134.	(1)	184.	(2)
35.	(3)	85.	(4)	135.	(1)	185.	(3)
36.	(1)	86.	(3)	136.	(1)	186.	(1)
37.	(1)	87.	(1)	137.	(4)	187.	(4)
38.	(4)	88.	(2)	138.	(1)	188.	(4)
39.	(4)	89.	(3)	139.	(4)	189.	(3)
40.	(3)	90.	(1)	140.	(3)	**190.**	**(3)g**
41.	(2)	91.	(3)	141.	(3)	191.	(2)
42.	(1)	92.	(2)	142.	(2)	192.	(1)
43.	(1)	93.	(4)	143.	(3)	193.	(2)
44.	(2)	94.	(4)	144.	(4)	194.	(2)
45.	(2)	95.	(2)	145.	(2)	195.	(2)
46.	(3)	96.	(1)	146.	(4)	196.	(3)
47.	(2)	97.	(1)	147.	(1)	197.	(1)
48.	(1)	98.	(3)	148.	(3)	198.	(3)
49.	(1)	99.	(3)	149.	(3)	199.	(3)
50.	(4)	100.	(3)	150.	(2)	200.	(2)

Dated :
18-10-2022

M.L. Syal's Helix Institute
S.C.O. 343-345, Top Floor, Sector 34-A, Chandigarh. Ph : 0172-2623155

Code-A

Test Booklet Code

A

Name of Candidate : ....

Signature ....

Roll No. : ....

Batch : ....

MM : 720

XII cum Competition Course for Medical
Test - 13

Time : 3 hrs. 20 min

PHYSICS	:	**Ray Optics (except Optical instruments)**
CHEMISTRY	:	CO-ORDINATION COMPOUNDS, TRANSITION ELEMENTS
ZOOLOGY	:	APPLICATION OF BIOTECHNOLOGY STRAT. FOR ENHANCEMENT IN FOOD PRODUCTION
BOTANY	:	ECOSYSTEM-II BIODIVERSITY AND CONSERVATION

PHYSICS : SECTION-A

All questions are compulsory in section A

1. A person is six feet tall. The least size of mirror for him to see his complete image is
   (1) 6 feet   (2) 3 feet
   (3) 2 feet   (4) depends on position

2. The radii of curvature of the faces of a double convex lens are 20 cm and 30 cm. If its focal length is 20 cm, then refractive index of material of lens is
   (1) 1.3   (2) 1.6
   (3) 1.2   (4) 1.25

3. Which of the following statements is correct w.r.t. prism?
   a. It can be designed to bend light by 90° or by 180° by total internal reflection
   b. It can be used to invert images without changing their size
   c. It can be used to produce spectrum of light
   (1) both a & b   (2) both b & c
   (3) a, b & c   (4) a only

4. A graph between object distance of a real object and image distance for its real image is drawn for a concave mirror. The shape of the graph is best represented in
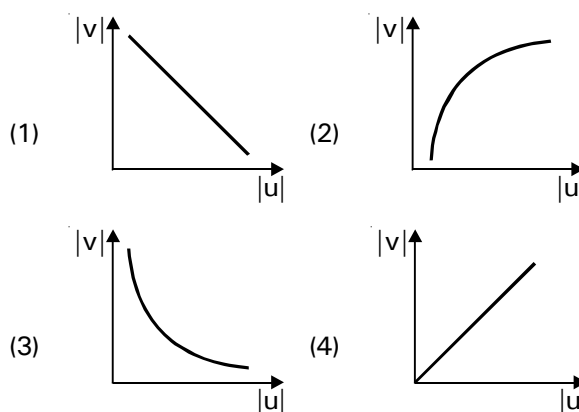
5. A convex lens has 20 cm focal length in air. What is the focal length in water? [Given : refractive index of water $= \dfrac{4}{3}$ and that of glass $= \dfrac{3}{2}$]
   (1) 60 cm   (2) 80 cm
   (3) 160 cm   (4) 40 cm

6. The distance between an object and the screen is 100 cm. A lens produces an image on the screen when placed at either of the positions 40 cm apart. The power of the lens is
(1) ≈ 3 D
(2) ≈ 5 D
(3) ≈ 7 D
(4) ≈ 9 D

7. Match the figures in column-I with phenomenon in column-II

column-I   **column-II**

a.

p. scattering

b.

q. refraction

c.
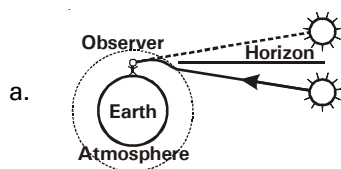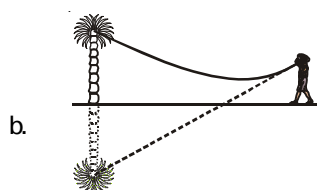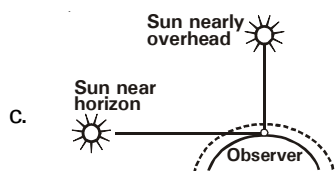
r. total internal reflection

(1) a-p, b-r, c-q
(2) a-q, b-p, c-r
(3) a-q, b-r, c-p
(4) a-p, b-q, c-r

8. If 3 images of an object are produced by two plane mirrors then, the angle between them may be
a. 90°
b. 30°
c. 60°
d. 120°
(1) both a & c
(2) a only
(3) both b & d
(4) both a & d

9. A hollow double concave lens is made of very thin transparent material. It can be filled with air or either of two liquids L_1 and L_2 having refractive indices n_1 and n_2 respectively $(n_2 > n_1 > 1)$. The lens will diverge a parallel beam of light if it is filled with
(1) Air and placed in air
(2) Air and immersed in L_1
(3) L_1 and immersed in L_2
(4) L_2 and immersed in L_1

10. The image formed by a convex mirror of focal length 30 cm is half of the size of the object. The distance of the object from the mirror is
(1) 30 cm
(2) 70 cm
(3) 45 cm
(4) 110 cm

11. A short object placed infront of a concave mirror produces an image with a lateral magnification -2. If the same object is placed longitudinally (parallel to principal axis), the magnification produced is
(1) -2
(2) $+2$
(3) -4
(4) $+4$

12.
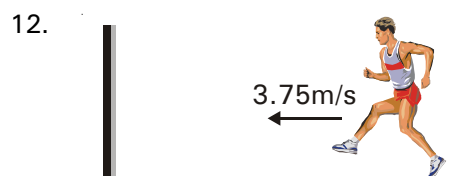
In the above situation, a person is running towards a mirror kept in vertical position. Velocity of the image relative to the person is
(1) 1.875 m/s
(2) zero
(3) 7.5 m/s
(4) 3.75 m/s

13. **Statement-I :** The reason for shining of air bubble in water is total internal reflection of light.
Statement-II : The phenomenon utilised in an optical fibre is total internal reflection.
(1) Both statement-I and statement-II are correct
(2) Both statement-I and statement-II are incorrect
(3) Statement-I is correct but statement-II is incorrect
(4) Statement-I is incorrect but statement-II is correct

14. Deviation produced in the ray, incident on a plane mirror at an angle of 30°, is
    (1) 30°   (2) 100°
    (3) 120°   (4) 150°

15. A transparent cube of 15 cm edge contains a small air bubble. Its apparent depth when viewed through one face is 6 cm and when viewed through the opposite face is 4 cm. Then the refractive index of the material of the cube is
    (1) 2.0   (2) 2.5
    (3) 1.6   (4) 1.5

16. A clock hung on a wall has marks instead of numbers on its dial. On opposite wall there is a mirror, and image of the clock in the mirror if read, indicates time as 8:20. What is the time in the clock?
    (1) 3:40   (2) 4:40
    (3) 5:20   (4) 4:20

17. A concave mirror is placed on a horizontal table, with its axis directed vertically upwards. Let O be the pole of the mirror and C its centre of curvature. A point object is placed at C. It has a real image, also located at C. If the mirror is now filled with water, the image will be
    (1) real, and will remain at C
    (2) real, and located at a point between C and ∞
    (3) virtual, and located at a point between C and O.
    (4) real, and located at a point between C and O.

18. A bird in air looks at a fish vertically below it and inside water. 'x' is height of bird above surface of water and 'y' depth of fish below surface of water. If refractive index of water with respect to air is μ, distance of the fish as observed by the bird is
    (1) $x+y$ (2) $x+y/\mu$
    (3) $\mu x+y$ (4) $\mu x+\mu y$

19. Which of the following diagrams, shows correctly the dispersion of white light by a prism

    (1)

    (2)

    (3)

    (4)

20. Which of the following statements is true?
    (1) An astronaut in a spaceship see the outer space as blue.
    (2) Reason of seeing the Sun a little before sunrise is scattering of the light.
    (3) Stars twinkle due to change in refractive index of air.
    (4) A cut diamond sparkles because of its low refractive index.

21. The plane surface of a plano-convex lens of focal length f is silvered. It will behave as
    (1) Plane mirror
    (2) Convex mirror of focal length 2f
    (3) Concave mirror of focal length f/2
    (4) None of the above

22. A thin prism of angle 7° made of glass of refractive index 1.5 is combined with another prism made of glass of $\mu = 1.6$ to produce dispersion without deviation. The angle of second prism is
    (1) 6.21°
    (2) 2.32°
    (3) 5.83°
    (4) 5.25°

23. **Assertion** : Focal length of convex mirror will not change if mirror is placed in water.
    Reason : Focal length of a convex mirror is independent of wavelength of light.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

24.

    (i)   (ii)   (iii)
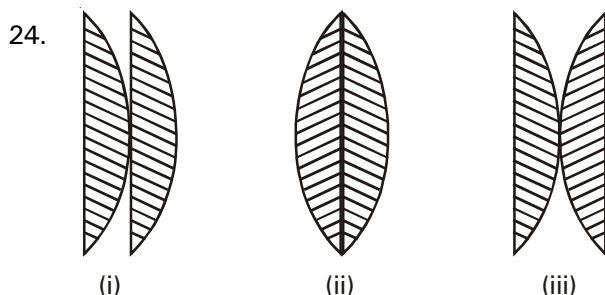
    Two plano-convex lenses, each of focal length 'f', are placed as shown in figure. The ratio of the focal lengths of the combinations (i), (ii) and (iii) respectively is
    (1) 1 : 2 : 3
    (2) 1 : 1 : 1
    (3) 1 : 2 : 1
    (4) 3 : 2 : 1

25. Two vertical plane mirrors are inclined at an angle of 60° with each other. A ray of light travelling horizontally is reflected first from one mirror and then from the other. The resultant deviation is
    (1) 60°
    (2) 120°
    (3) 180°
    (4) 240°

26. A diver at a depth of 12m in water ($\mu = 4/3$) sees the sky in a cone of semi-vertical angle
    (1) $\sin^{-1}(4/3)$
    (2) $\tan^{-1}(4/3)$
    (3) $\sin^{-1}(3/4)$
    (4) 90°

27.
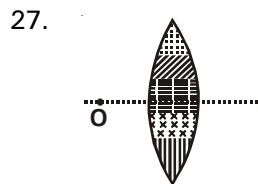
    A point object is placed infront of a lens made up of layer of different material as shown in figure. Then number of images formed is
    (1) 1
    (2) 2
    (3) 3
    (4) 5

28. For the same angle of incidence, the angles of refraction in three different media A, B and C are 15°, 25°, and 35°, respectively. Velocity of light will be
    (1) minimum in medium A
    (2) minimum in medium B
    (3) minimum in medium C
    (4) same in all media

29. A ray of light is incident at the glass−water interface at an angle i, it emerges finally parallel to the surface of water, then the value of μ_g would be
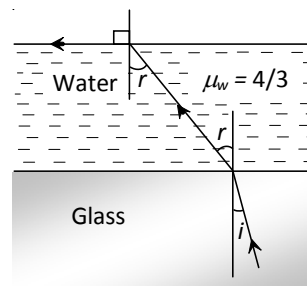
    (1) $\left(\dfrac{4}{3}\right)\sin i$
    (2) $1/\sin i$
    (3) $\dfrac{4}{3}$
    (4) 1

30.

A convex lens of focal length 20 cm is cut in two equal parts by a plane parallel to the principal axis. The two parts are now placed in contact as shown. Power of combination will be

(1) 5 D (2) 10 D
(3) 2.5 D (4) zero

31. Critical angle for green light going from medium A into medium B is 60°. Then critical angle for same combination of media can be 50° for

(1) orange light (2) red light
(3) yellow light (4) blue light

32. The angle of minimum deviation measured with a prism is 30° and the angle of prism is 60°. The refractive index of prism material is

(1) $\sqrt{2}$ (2) 2
(3) 3/2 (4) 4/3

33. Colour of the sky is blue because
(1) red light is scattered the most
(2) blue light is scattered the most
(3) red light is deviated the most
(4) blue light is deviated the most

34.
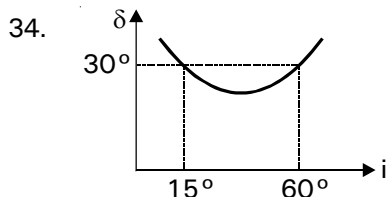
Figure shows variation of deviation δ with angle of incidence i for a light ray striking a prism. Angle of prism is

(1) 30° (2) 45°
(3) 60° (4) 53°

35. An object is placed at a distance of 0.5f from a convex lens. The image will be at
(1) one of the foci, virtual and double its size
(2) 1.5f, real and inverted
(3) 2f, virtual and erect
(4) 0.5f, virtual and erect

PHYSICS : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

36. When a ray of light moves from air into water, the physical quantity that changes is its

a. speed b. amplitude
c. frequency d. wavelength

(1) a, b, c & d (2) both a & b
(3) a, b & d (4) c only

37. Which of the following statements is true ?
(1) The focal length of a convex lens depends on wavelength of the light ray.
(2) A substance is behaving as convex lens in air and concave in water, then its refractive index is greater than that of water.
(3) Focal length of lens can be reduced by reducing its aperture.
(4) If a convex lens of focal length f_1 and concave lens of focal lengths f_2 are combined, combination will behave like a concave lens, if $f_1 < f_2$.

38. In a concave mirror an object is placed at a distance x from the focus, and the image is formed at a distance y from the focus. The focal length of the mirror is

(1) xy (2) $\sqrt{xy}$

(3) $\dfrac{x + y}{2}$ (4) $\sqrt{\dfrac{x}{y}}$

39. In the figure shown, the image of a real object O is formed at point I. AB is the principal axis of the mirror. The mirror must be

O•
A ——————————— B

•I

(1) concave & placed on the right of I
(2) concave & placed on the left of O
(3) convex & placed on the right of I
(4) convex & placed on the left of O

40. The refractive index of a prism is $\cot\dfrac{A}{2}$ where A is the angle of prism. The angle of minimum deviation is (in degrees)
    (1) 2A
    (2) 90 − A
    (3) 180 − 2A
    (4) zero

41. Which of the following statements is incorrect?
    (1) In primary rainbow, observer sees a rainbow with red colour on top and violet on bottom
    (2) Primary rainbow is a result of 3-step process, that is, refraction, reflection and refraction
    (3) Secondary rainbow is formed by rays undergoing internal reflection twice inside the drop
    (4) Primary rainbow is fainter than the secondary rainbow

42. The minimum distance between real image and real object in case of concave mirror is
    (1) 4F
    (2) 2F
    (3) F
    (4) zero

43. **Assertion** : A convex lens is cut into two equal semicircular parts and one part is kept at its original location. Then intensity of image becomes one half.
    Reason : On cutting lens into half, its focal length becomes double .
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

44. A concave lens of focal length 50 cm and a convex of focal length 25 cm are placed in contact. The effective power is
    (1) − 2 D
    (2) + 2.5 D
    (3) + 4 D
    (4) + 2 D

45. A point object O is placed in front of a glass rod having spherical end of radius of curvature 30 cm. The image would be formed at ($\mu = 1.5$).
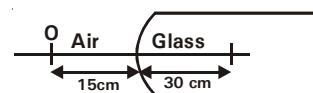
    (1) 30 cm to the left of pole
    (2) infinity
    (3) 1 cm to the right of pole
    (4) 18 cm to the left of pole

46. The refractive indices of violet and red light are 1.54 and 1.52 respectively. If the angle of prism is 10°, then the angular dispersion is
    (1) 0.02°
    (2) 0.2°
    (3) 3.06°
    (4) 30.6°

47. Figure shows a convex lens cut symmetrially into two equal halves and separated laterally a distance 'h'. A point object O placed symmetrically at a distance 30 cm from the lens halves forms images separated by a distance 'd'. A plot of 'd' versus 'h' is shown in figure. The focal length of the lens is
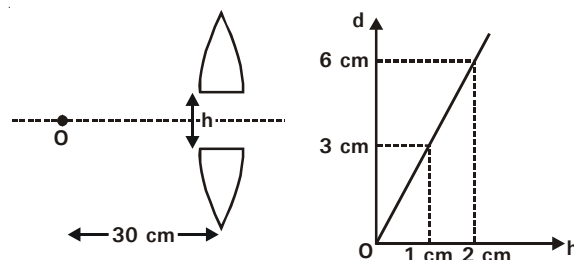
    (1) 35 cm
    (2) 40 cm
    (3) 20 cm
    (4) 60 cm

48. A convex mirror is used to form the image of an object. Then which of the following statements is wrong?
    (1) Image lies between the pole and the focus
    (2) Image is diminished in size
    (3) Image is erect
    (4) Image is real

49. **Statement-I :** Two thin lenses of focal lengths f_1 and f_2 are in contact and coaxial. The combination is equivalent to a single lens of power $\dfrac{f_1 f_2}{f_1 + f_2}$.

Statement-II : Power of a lens is inversely proportional to its focal length.
   (1) Both statement-I and statement-II are correct
   (2) Both statement-I and statement-II are incorrect
   (3) Statement-I is correct but statement-II is incorrect
   (4) Statement-I is incorrect but statement-II is correct

50.
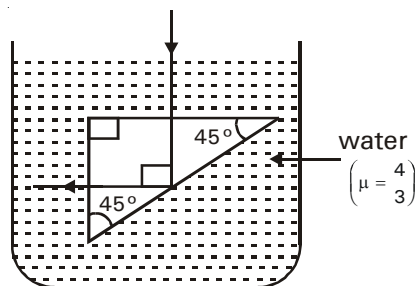
A prism is immersed in water. A ray of light incident normally on one of its shorter faces is totally reflected. Minimum index of refraction of material of the prism is nearly ($\mu_{water} = 4/3$)

   (1) 1.9
   (2) $1 - \dfrac{1}{\sqrt{2}}$
   (3) $\sqrt{3}$
   (4) 1.5

CHEMISTRY : SECTION-A

All questions are compulsory in section A

51. The number of unpaired electrons in the t_{2g} set of d orbitals in the complex $[Co(H_2O)_3F_3]$ is
   (1) 4
   (2) zero
   (3) 2
   (4) 3

52. Which of the following will not be coloured in aqueous solution?
   (1) Co^{2+}
   (2) Sc^{+3}
   (3) Mn^{+2}
   (4) V^{3+}

53. The number of bridging ligands in the compound, pentaammine chromium (III)-μ-hydroxopenta-amminechromium-(III) bromide is
   (1) 1
   (2) 5
   (3) 3
   (4) 6

54. The number of moles of peroxodisulphate ion required to oxidise 0.05 moles of manganese(II) ion is
   (1) 0.25
   (2) 0.125
   (3) 0.05
   (4) 0.025

55. Which of the following pairs has the same size?
   (1) Zr, Ti
   (2) Zr, Hf
   (3) Zn, Hf
   (4) Fe, Ni

56. Dimethyl glyoxime gives a coloured precipitate with Ni^{2+}, which is used for its detection. The colour of precipitate is
   (1) red
   (2) black
   (3) yellow
   (4) green

57. In the compound $[M(CO)_x(\eta^y - C_5H_5)]$; the value of x & y respectively can be (if M lies below cobalt in the transition series)
   a. x = 3; y = 3
   b. x = 4; y = 1
   c. x = 2; y = 5
   d. x = 3; y = 5
   (1) only d
   (2) a, b & c
   (3) only c
   (4) a,b,c & d

58. Brass contains
   (1) Cu, Zn
   (2) Cu, Sn
   (3) Cu, Zn, Ni
   (4) Cu, Ni

59. EAN of the complex $[Co(NH_3)_6]Cl_3$ is
   (1) 54
   (2) 36
   (3) 18
   (4) 88

60. **Statement-I** : $[Mn(CN)_6]^{3-}$ has magnetic moment of two unpaired electrons while $[MnCl_6]^{3-}$ has a paramagnetic moment of four unpaired electrons.
    Statement-II : This apparent anomaly is explained by valence bond theory in terms of formation of inner orbital and outer orbital coordination entities.
    (1) Both statement-I and statement-II are correct
    (2) Both statement-I and statement-II are incorrect
    (3) Statement-I is correct but statement-II is incorrect
    (4) Statement-I is incorrect but statement-II is correct

61. The C.F.S.E for the complex $K_4[Fe(CN)_6]$ is
    (1) $0.6 \, \Delta_0$ (2) $-3.6 \, \Delta_0$
    (3) $-2.4 \, \Delta_0$ (4) $-0.4 \, \Delta_0$

62. Wilkinson's catalyst contains
    (1) rhodium   (2) iron
    (3) aluminium   (4) cobalt

63. Identify the mismatch
    (i) $[Ni(gly)_2]$; only optical isomerism but not geometrical isomerism
    (ii) $[Ni(en)_2]^{2+}$; Neither optical nor geometrical isomerism
    (iii) $[Co(en)_3]^{3+}$; Geometrical and optical isomerism
    (iv) $[Pt(gly)_2$; only optical isomerism but not geometrical isomerism
    (1) (i), (iv)   (2) only (iii)
    (3) (i), (ii), (iii)   (4) (iii), (iv)

64. Which of the following complexes is most stable?
    (1) $[Co(edta)]^-$ (2) $[MnCl_6]^{3-}$
    (3) $[FeCl_6]^{3-}$ (4) $[Co(C_2O_4)_3]^{3-}$

65. **Assertion** : Ionisation of transition metals involve loss of ns electrons before (n−1)d electrons.
    Reason : Filling of ns−orbitals take place before the filling of (n−1)d−orbitals.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

66. Which of the following is green in colour ?
    (1) permanganate ion   (2) dichromate ion
    (3) manganate ion   (4) manganous ion

67. The coordination number of Co in $[Co(en)_3]_2 (SO_4)_3$ is
    (1) 2   (2) 4
    (3) 3   (4) 6

68. $E^o (M^{3+}/M^{2+})$ value is negative for
    (1) Cr   (2) Fe
    (3) Co   (4) Mn

69. In square planar field which d orbital has highest energy
    (1) d_{xy} (2) d_{z^2}
    (3) d_{xz} (4) $d_{x^2-y^2}$

70. Pyrolusite is used to prepare $KMnO_4$. The steps involved are
    $$MnO_2 \xrightarrow{\text{I}} MnO_4^{2-} \xrightarrow{\text{II}} MnO_4^-$$
    I and II are
    (1) fuse with KOH/air, electrolytic oxidation
    (2) fuse with KOH/air, electrolytic reduction
    (3) fuse with conc HNO_3/air, electrolytic reduction
    (4) all correct

71. In an octahedral co-ordination complex, the energy of the two e_g orbitals
    (1) will decrease by $\dfrac{3}{5} \Delta_0$
    (2) will decrease by $\dfrac{2}{5} \Delta_0$
    (3) will increase by $\dfrac{3}{5} \Delta_0$
    (4) will increase by $\dfrac{2}{5} \Delta_0$

72. Which of the following statement is incorrect when a mixture of NaCl & $K_2Cr_2O_7$ is gently warmed with conc. H_2SO_4?
    (1) deep red vapours are formed
    (2) no redox for Cr occurs
    (3) chlorine gas is evolved
    (4) chromyl chloride is formed

8

73. The complex $[Cu(NH_3)_4]^{2+}$ has
   (1) the tetrahedral configuration with one unpaired electron configuration
   (2) square planar configuration with one unpaired electrons
   (3) tetrahedral configuration with all electrons paired
   (4) square planar configuration with all electrons paired

74. Match the statements given in Column I with the oxidation states given in Column II.

Column I		Column II	
i.	Oxidation state of Mn in MnO_2	a.	$+2$
ii.	Most stable oxidation state of Mn	b.	$+3$
iii.	Highest oxidation state of Mn in oxides	c.	$+4$
iv.	Characteristic oxidation state of lanthanoids	d.	$+5$
		e.	$+7$

   (1) i-d, ii-a, iii-e, iv-b
   (2) i-c, ii-a, iii-e, iv-b
   (3) i-c, ii-a, iii-d, iv-b
   (4) i-c, ii-d, iii-e, iv-b

75. Which of the following is an ambidentate ligand?
   (1) Chlorido   (2) Carbonato
   (3) Aqua   (4) Thiocyanato

76. The IUPAC name of the compound
   $[Pt(NH_3)_3Br(NO_2)Cl]Cl$
   (1) triamminebromidochloridonitroplatinum (IV) chloride
   (2) triamminebromidochloridonitroplatinum (III) chloride
   (3) triamminechloridobromidonitroplatinum (IV) chloride
   (4) triamminebromidochloridonitroplatinum (II)
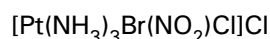
77. Which of the following isomer of a complex containing monodentate ligands A, B, C & D is optically active?

   (1)
   (2)
   (3)
   (4)
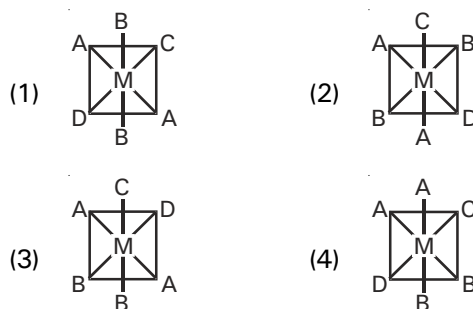
78. The tetrahedral field splitting is only _____ of octahedral splitting
   (1) 1/9   (2) 2/9
   (3) 4/9   (4) 5/9

79. When 1 mol $CoCl_3(NH_3)_5$ is treated with excess of $AgNO_3$, 2mol of AgCl are obtained. The number of ionic chlorine(s) is
   (1) 1   (2) 2
   (3) 3   (4) zero

80. Which one of the following complexes is spin free complex?
   (1) $[Co(NH_3)_6]^{+3}$ (2) $[Fe(CN)_6]^{-3}$
   (3) $[Fe(CN)_6]^{-4}$ (4) $[Ni(NH_3)_6]^{+2}$

81. Some salts containing two different metal ions give test for only one of them in solution. Such salts are
   (1) Normal salts   (2) Double salts
   (3) Complex salts   (4) None of these

82. Which of the following is not a π−bonded organometallic compound?
   (1) $K[PtCl_3(\eta^2-C_2H_4)]$ (2) $[Cr(\eta^6-C_6H_6)_2]$
   (3) $[Fe(\eta^5-C_5H_5)_2]$ (4) $(CH_3)_4Sn$

83. Colour of MnO_4^-, CrO_4^{2-}, $Cr_2O_7^{2-}$ can be explained by
   (1) d-d transition
   (2) f-f transition
   (3) charge transfer spectra
   (4) low oxidation state of the metal

84. In the presence of strong field ligand which of the following set of orbitals can never be degenerate

   (1) $3d_{xy}$ & $3d_{z^2}$
   (2) $3d_{xy}$ & $3d_{yz}$
   (3) $3d_{xy}$; $3d_{xz}$ & $3d_{yz}$
   (4) $3d_{x^2-y^2}$ & $3d_{z^2}$

85. The acidic oxide of Cr is
   (1) CrO
   (2) CrO_3
   (3) Cr_2O_3
   (4) Cr_2O

CHEMISTRY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

86. Which of the following will give a pair of enantiomorphs?
   (1) $[Co(NH_3)_4Cl_2]NO_2$
   (2) $[Co(en)_2Cl_2]^+$ (cis)
   (3) $[Ni(NH_3)_6]^{+2}$
   (4) $[Pt(NH_3)_2Cl_2]$ (cis)

87. Which of the following statement is/are false?
   (1) In sodium nitroprusside, $Na_2[Fe(CN)_5NO]$, NO is present as nitosonium ion.
   (2) CN^- is a stronger field ligand than CO.
   (3) $[Pt(trien)]^{2+}$ contains three en groups, hence it is a hexadentate ligand.
   (4) both (2) and (3)

88. For actinoids, the configuration is $5f^n 6d^{0-2} 7s^2$ the value of n cannot be
   (1) 3
   (2) 5
   (3) 7
   (4) 10

89. Which of the following is true?
   (1) All lanthanides are non-radioactive
   (2) Enthalpy of atomisation is lowest for zinc in first transition series
   (3) $KMnO_4$ is used as primary standard
   (4) Mn_2O_7 contains two Mn−O−Mn bonds

90. **Statement-I** : As M−C π bonding increases in metal carbonyl, the C−O bond length increases.
   Statement-II : Octacarbonyl dicobalt(0) has a Co−Co bond bridged by two CO groups.
   (1) Both statement-I and statement-II are correct
   (2) Both statement-I and statement-II are incorrect
   (3) Statement-I is correct but statement-II is incorrect
   (4) Statement-I is incorrect but statement-II is correct

91. The correct increasing order of electrical conductivity
   (1) $K_4[Fe(CN)_6] < K_2[PtCl_6] < [Co(NH_3)_4Cl_2]Cl$
   (2) $[Co(NH_3)_4Cl_2]Cl < K_2[PtCl_6] < K_4[Fe(CN)_6]$
   (3) $[Co(NH_3)_4Cl_2]Cl < Ni(CO)_4 < Fe_4[Fe(CN)_6]_3$
   (4) All complexes show equal electrical conductivity

92. **Assertion** : Co-ordination isomerism is shown by the compounds in which both cation and anions are complexes.
   Reason : Complexes containing ambidentate ligands only can exhibit co-ordination isomerism.
   (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
   (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
   (3) Assertion is true statement but Reason is false
   (4) Assertion is false

93. In which of the following species, the central atom is in +4 oxidation state
   (1) Manganate ion
   (2) Pyrolusite ore
   (3) Chromate ion
   (4) Permanganic acid

94. The stability constant (hypothetical values) of certain ligands are given below, :
   (a) $Cu^{2+} + 4NH_3 \rightleftharpoons [Cu(NH_3)_4]^{2+}$, $K = 4.5 \times 10^{11}$
   (b) $Cu^{2+} + 4CN^- \rightleftharpoons [Cu(CN)_4]^{2-}$, $K = 2.0 \times 10^{27}$
   (c) $Cu^{2+} + 2en \rightleftharpoons [Cu(en)_2]^{2+}$, $K = 3.0 \times 10^{15}$
   (d) $Cu^{2+} + 4H_2O \rightleftharpoons [Cu(H_2O)_4]^{2+}$, $K = 9.5 \times 10^8$
   Predict which of the above is the strongest ligand?
   (1) NH_3
   (2) CN^-
   (3) en
   (4) H_2O

95. Identify the false statements about ionisation energies of first transition series elements
   (1) The unipositive ions have d^n configurations with no 4s electrons.
   (2) The value of Cr is lower because of the absence of any change in the d configuration
   (3) To form the M^{2+} ions from the gaseous atoms, $(I.E_1 + I.E_2)$ is required in addition to the enthalpy of atomisation for each element
   (4) Dominant term is $I.E_2$ which shows unusually high values for Cu where the d^{10} configurations of the M^+ ions is disrupted, with considerable gain of exchange energy

96. Which of the following is an oxidizing agent?
    (1) $Mn(CO)_5$ (2) $Fe(CO)_5$
    (3) $Fe_2(CO)_9$ (4) $Mn_2(CO)_{10}$

97. $X-[M(H_2O)_6]^{2+}$, $Y-[M Br_6]^{4-}$, $Z-[M(en)_3]^{2+}$
    The correct order of excitation energies for d-d transition for the above complexes is
    (1) $X>Y>Z$ (2) $Z>Y>X$
    (3) $X=Y=Z$ (4) $Z>X>Y$

98. Which of the following contains three unpaired electrons ?
    (1) $[Cr(NH_3)_6]^{3+}$ (2) $[Fe(H_2O)_5NO]^{2+}$
    (3) $[CoF_6]^{-4}$ (4) All of these

99. Which of the following is used in the treatment of cancer ?
    (1) EDTA   (2) DMG
    (3) Cis-platin   (4) trans-platin

100. What is the ratio of equivalent weights of $KMnO_4$ as oxidising agent in acidic, alkaline and neutral medium
    (1) 3 : 5 : 5   (2) 5 : 3 : 5
    (3) 3 : 5 : 1   (4) 1 : 1 : 1

ZOOLOGY : SECTION-A

All questions are compulsory in section A

101. Proteins produced by some strains of *Bacillus thuringiensis* kill certain insects like
    (1) tobacco budworm
    (2) army worm, flies
    (3) mosquitoes, beetles
    (4) all of these

102. An established income generating industry in terms of products mainly with medicinal value is
    (1) Apiculture   (2) Dairy farming
    (3) Poultry   (4) Fisheries

103. Very low concentration of a bacteria or virus can be detected by amplification of their
    (1) nucleic acid by PCR
    (2) proteins by PCR
    (3) polysaccharide by PCR
    (4) all of these

104. The Bt toxin genes are incorporated into sevaral crop plants. Choice of gene does not depends on
    (1) Targeted crop   (2) Insect species
    (3) Ti plasmid   (4) Both (2) & (3)

105. Which of the following proteins is/are both diagnostic and therapeutic?
    (1) Antibiotics   (2) Antibodies
    (3) X-Rays   (4) Both (2) & (3)

106. Most financially rich nations are
    (1) poor in biodiversity & traditional knowledge
    (2) rich in biodiversity & traditional knowledge
    (3) rich in biodiversity & poor in traditional knowledge
    (4) poor in biodiversity & rich in traditional knowledge

107. Mark the correct statement
    (1) The first transgenic animal was a supermouse expressing gene for GH
    (2) *Pseudomonas putida* is transgenic microbe used to remove heavy metal pollution.
    (3) Vaccine for Hepatitis is being produced using transgenic *E.coli*.
    (4) Both (1) &(2)

108. Identify the incorrect statement w.r.t animals produced by cross breeding
    (1) Progeny hybrid animals may themselves be used for commercial production
    (2) They may be subjected to some form of inbreeding
    (3) Can be used in development of new stable breeds that may be superior to existing breeds
    (4) New animal breeds cannot be developed by this technique

109. Identify the correct statement
    (1) Enzyme replacement therapy is completely curative
    (2) SCID is due to mutations in dystrophin gene
    (3) Treatment of SCID patients requries periodic infusion of genetically engineered lymphocytes.
    (4) Lymphocytes are immortal cells so they need to be provided at regular interval in SCID patients.

110. Which of the following statement is incorrect?
    (1) Bee keeping is practiced in any area where there are sufficient bee pastures
    (2) Bee keeping is maintenance of hives for production of honey
    (3) Bee keeping is labour intensive
    (4) Bee keeping is successful when we have knowledge of nature and habits of bee

111. DNA vaccines are
    (1) Mixture of hormones
    (2) Cell coat of pathogen
    (3) 1st generation vaccines
    (4) Pure DNA/ gene

112. Which of the following DNA sources would be suitable for DNA profiling technique?
    (1) Blood   (2) Hair
   (3) Semen   (4) Any of these

113. First Gene Therapy was given to a 4 year old girl in the year _____ and first transgenic cow producing human milk protein was developed in the year _____.
   (1) 1990; 1983
   (2) 1997; 1994
   (3) 1990; 1997
   (4) 1994; 1997

114. What is true for *cry* genes?
   a. *cry* IAc and *cry* IAb control cotton bollworms.
   b. *cry* IIAb control the cotton bollworms as well as corn borer.
   c. *cry* IAc and *cry*IIAb control cotton bollworms.
   d. *cry* IAb controls corn border.
   (1) a, b, c, d
   (2) c, d
   (3) b, c, d
   (4) only d

115. An outcross is done to increase the production of milk in milch cattle. The effect will be seen in the
   (1) parent generation
   (2) progeny in next (F_1) generation only
   (3) progeny in next and subsequent generations
   (4) Both parent yield and progeny yield immediately

116. In gene therapy for SCID, functional ADA is introduced in lymphocytes with the help of
   (1) Biolistics
   (2) *Agrobacterium*
   (3) Retrovirus
   (4) Electroporation

117. Find the correct statement regarding natural genetic engineer bacteria
   a. it can affect several dicot plants
   b. its Ti plasmid is inserted into host plant
   c. the virulence gene is replaced with gene of interest to deliver alien DNA into plant cell
   d. it has Y_{EP} and Ti plasmids
   (1) a, b, c
   (2) b, c
   (3) c, d
   (4) a only

118. Match the column
   i. Marine fishes   a. Cosmetics, bee wax
   ii. Fresh water fishes   b. Shrubs, fruit, orchards and cultivated crops
   iii. Bee pastures   c. Hilsa, Sardine, Mackerel, Pomfrets
   iv. Honey bee products d. Catla, Rohu, common carp
   (1) i-b, ii-d, iii-a, iv-a
   (2) i-c, ii-d, iii-b, iv-a
   (3) i-d, ii-c, iii-a, iv-b
   (4) i-a, ii-d, iii-a, iv-b

119. Which of the following technique is used to locate a specific DNA sequence in the target DNA?
   (1) PCR
   (2) Probes
   (3) ELISA
   (4) Serum analysis

120. Transgenic plant are the ones
   (1) produced by introducing foreign DNA into a cell and regenerating a plant from that cell
   (2) produced after protoplast fusion in artificial medium
   (3) grown in artificial medium after hybridisation in the field
   (4) produced by a somatic embryo in artifical medium

121. Name the protein used in hepatitis treatment produced by using biotechnology
   (1) Tetramycin
   (2) Engerix
   (3) Insulin
   (4) interferon

122. What is golden rice?
   (1) It is vitamin A enriched GM rice
   (2) It is vitamin D enriched GM rice
   (3) It is a vitamin C enriched variety of normal basmati
   (4) It has been patented by a U.S company

123. Which of the given transgenic plants is not correctly matched to its application or feature
   (1) Golden rice – Biofortification of food
   (2) *Brassica napus*– Hirudin production
   (3) Bt corn–Pest feeding on plant dies
   (4) Tobacco– Pesticide resistance

124. Breeding between superior quality male and superior quality female of sahiwal breed is an example of
   a. Inbreeding
   b. cross breeding
   c. outcrossing
   d. interspecific hybridization
   (1) a & b
   (2) b & c
   (3) a & c
   (4) c& d

125. Choose the incorrect statements
   a. RNAi takes place in prokaryotic organism as a method of cellular defence.
   b. ds RNA attaches to DNA and prevent translation
   c. Nematode specific genes are introduced into host plants using *Agrobacterium tumefaciens*
   (1) a & c
   (2) b & c
   (3) a & b
   (4) a, b & c

126. While creating genetically modified organisms, genetic barriers are not respected.This will be dangerous in the long run as
   (1) Transgenic product cause toxicity and produce allergies
   (2) Bacteria may become antibiotic resistant
   (3) It may cause harm to other organisms
   (4) All of these

127. A crop expressing a *cry* gene is usually
    (1) resistant to a group of insects
    (2) toxic to larvae of certain nematodes
    (3) kills *Meloidegyne incognitia*
    (4) glyphosate resistant

128. Breeding of animals belonging to different breeds is
    (1) inbreeding
    (2) out crossing
    (3) inter specific hybridization
    (4) cross breeding

129. DNA probes are used to make
    (1) cDNA
    (2) Detection of mutated gene
    (3) ds RNA
    (4) Therapeutic proteins

130. Tobacco plants resistant to nematode have been developed by introduction of DNA into host cell that produces.
    (1) a particular toxic protein to kill the pest
    (2) a herbicide
    (3) both sense and anti-sense RNA
    (4) particular hormone for proliferation of cells.

131. **Assertion** : Oral therapeutic proteins are designed at genetic level to make them free of liable peptide bonds.
    Reason : Therapeutic proteins should not be digested in gut but should be absorbed directly .
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

132. At present management of diabetes is possible by
    (1) taking insulin at regular time intervals
    (2) introducing a working copy of gene encoding insulin in the pancreatic cells
    (3) introducing a working copy of gene encoding insulin in the bone marrow stem cells
    (4) both 1 & 2

133. How many recombinant therapeutics are being presently marketed in India?
    (1) 30   (2) 12
    (3) 21   (4) 120

134.
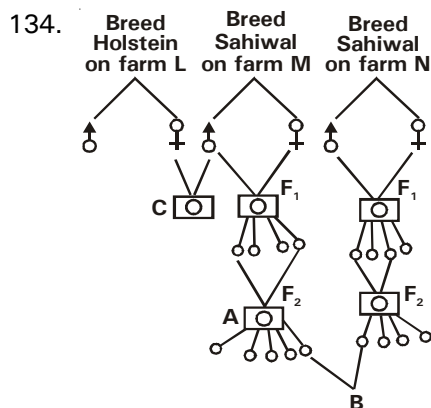
Identify among techniques A, B & C correctly matched to its features
    i-A. there is selection at every step to increase productivity.
    ii-B. helps to overcome inbreeding depression
    iii-C. similar techanique was used to develop Hisardale in Punjab
    iv-C. the offspring of such breeds is generally sterile
    (1) i & iii only   (2) i, ii, iii
    (3) ii, iii, iv   (4) i & iv

135. How many among the following are applicable to ELISA
    Rapid assay, Highly sensitive, Quantitative test, Antigen-antibody interaction, Detection of pathogen
    (1) 4   (2) 5
    (3) 3   (4) 2

ZOOLOGY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

136. Which of the following vector is used to replace defective human gene in gene therapy
    (1) Ti–plasmid   (2) BAC
    (3) pBR322   (4) None of these

137. How many of the given organisms are come under fishery (A) and Pisciulture (B) respectively?
    Hilsa, Catla, **Prawn, Oyster, Rohu, Mackeral, Common Carp**
    (1) A–7, B–5   (2) A–5, B–7
    (3) A–2, B–5   (4) A–6, B–1

138. Insulin used for diabetes was earlier extracted from pancreas of slaughtered pigs and cattle. But it has many drawbacks as compared to humulin
    (1) some people develop allergy and different types of reactions
    (2) that insulin can be easily digested if given orally
    (3) that can not be assembled into the mature form in the body of patients
    (4) both (1) and (2)

139. A new breed of sheep developed by scientists of Punjab is result of ____ obtained by using ram of _____ breed and the ewes of _____ breed
    (1) out cross; Marino; Bikanari
    (2) cross breeding; Marino ; Bikanari
    (3) cross breeding; Bikanari; Marino
    (4) outbreeding; Marino; Bikanari
140. First transgenic cow developed was
    (1) Dolly that produced double the amount of milk
    (2) Dolly that produced milk enriched with human protein, alpha-lactalbumin
    (3) Rosie that produced milk enriched with human protein, alpha-lactalbumin
    (4) Rosie that produced human protein-enriched milk at 24 g/litre
141. **Statement-I** : In 1983, Eli Lilly, an American company prepared two DNA sequences corresponding to A & B chain in *E.coli.*
    Statement-II : Chains A & B of insulin produced together in same *E.coli* were extracted and combined by creating dipeptide bonds.
    (1) Both statement-I and statement-II are correct
    (2) Both statement-I and statement-II are incorrect
    (3) Statement-I is correct but statement-II is incorrect
    (4) Statement-I is incorrect but statement-II is correct
142. The crops engineered for glyphosate are resistant/tolerant to
    (1) Bacteria   (2) Insects
    (3) Herbicides   (4) Fungi
143. Identify the correct statement.
    (1) Pisciculture includes Aquaculture
    (2) Aquaculture includes Pisciculture
    (3) Industry devoted to catching, processing & selling of fish only is fisheries
    (4) Silver revolution refers to Pisciculture
144. Fill in the blanks in the table given below

Transgenic plant	Useful application
A	Higher protein content
B	production of hirudin
flavr savr	C
golden rice	D

    (1) A–Bt Brinjal, B–Potato, C–decreased shelf life, D–Phytoremediation
    (2) A–Potato, B–Brassica, C–increased shelf life, D–Biofortification
    (3) A–Potato, B–Brassica, C–decreased shelf life, D–improved taste
    (4) A–Bt Brinjal, B–Brassica, C–increased shelf life, D–Biofortification

145. Which among the following is correct matching set w.r.t transgenic animal
    (1) Common carp – hCG to increase size
    (2) Pig   – to incorporate gene for therapeutic proteins
    (3) Mouse   – human α lactalbumin
    (4) Cattles   – molecular harvesting
146. Carefully read the following statements & choose the correct option.
    a. Inbreeding increases homozygosity & is necessary for development of pure lines
    b. Continued inbreeding may results in loss of fertility & productivity
    c. Out crossing involves mating superior males of one breed with superior females of another breed
    d. Hisardale a new breed of sheep has been developed through out crossing
    (1) a & b are true, while c & d are false
    (2) a, b & c are true, while d is false
    (3) All statements are ture
    (4) All statements are false
147. Which among the following statement is incorrect ?
    (1) Bio patent are set of exclusive rights granted to inventor for unlimited period of time
    (2) The patent extends to functional equivalents of species
    (3) GEAC makes decisions regarding the safety of introducing GM organisms for public services
    (4) The Indian Parliament has recently cleared the second amendment of the Indian Patent bill
148. Production of a human protein in bacteria by genetic engineering is possible because
    (1) bacterial cell can carry out the RNA splicing reactions
    (2) the human chromosome can replicate in bacterial cell
    (3) the mechanism of gene regulation is identical in humans and bacteria
    (4) the genetic code is universal
149. Which of the following statement is correct w.r.t. MOET?
    (1) Estrogen like hormone is injected to produce 6-8 eggs
    (2) The cow is mated with best bull and embryos are recovered surgically
    (3) Embryos at 8-32 cell stage are recovered and transferred to surrogate mother
   (4) All the statements are correct

150. Which biological product has not be obtained from transgenic animal?
    (1) Human α-lactalbumin
    (2) α−1−antitrypsin
    (3) Insulin
    (4) none of these

BOTANY : SECTION-A

All questions are compulsory in section A

151. Select the odd one out w.r.t. hot spots
    (1) Endemism
    (2) Species richness
    (3) Accelerated habitat loss
    (4) Less interspecific competition
152. Pyramid of numbers is
    (1) always upright
    (2) always inverted
    (3) either upright or inverted
    (4) neither upright nor-inverted
153. Species diversity decreases with
    (1) increase in latitude and decrease in altitude.
    (2) decrease in latitude and increase in altitude
    (3) decrease in both latitude and altitude
    (4) increase in both latitude and altitude
154. Which one has highest diversity?
    (1) 6 birds; 4 birds of one species and one bird each of the other two species
    (2) 6 birds; 3 species, each species with 2 individuals
    (3) 2 animals each of 3 species, belonging to different taxonomic groups
    (4) both (2) & (3)
155. In most ecosystems, the population of
    (1) primary producers are more than that of primary consumers
    (2) secondary consumers are largest as these are most powerful
    (3) primary consumers out number primary producers
    (4) primary consumers are least dependent upon primary producers
156. In secondary succession, the species that invade the area depend on the
    (1) conditions of the soil
    (2) availability of water
    (3) availability of seeds or other propagules
    (4) all of these
157. All are true for carbon cycle except
    (1) 71% of global carbon regulates amount of carbon dioxide in the atmosphere
    (2) Decomposers contribute substantially to CO_2 pool by processing of waste materials and dead organic matter of land on oceans.
    (3) Atmospheric inputs of C through wet deposition /rainfall is smaller when compared to phosphorus cycle
    (4) Some amount of fixed carbon is lost to sediments and removed from circulation

158. On analysing species-area relationships among very large areas like entire continents, it is found that for frugivorous (fruit-eating) birds and mammals in tropical forests of different continents, the slope is
    (1) 1.50   (2) 0.6
    (3) 1.15   (4) 0.75
159. Which of the following are extinct organisms?
    (1) Pigmy hog and black buck
    (2) *Dodo* and tasmanian wolf
    (3) Californian condor and black footed ferrat
    (4) *Aconitum* and *Nepenthes*
160. Alexander Von Humbolt described for the first time
    (1) Ecological Biodiversity
    (2) Laws of limiting factor
    (3) Species area relationships
    (4) Population Growth equation
161. In "rivet popper hypothesis" an analogy given by Paul Ehrlich, what "rivets" stand for?
    (1) Population   (2) Ecosystem
    (3) Species   (4) Community
162. Choose the correct option of unlabelled areas (a, b, c and d) in the following pie charts which show global animal diversity.
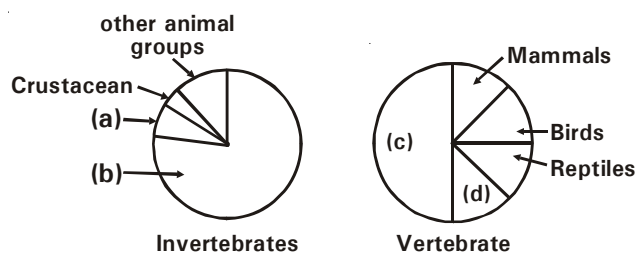
    (1) a−insects, d−fishes
    (2) b−insects, c−fishes
    (3) c−amphibians, d−angiosperms
    (4) a−molluscs, c−insects
163. Loss of biodiversity in a region may lead to
    (1) more resilience
    (2) increased resistance to environmental perturbations
    (3) no change in water use
    (4) increased variability in certain ecosystem processes
164. Select the incorrect match
    (1) Mango   − 1000 varieties
    (2) Eaglenest − Major birding area
    (3) Brazil   − Maximum biodiversity
    (4) India   − 2.4 % of world's biodiversity
165. Which of the following is not included in ecosystem services?
    (1) Maintenance of biodiversity
    (2) Recharging of ground water
    (3) Decrease in atmospheric humidity
    (4) Pollination of crops

166. Pick the odd one in relation to phosphorous cycle
    (1) Reservoir is earth crust
    (2) Respiratory release
    (3) Guano deposits
    (4) Shells, bones and teeth contain phosphorus
167. **Assertion :** Food webs are very important in maintaining the stability of ecosystem.
    Reason : So many alternate source of food are available.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false
168. Which one of following shows secondary succession?
    (1) Cooled volcanic lava
    (2) Abandoned farm lands
    (3) Sand dunes
    (4) Newly created reservoirs
169. For reducing the current rate of biodiversity loss at global, regional and local level, a convention was held in 2002 which was named as
    (1) Earth summit
    (2) World summit on sustainable development
    (3) Forest conservation act
    (4) Red data programme
170. Dodo, an extinct flightless bird, belonged to
    (1) Mauritius   (2) Lakshadweep
    (3) Canada   (4) Iceland
171. Pick out the odd one
    (1) Input of nutrients – Nitrogen fixation
    (2) Output of nutrients – Harvesting of crop
    (3) Carbon cycle – Oceanic reservoir
    (4) Phosphorus cycle – Atmospheric reservoir
172. Identify the levels of bio-diversity in India represented by
    a. 50,000 strains of rice in India
    b. Presence of deserts, mangroves and coral reef in India.
    (1) Ecological and community
    (2) Genetic and ecological
    (3) Species and genetic
    (4) Variety and ecological
173. Biosphere Reserves differ from National parks and Wildlife Sanctuaries because in the former
    (1) human beings are not allowed to enter
    (2) people are an integral part of the system
    (3) plants are given greater attention than the animals
    (4) living organisms are brought from all over the world and preserved
174. The function of reservoir in the biogeochemical cycle is to meet the
    (1) deficit   (2) input only
    (3) output only   (4) both (2) and (3)

175. Robert May places the global species diversity at about
    (1) 20–50 million   (2) 1.7 million
    (3) 7 million   (4) 2-5 million
176. Match the column-I and column-II w.r.t. total cost of various ecosystem services

	Column-I		Column-II
i.	Soil formation	a.	6 %
ii.	Recreation	b.	10 %
iii.	Nutrient cycling	c.	50 %
iv.	Climate regulation	d.	10 %
v.	Habitat for wildlife	e.	6 %

    (1) i-a, ii-b, iii-c, iv-d, v-e
    (2) i-c, ii-b, iii-d, iv-a, v-e
    (3) i-e, ii-b, iii-d, iv-a, v-c
    (4) i-a, ii-b, iii-c, iv-d, v-e
177. Among the crustose, foliose, fructicose lichen which is a pioneer species of succession?
    (1) Foliose lichen   (2) Crustose lichen
    (3) Fructicose lichen (4) All of these
178. Bioprospecting is study of diversity of economically important organisms at
    (1) molecular level (2) genetic level
    (3) species level   (4) all of these
179. Which of the following is a broadly utilitarian argument for conservation of bio-diversity?
    (1) it provides plant pollinators
    (2) provides food
    (3) it is source of medicines
    (4) it is source of fibres
180. Pyramid of .... is always upright.
    (1) biomass   (2) energy
    (3) number   (4) both (1) and (3)
181. What is not true for pyramid of biomass in sea?
    a. Biomass of fishes far exceeds that of phytoplanktons
    b. Pyramid is inverted
    c. Primary consumers are large and long lived as compared to tertiary consumers
    d. Phytoplanktons have short life span
    e. Amount of time that energy remains within organisms decreases with each trophic level
    (1) a, c and e   (2) c and e only
    (3) b, c and d   (4) c, d and e
182. Earth summit was held in
    (1) Rio de Janerio, Brazil
    (2) Johannesberg, S. Africa
    (3) Morges, Switzerland
    (4) New York
183. Which of the following statements is correct?
    (1) *Parthenium* is an endemic species of our country
    (2) African catfish is not a threat to indigenous catfishes.
    (3) Steller's sea cow is an extinct animal.
    (4) *Lantana* is popularly known as carrot grass

184.

PC [   ]
    PP [   ]

The given pyramid is
(1) Pyramid of biomass in an aquatic ecosystem
(2) Pyramid of biomass in a grassland ecosystem
(3) Pyramid of energy in an aquatic ecosystem
(4) Pyramid of numbers in a grassland ecosystem

185. MAB is
(1) man and botany
(2) man and biosphere
(3) man and biotic community
(4) man, antibiotic and bacteria

BOTANY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

186. Sere developing in sandy area is
(1) Psammosere   (2) Lithosere
(3) Xerosere   (4) Hydrosere

187. In a terrestrial ecosystem, a much larger fraction of energy flows through
(1) grazing food chain
(2) detritus food chain
(3) parasitic food chain
(4) both (1) and (2)

188. In which zone of biosphere reserves is limited human activity allowed?
(1) Core zone   (2) Buffer zone
(3) Manipulation zone   (4) Restoration zone

189. Which of the following is not a method of ex situ conservation?
(1) In vitro fertilization
(2) National parks
(3) Gene bank
(4) Cryopreservation

190. **Statement–I :** Red List contains data or information on threatened species.
Statement–II : Products of ecosystem processes are named as ecosystem services.
(1) Both statement-I and statement-II are correct
(2) Both statement-I and statement-II are incorrect
(3) Statement-I is correct but statement-II is incorrect
(4) Statement-I is incorrect but statement-II is correct

191. The expanded from of IUCN is
(1) Indian universal conservation of nature
(2) International union of conservation of nature
(3) International union of conservation of nature and natural resources
(4) Indian universal council for nature

192. As per present analysis of records match the species in column I with their percentage facing the threat of extinction worldwide in column II

Column I	Column II
a. All bird species	p. 31
b. All mammal species	q. 12
c. All amphibian species	r. 23
d. All gymnosperm species	s. 32

(1) a-s, b-r, c-p, d-q   (2) a-r, b-p, c-q, d-s
(3) a-q, b-r, c-s, d-p   (4) a-q, b-s, c-r, d-p

193. In which state is Kanha National Park and for the protection of which animal it is famous ?
(1) Gujarat, Lion
(2) Assam, Rhino
(3) Uttaranchal, Tiger
(4) Madhya Pradesh, Tiger

194. Replacement of species along a gradient of habitats/communities is called
(1) α -diversity   (2) β -diversity
(3) γ -diversity   (4) ω -diversity

195. Approximately how much of the solar energy that falls on the leaves of a plant is converted to chemical energy by photosynthesis?
(1) Less than 1%   (2) 2-10%
(3) 30%   (4) 50%

196. Which group of vertebrates comprises the highest number of endangered species?
(1) Amphibians   (2) Reptiles
(3) Birds   (4) Mammals

197. In an ecosystem, which shows one−way passage?
(1) Free energy   (2) Carbon
(3) Nitrogen   (4) Oxygen

198. Both hydrarch and xerarch succession lead to
(1) excessive wet condition
(2) medium water condition
(3) xeric condition
(4) highly dry condition

199. Which is not a major trend during ecological succession?
(1) Increase in standing crop
(2) Increase in net community production
(3) Niches become specialized
(4) Food chain relationships become complex

200. Which is incorrect with respect to global carbon?
(1) It constitutes 49% of dry weight of organisms
(2) 71% carbon is found dissolved in oceans
(3) Atmosphere contains about 1% of total global carbon
(4) Atmosphere contains about 10% of total global carbon

Dated : 18-10-2022

M.L. Syal's Helix Institute
S.C.O. 343-345, Top Floor, Sector 34-A, Chandigarh. Ph : 0172-2623155

Code-A

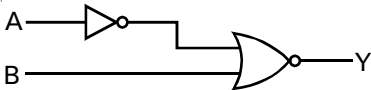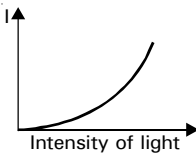**XII cum Competition Course for Medical – Test - 13**

#	Ans	#	Ans	#	Ans	#	Ans
1.	(2)	51.	(3)	101.	(4)	151.	(4)
2.	(2)	52.	(2)	102.	(1)	152.	(3)
3.	(3)	53.	(1)	103.	(1)	153.	(4)
4.	(3)	54.	(2)	104.	(3)	154.	(3)
5.	(2)	55.	(2)	105.	(2)	155.	(1)
6.	(2)	56.	(1)	106.	(1)	156.	(4)
7.	(3)	57.	(2)	107.	(4)	157.	(3)
8.	(4)	58.	(1)	108.	(4)	158.	(3)
9.	(4)	59.	(2)	109.	(3)	159.	(2)
10.	(1)	60.	(1)	110.	(3)	160.	(3)
11.	(3)	61.	(3)	111.	(4)	161.	(3)
12.	(3)	62.	(1)	112.	(4)	162.	(2)
13.	(1)	63.	(4)	113.	(3)	163.	(4)
14.	(3)	64.	(1)	114.	(2)	164.	(4)
15.	(4)	65.	(2)	115.	(3)	165.	(3)
16.	(1)	66.	(3)	116.	(3)	166.	(2)
17.	(4)	67.	(4)	117.	(4)	167.	(1)
18.	(2)	68.	(1)	118.	(2)	168.	(2)
19.	(2)	69.	(4)	119.	(2)	169.	(2)
20.	(3)	70.	(1)	120.	(1)	170.	(1)
21.	(3)	71.	(3)	121.	(4)	171.	(4)
22.	(3)	72.	(3)	122.	(1)	172.	(2)
23.	(1)	73.	(2)	123.	(4)	173.	(2)
24.	(2)	74.	(2)	124.	(3)	174.	(1)
25.	(4)	75.	(4)	125.	(3)	175.	(3)
26.	(3)	76.	(1)	126.	(4)	176.	(2)
27.	(4)	77.	(4)	127.	(1)	177.	(2)
28.	(1)	78.	(3)	128.	(4)	178.	(4)
29.	(2)	79.	(2)	129.	(2)	179.	(1)
30.	(2)	80.	(4)	130.	(3)	180.	(2)
31.	(4)	81.	(3)	131.	(1)	181.	(2)
32.	(1)	82.	(4)	132.	(1)	182.	(1)
33.	(2)	83.	(3)	133.	(2)	183.	(3)
34.	(2)	84.	(1)	134.	(2)	184.	(1)
35.	(1)	85.	(2)	135.	(2)	185.	(2)
36.	(3)	86.	(2)	136.	(4)	186.	(1)
37.	(1)	87.	(4)	137.	(1)	187.	(2)
38.	(2)	88.	(2)	138.	(1)	188.	(2)
39.	(2)	89.	(2)	139.	(2)	189.	(2)
40.	(3)	90.	(1)	140.	(3)	190.	(1)
41.	(4)	91.	(2)	**141.**	**(2)**	191.	(3)
42.	(4)	92.	(3)	142.	(3)	192.	(3)
43.	(3)	93.	(2)	143.	(2)	193.	(4)
44.	(4)	94.	(2)	144.	(2)	194.	(2)
45.	(1)	95.	(4)	145.	(4)	195.	(2)
46.	(2)	96.	(1)	146.	(1)	196.	(1)
47.	(3)	97.	(4)	147.	(1)	197.	(1)
48.	(4)	98.	(4)	148.	(4)	198.	(2)
49.	(4)	99.	(3)	149.	(3)	199.	(2)
50.	(1)	100.	(1)	150.	(3)	200.	(4)

XII cum Competition Course for Medical
Test - 14(Rev.)
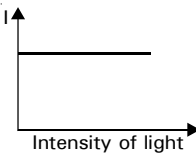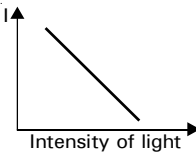
MM : 720   Time : 3 hrs. 20 min

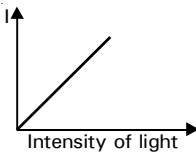|		
PHYSICS	:	**AC CIRCUITS & DEVICES-II, DUAL NATURE OF MATTER & RADIATION, ATOMS & NUCLEI, SEMICONDUCTOR DEVICES & EM WAVES, RAY OPTICS** (EXCEPT Optical instruments)
CHEMISTRY	:	**PHENOL & POLYMERS, ALDEHYDES, KETONES & CARBOXYLIC ACIDS, NITROGEN CONTAINING COMPOUNDS, CO-ORDINATION COMPOUNDS, TRANSITION ELEMENTS**
ZOOLOGY	:	**THEORIES OF EVOLUTION, HUMAN EVOLUTION, BIOTECHNOLOGY, STRATEGIES FOR ENHANCEMENT IN FOOD PRODUCTION**
BOTANY	:	**MOLECULAR BASIS OF INHERITANCE -III (GENE REGULATION, GENE MUTATION & PLANT BREEDING), STRATEGIES FOR ENHANCEMENT IN FOOD PRODUCTION, ORGANISMS AND POPULATIONS, ECOSYSTEM, BIODIVERSITY AND CONSERVATION**

PHYSICS : SECTION-A

All questions are compulsory in section A

1. Photo-current depends upon
   (1) collector plate potential
   (2) intensity of incident light
   (3) both (1) and (2)
   (4) neither (1) nor (2)

2. A small object is placed 10 cm in front of a plane mirror. If you stand behind the object 30 cm from the mirror and look at its image, the distance focused for your eye will be
   (1) 60 cm   (2) 20 cm
   (3) 40 cm   (4) 80 cm

3. A sinusoidal ac current flows through a resistor of resistance R. If the peak current is I_p, then the power dissipated is
   (1) $I_p^2 R \cos\theta$ (2) $\dfrac{1}{2} I_p^2 R$
   (3) $\dfrac{4}{\pi} I_p^2 R$ (4) $\dfrac{1}{\pi} I_p^2 R$

4. Which of the following processes represents a gamma-decay?
   (1) $_Z^A X + \gamma \rightarrow {}_{Z-1}^A X + a + b$
   (2) $_Z^A X + {}_0^1 n \rightarrow {}_{Z-2}^{A-3} X + c$
   (3) $_Z^A X \rightarrow {}_Z^A X + f$
   (4) $_Z^A X + {}_{-1} e \rightarrow {}_{Z-1}^A X + g$

5. An α-particle of energy $\dfrac{1}{2} mv^2$ bombards a heavy target of charge Ze. Then the distance of closest approach for the α-particle will be proportional to
   (1) v^2 (2) $1/m$
   (3) $1/v^4$ (4) $1/Z$

6. **Assertion** : A pure semiconductor has negative temperature coefficient of resistance.
   Reason : On raising the temperature, resistance of semiconductor decreases.
   (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
   (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
   (3) Assertion is true statement but Reason is false
   (4) Assertion is false

7. The work function of caesium metal is 2.14 eV. When light of frequency 6×10^{14} Hz is incident on the metal surface, photoemission of electrons occurs. What is the stopping potential?
   (1) 0.4 V   (2) 0.34 V
   (3) 0.68 V   (4) 0.8 V

8. In a p-type semiconductor,
   (1) the acceptor energy level is slightly above the top of the valence band
   (2) at room temperature the density of holes in the valence band is predominantly due to impurity in the extrinsic semiconductor
   (3) both (1) & (2)
   (4) neither (1) nor (2)

9. A rectangular tank of depth 8 meter is full of water ($\mu = 4/3$), the bottom is seen at the depth
   (1) 6 m   (2) 8/3 m
   (3) 8 m   (4) 10 m

10. In a hypothetical atom, if transition from n = 4 to n = 3 produces visible light then the possible transition to obtain infrared radiation is
    (1) n = 5 to n = 3   (2) n = 4 to n = 2
    (3) n = 3 to n = 1   (4) none of these

11.

    A— [NOT gate] —[into NOR gate]
    B— —Y

    Which of the following boolean expressions gives the output of the given circuit?
    (1) $Y = A\bar{B}$ (2) $Y = \bar{A}B$
    (3) $Y = A + \bar{B}$ (4) $Y = \bar{A} + B$

12. The primary winding of a transformer has 100 turns and its secondary winding has 200 turns. The primary is connected to an ac supply of 120 V and the current flowing in it is 10 A. The voltage and the current in the secondary are
    (1) 240 V, 5 A   (2) 240 V, 10 A
    (3) 60 V, 20 A   (4) 120 V, 20 A

13. On a glass plate a light wave is incident at an angle of 60°. If the reflected and the refracted waves are mutually perpendicular, the refractive index of material is
    (1) $\dfrac{\sqrt{3}}{2}$ (2) $\sqrt{3}$
    (3) $\dfrac{3}{2}$ (4) $\dfrac{1}{\sqrt{3}}$

14. Fraunhoffer lines are observed in the spectrum of
    (1) a hydrogen discharge tube
    (2) a carbon arc
    (3) the sun
    (4) sodium vapour lamp

15. Keeping the frequency of the incident radiation and the accelerating potential fixed, if the intensity of light is varied, the variation of resulting photoelectric current (I) can be shown graphically as

16. In a plane electromagnetic wave in vacuum the equation of magnetic vector can be written as $B_y = (10^{-8}T) \sin(5 \times 10^6 \pi x + 1.5 \times 10^{15} \pi t)$. The peak value of electric field vector in the wave is
    (1) 3 V/m   (2) 3×10^8 V/m
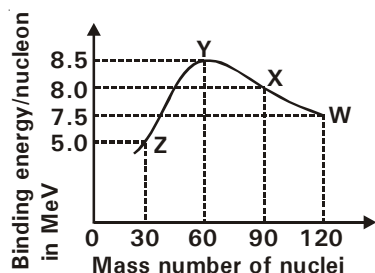   (3) 10^{-8} V/m   (4) 3×10^{-8} V/m

17. An LC circuit has a 20 mH inductor and a $50\,\mu F$ capacitor. The natural frequency of oscillation of circuit is
(1) 144 Hz
(2) 159 Hz
(3) 216 Hz
(4) 258 Hz

18. A light beam of intensity 'I' falls normally on a reflecting surface of area A. The force acting on the surface is
(1) IA
(2) 2 IA
(3) $\dfrac{IA}{C}$
(4) $\dfrac{2IA}{C}$

19.

Binding energy per nucleon versus mass number curve for nuclei is shown in figure. W, X, Y and Z are four nuclei indicated on the curve. The process that would release energy is
(1) $Y \rightarrow 2Z$
(2) $W \rightarrow X + Z$
(3) $W \rightarrow 2Y$
(4) $X \rightarrow Y + Z$

20. **Assertion** : Sun appears red during sunrise or sunset.
   Reason : Sun is less hot in the morning and at dusk.
   (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
   (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
   (3) Assertion is true statement but Reason is false
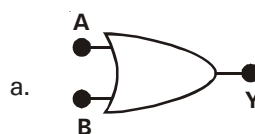   (4) Assertion is false

21. Power factor is maximum in an LCR circuit when
(1) $X_L = X_C$
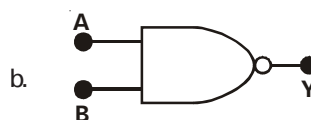(2) $R = 0$
(3) $X_L = 0$
(4) $X_C = 0$

22. Match the logic symbols in column I with their corresponding gates in column II
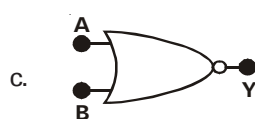
Column I   **Column II**

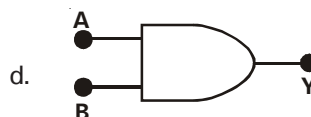a.   p. NOR

b.   q. AND

c.   r. OR

d.   s. NAND

(1) a-s, b-p, c-r, d-q
(2) a-q, b-r, c-s, d-p
(3) a-r, b-s, c-p, d-q
(4) a-p, b-s, c-q, d-p

23. In which of the following pairs, nuclear fusion is involved?
(1) Hydrogen bomb ; Energy production in sun
(2) Hydrogen bomb ; Radioactivity
(3) Atom bomb ; Nuclear reactor
(4) Energy production in sun ; Nuclear reactor

24. A particle of mass 'm' and charge Q is accelerated through potential difference V. Then the de Broglie wavelength associated with it, is

(1) $\dfrac{h}{\sqrt{mV}}$ (2) $\dfrac{h}{\sqrt{2mQ}}$

(3) $\dfrac{h}{\sqrt{2mQV}}$ (4) $\dfrac{h}{\sqrt{2mV}}$

25 Which of the following waves have minimum wavelength among these four?
   (1) Infrared rays   (2) UV-rays
   (3) Radio waves   (4) X-rays

26. The ratio of the wavelengths of the longest wavelength lines in the Lyman and Balmer series of hydrogen spectrum is

(1) $\dfrac{3}{23}$ (2) $\dfrac{5}{27}$

(3) $\dfrac{7}{29}$ (4) $\dfrac{9}{31}$

27. 1 kg fuel is consumed in 20 days in $_{92}U^{235}$ nuclear reactor. If the useful energy per fission is 190 MeV, then the output power of the reactor will be
   (1) 15 MW   (2) 30 MW
   (3) 45 MW   (4) 60 MW

28. The resonance curve for series LCR circuit is shown for three different resistances. Then
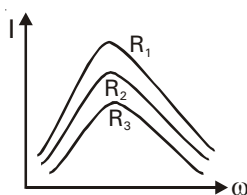
(1) $R_1 > R_2 > R_3$ (2) $R_1 < R_2 < R_3$
(3) $R_1 = R_2 = R_3$ (4) None of these

29. For a real object, a divergent lens will produce
   (1) a virtual image always
   (2) a real image always
   (3) sometimes a real & sometimes a virtual image
   (4) none of the above

30. If the operating potential in an X-ray tube is increased by 1%, by what percentage does the cutoff wavelength decrease?
   (1) 1%   (2) 2%
   (3) 0.5%   (4) 4%

31. Which of the following graphs will represent the angle of deviation δ by a prism versus angle of incidence 'i' for a monochromatic light?

(1) (a)   (2) (b)
(3) (c)   (4) (d)
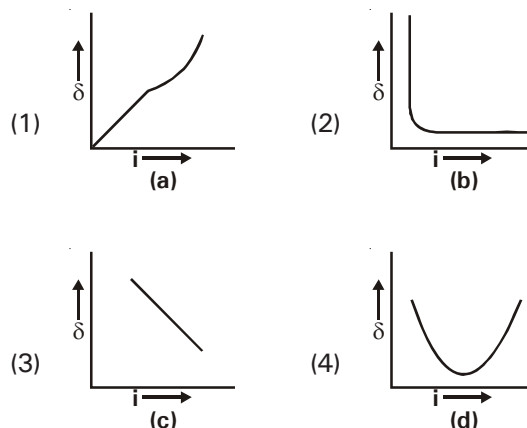
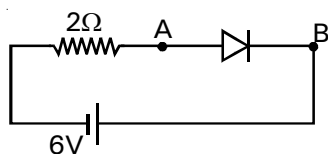32. The equation $E = pc$ is valid
   (1) for an electron as well as for a photon
   (2) for an electron but not for a photon
   (3) for a photon but not for an electron
   (4) neither for an electron nor for a photon.

33.

Potential difference between points A and B, if the diode shown in the circuit above is a silicon diode, will be

(1) 0.7 V (2) 0 V
(3) 6 V (4) 5.3 V

34. Which of the following statements is correct?
(1) β-radioactivity is the process in which an electron is emitted from an unstable atom whose atomic number remains unchanged
(2) γ-radioactive is the process in which the daughter nucleus has atomic number 1 unit more than that of the parent nucleus
(3) α-radioactivity is process in which an unstable atom emits nucleus of a helium atom
(4) radioactivity is the process in which a heavy atom emits electromagnetic radiations of very high frequency

35. a.
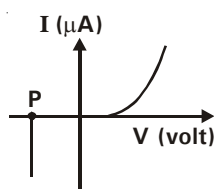
b.
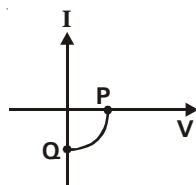
Regarding above figures which is FALSE?
(1) Figure 'a' represents a zener diode
(2) point P in figure 'a' represents reverse breakdown voltage
(3) figure 'b' represents a solar cell
(4) point Q represents open circuit voltage

PHYSICS : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

36. Two field vectors $\vec{E}$ and $\vec{B}$ for em waves is shown in figure. Direction of propagation of em wave is
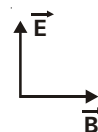
(1) along $\vec{E}$
(2) along $\vec{B}$
(3) out of the plane of paper
(4) into the plane of paper

37. The radius of curvature for a convex lens is 40 cm, for each surface. Its refractive index is 1.5. The focal length will be
(1) 40 cm (2) 20 cm
(3) 80 cm (4) 30 cm

38. For an electromagnetic wave traveling along y-axis, the possible combination of electric and magnetic fields are
(1) E_x & B_x (2) E_y & B_y
(3) E_y & B_z (4) E_x & B_z
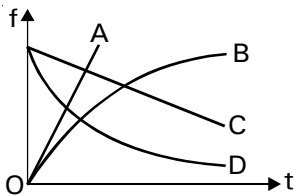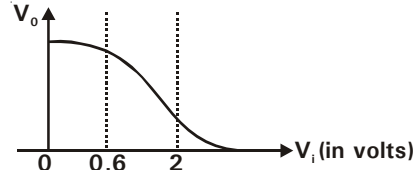
39. In an ac circuit, the resistance of a coil is $\sqrt{3}$ times its reactance. The power factor of the circuit is
(1) $\dfrac{1}{2}$ (2) $\dfrac{1}{\sqrt{3}}$
(3) $\dfrac{\sqrt{3}}{2}$ (4) $\dfrac{1}{3}$

40. An energy of 24.6 eV is required to remove one of the electrons from a neutral helium atom. The energy required to remove both the electrons from a neutral helium atom is
(1) 38.2 eV (2) 49.2 eV
(3) 51.8 eV (4) 79.0 eV

41. The value of current gain α for a transistor is 0.9. What would be the change in the collector current corresponding to a change of 4 mA in the base current in a common emitter arrangement?
    (1) 36 mA   (2) 72 mA
    (3) 18 mA   (4) none of these

42. If a hydrogen atom at rest, emits a photon of de-Broglie wavelength λ, recoil speed of atom of mass 'm' is

    (1) $\dfrac{h}{m\lambda}$ (2) $\dfrac{mh}{\lambda}$

    (3) $mh\lambda$ (4) none of these

43. A common base amplifier gives a current gain of 0.95. If input and load resistance are respectively $50\,\Omega$ and $2\,k\Omega$, the power gain of the amplifier is
   (1) 36.1   (2) 38
    (3) 44.5   (4) 95

44. Which is incorrect about neutron?
    (1) The mass of a neutron is 1.6749×10^{-27} kg
    (2) It is made up of a proton, an electron & an antineutrino.
    (3) It decays into a proton, an electron & an antineutrino with a mean life of about 1000 s
    (4) It is stable inside the nucleus

45.

    Correct graph showing the fraction 'f' of a radioactive sample that has decayed in time 't' is
    (1) A   (2) B
    (3) C   (4) D

46. A choke coil is preferred for controlling current in an ac circuit rather than a resistance because it
    (1) blocks current
    (2) increases power
    (3) is cheaper to manufacture
    (4) consumes very small power

47. If a plane glass slab is kept over various coloured letters, the letter which appears least raised is
    (1) violet   (2) green
    (3) yellow   (4) red

48. A nucleus containing Z protons and N neutrons has a mass M. If mass of a proton is m_p and that of a neutron is m_n then mass defect of nucleus is

    (1) $M - Zm_p - Nm_n$ (2) $Zm_p + Nm_p - M$

    (3) $\dfrac{M - Zm_p - Nm_n}{Z + N}$ (4) $\dfrac{Zm_p + Nm_n - M}{Z + N}$

49.

    Figure shows the transfer characteristics of a base biased CE transistor. Then
    a. At $V_i = 0.4$ V, transistor is in active state
    b. At $V_i = 1$ V, it can be used as an amplifier
    c. At $V_i = 0.5$ V, it can be used as a switch turned off
    d. At $V_i = 2.5$ V, it can be used as a switch turned on
    (1) a, b & c but not d   (2) a, b, c & d
    (3) c only   (4) b, c & d but not a

50. An electron is moving with an initial velocity $\vec{v} = v_0 \hat{i}$ and enters in a magnetic field $\vec{B} = B_0 \hat{j}$.

Then it's de Broglie wavelength
(1) remains constant
(2) increases with time
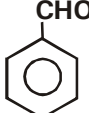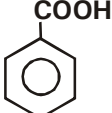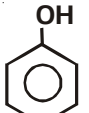(3) decreases with time
(4) increases and decreases periodically
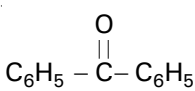
CHEMISTRY : SECTION-A

All questions are compulsory in section A

51. Which is correct for acidic nature of following?

i. $PhCOOH$ ii. $o\text{-}NO_2C_6H_4COOH$
iii. $p\text{-}NO_2C_6H_4COOH$ iv. $m\text{-}NO_2C_6H_4COOH$
(1) ii > iii > iv > i (2) iii > ii > iv > i
(3) ii > iv > i > iii (4) i > ii > iii > iv

52. The species in which the degeneracy of all five 3-d orbitals is maintained is
(1) $Co^{3+}(g)$ (2) $Co^{3+}(Aq)$
(3) $[Co(NH_3)_6]^{3+}$ (4) None of these

53.
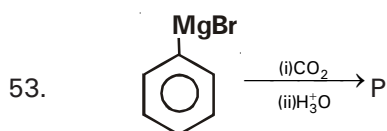
In the above reaction, product P is

(1) CHO
(2) COOH
(3) OH
(4) $C_6H_5 - \overset{O}{\underset{\|}{C}} - C_6H_5$
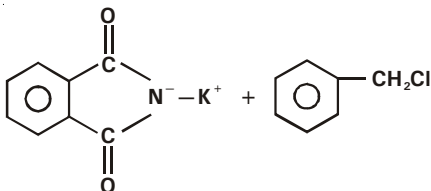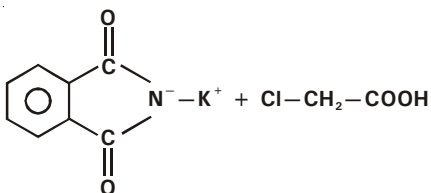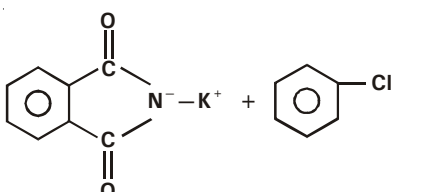
54. The correct order of ionic radii of Y^{+3}, La^{+3}, Eu^{+3} and Lu^{+3} is
(1) $La^{+3} > Eu^{+3} > Y^{+3} > Lu^{+3}$
(2) $Y^{+3} > Lu^{+3} > Eu^{+3} > La^{+3}$
(3) $Lu^{+3} > Eu^{+3} > La^{+3} > Y^{+3}$
(4) $Eu^{+3} > La^{+3} > Lu^{+3} > Y^{+3}$

55.
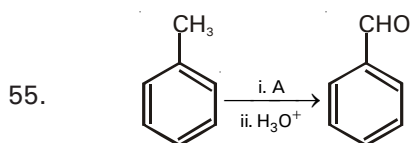
The reagent A cannot be
(1) CrO_2Cl_2
(2) CrO_3 in $(CH_3CO)_2O$
(3) Cl_2/hv
(4) CO, HCl with anhyd $AlCl_3$

56. Which of the following does not have one or more typical metallic structures at normal temperatures?
(1) Cd (2) Hg
(3) Mn (4) All of these

57. The increasing order of the rate of HCN addition to compounds A to D is
A. $HCHO$ B. CH_3COCH_3
C. $PhCOCH_3$ D. $PhCOPh$
(1) A < B < C < D (2) D < B < C < A
(3) D < C < B < A (4) C < D < B < A

58. Which one is true?
(1) Cu^{2+} is less stable in aqueous medium
(2) Cu^+ is very stable in aqueous medium due to $[Ar]3d^{10}$ configuration
(3) K_2PtCl_6 is known but K_2NiCl_6 is not known
(4) None of these

59. Which of the following will be coloured in aqueous solution?
(1) Ti^{4+} (2) Sc^{+3}
(3) Cu^{+2} (4) Zn^{2+}

60. The factor / factors which decide the basic strength of alkyl amines in the aquous state is/are :
    (1) Inductive effect　(2) Solvation effect
    (3) Steric hinderance　(4) All of these

61. In general, the melting and boiling point of transition metals
    (1) increases gradually across the period from left to right
    (2) decreases gradually across the period from left to right
    (3) first increases till the middle of the period and then decreases towards the end
    (4) first decreases regularly till the middle of the period and then increases towards the end

62. Which of the following reaction is not possible?

    (1)

    (2)

    (3)

    (4) All are possible.

63.
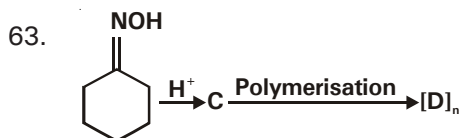
    In above reaction, the polymer $[D]_n$ is
    (1) caproclactum　(2) nylon$-6,6$
    (3) nylon-6　(4) glyptal

64. The type of isomerism shown by $[Co(en)_2(NCS)_2]Cl$ and $[Co(en)_2(NCS)Cl]NCS$ is
    (1) co-ordination　(2) ionization
    (3) linkage　(4) all of these

65. $CH_3 - \overset{\overset{O}{\|}}{C} - CH_2COOH \xrightarrow{\Delta}$ product.
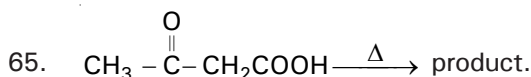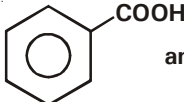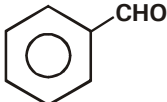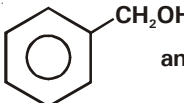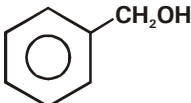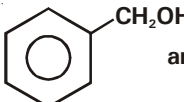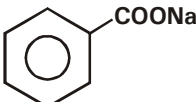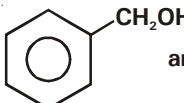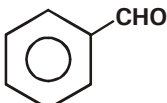
    Product formed is-
    (1) ethanol　(2) ethanal
    (3) acetone　(4) pentanone

66. In alkaline medium $KMnO_4$ oxidizes I^-
    (1) I_2　(2) I_3^-
    (3) IO_3^-　(4) I_2O_7

67. **Assertion :** $NH_3 < Me_2NH > Me_3N$ is the order of basicity of the amines shown.
    Reason : The basicity of amines depends only on the magnitude of the $+I$ effect.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

68.

$$\text{(benzaldehyde, CHO)} \xrightarrow{\text{Conc. NaOH}} A + B$$

A and B is

(1) COOH and CHO

(2) CH$_2$OH and CH$_2$OH

(3) CH$_2$OH and COONa

(4) CH$_2$OH and CHO
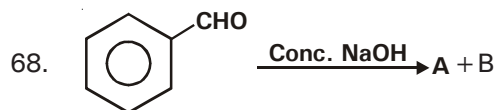
69. Co-ordination compounds have great importance in biological systems. In this context, which statement is incorrect?

(1) Carboxypeptidase - A is an enzyme and contains zinc

(2) Haemoglobin is the red pigment of blood and contains iron

(3) Cyanocobalmin is B$_{12}$ and contains cobalt

(4) Chlorophylls are green pigments in plants and contain calcium

70.
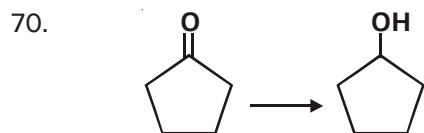
The reagents which can be used for the above conversion are

(1) HI/Red P

(2) NH$_2$–NH$_2$, KOH, glycol

(3) Zn-Hg/HCl

(4) LiAlH$_4$

71. The alkaline CuSO$_4$ containing sodium potassium citrate reacts with

(1) CH$_3$OCH$_3$ (2) C$_6$H$_5$COC$_6$H$_5$

(3) C$_6$H$_5$CH$_2$CHO   (4) C$_6$H$_5$CHO

72.

$$\text{(toluene, CH}_3\text{)} \xrightarrow{\text{CrO}_2\text{Cl}_2} X \xrightarrow[\text{OH}^-;\Delta]{\text{CH}_3\text{CHO}} Y$$
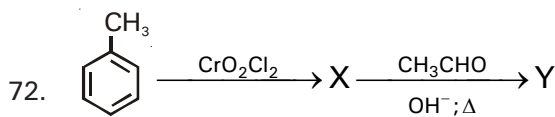
Identify the product in the above reaction

(1) Cinnamaldehyde   (2) Cinnamic acid

(3) Benzoic acid   (4) Benzaldehyde

73. Formation of ketals generally involves the reaction of _____A_____ and _____B_____.

A and B are respectively

(1) an aromatic aldehyde and monohydric alcohol

(2) carboxylic acid and monohydric alcohol

(3) ketone and dihydric alcohol

(4) ketone and hydroxyl amine

74. Match the example given in Column I with the name of the reaction in Column II.

Column I (Example)	Column II (Reaction)
i. CH$_3$COCl is reduced in the presence of Lindlar's catalyst	a. Friedel Crafts acylation
ii. C$_6$H$_5$CHO is treated with alkali	b. HVZ reaction
iii. C$_6$H$_6$ is treated with CH$_3$COCl/AlCl$_3$	c. Aldol condensation
iv. RCH$_2$COOH is treated with Br$_2$/red P	d. Cannizaro's reaction
v. CH$_3$CN is reduced with SnCl$_2$ and hydrolysed	e. Rosenmund's reduction
vi. CH$_3$CHO is treated with alkali to give CH$_3$CH=CHCHO	f. Stephen's reaction

(1) i-a, ii-d, iii-e, iv-c, v-b, vi-f

(2) i-b, ii-f, iii-d, iv-a, v-c, vi-e

(3) i-c, ii-b, iii-f, iv-e, v-a, vi-d

(4) i-e, ii-d, iii-a, iv-b, v-f, vi-c

75. Phenols reacts with bromine in aqueous medium at low temperature to give
    (1) o - bromophenol
    (2) o & p-bromophenol
    (3) 2,4,6-tri bromophenol
    (4) p - bromophenol

76. $CH_3-CH=CH-CH_2-CN \xrightarrow[\text{2. } H_2O]{\text{1. DIBAL-H}} A$

    A is
    (1) $CH_3-CH=CH-CH_2CHO$
    (2) $CH_3CH_2-CH_2-CH_2CHO$
    (3) $CH_3-CH=CH-CH_2COOH$
    (4) $CH_3CH_2CH_2CH_2COOH$

77. $CH_3-CH_2-CH_2NH_2$ on treatment with nitrous acid gives major product

    (1) $CH_3CH_2CH_2OH$
    (2) $CH_3-CH-CH_3$ with OH below the central carbon
    (3) $CH_3-CH_2-CH_2Cl$
    (4) None of these

78. The correct order of acidic strength of phenol, ethyl alcohol & water is
    (1) Phenol > ethyl alcohol > water
    (2) Phenol > water > ethyl alcohol
    (3) Ethanol > water > phenol
    (4) Water > ethanol > phenol

79. Oil of wintergreen is obtained on treating A with B in acidic medium. A and B are
    (1) Salicylic acid and Methanol
    (2) Salicylic acid and Phenol
    (3) Phenol and Benzoyl Chloride
    (4) Cumene and Air

80. Hinsberg's reagent is
    (1) CH_3SO_2Cl
    (2) $C_6H_5SO_2Cl$
    (3) $CH_3CH_2SO_2Cl$
    (4) $C_6H_5SO_2OH$

81. Composition of Ziegler-Natta catalyst is
    (1) $(Et_3)_3Al. TiCl_2$
    (2) $(Me)_3Al. TiCl_2$
    (3) $(Et)_3Al. TiCl_4$
    (4) $(Et)_3Al.PtCl_4$

82. Which of the following is a outer orbital complex?
    (1) $[Co(NH_3)_6]^{3+}$
    (2) $Fe(CN)_6]^{4-}$
    (3) $[CoF_6]^{3-}$
    (4) $[Mn(CN)_6]^{2+}$

83. Match the column-I with column-II and mark the appropriate choice

	Column-I		Column-II
a.	Buna-S	i.	Thermosetting
b.	Polyamides	ii.	Fibres
c.	Polyvinyls	iii.	Elastomers
d.	Urea-formaldehyde	iv.	Thermoplastics

    (1) a–iv, b–iii, c–i, d–ii
    (2) a–ii, b–i, c–iii, d–iv
    (3) a–iii, b–ii, c–iv, d–i
    (4) a–i, b–iv, c–ii,d–iii

84. Which of the following does not exist?
    (1) TiX_4
    (2) VF_5
    (3) CrF_6
    (4) MnF_7
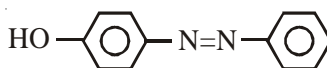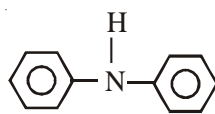
85. During Kolbe's reaction the reaction involves
    (1) reaction of phenol with carbon dioxide
    (2) reaction of phenoxide with carbon dioxide
    (3) reaction of phenol with $CHCl_3$ & KOH
    (4) reaction phenoxide with $CHCl_3$ & KOH

CHEMISTRY : SECTION-B
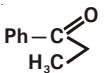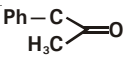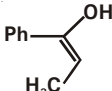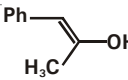
This section has 15 questions, attempt any 10 questions of them.

86.
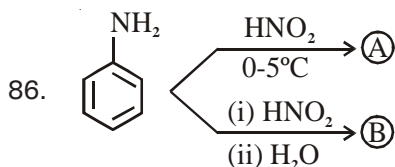
    Product of reaction of Ⓐ and Ⓑ in basic medium (pH = 9 – 10) is

    (1) $HO-\bigcirc-N=N-\bigcirc$

    (2) $\bigcirc-N=N-\bigcirc$

    (3) $\bigcirc-\overset{H}{\underset{|}{N}}-\bigcirc$

    (4) No reaction

87. Ozonolysis of 2-methyl but-2-ene gives
    (1) 2 moles CH_3CHO
    (2) 2 moles HCHO
    (3) mixture of CH_3CHO and CH_3COCH_3
    (4) CH_3CH_2CHO

88. The increasing order of crytal field splitting power of some ligand is
    (1) $H_2O < OH^- < Cl^- < F^-$
    (2) $H_2O < Cl^- < OH^- < F^-$
    (3) $OH^- < H_2O < Cl^- < F^-$
    (4) $Cl^- < F^- < OH^- < H_2O$

89. **Assertion :** Arenediazonium salts are much more stable than their aliphatic counterparts.
    Reason : In arenediazonium salts there is resonance, i.e., dispersal of positive charge on the benzene ring.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

90. Blue solution of $CuSO_4$ + excess KCN → colourless solution. It is due to
    (1) formation of CuCN
    (2) formation of $Cu(OH)_2$
    (3) formation of $[Cu(CN)_4]^{2-}$
    (4) Cu^{+2} is reduced by CN^- to Cu^+ which forms the complex $[Cu(CN)_4]^{3-}$

91. Which is most stable out of the following compounds?
    (1) $[Ag(NH_3)_2]NO_3$ (2) $[Pt(en)_2Cl_2]$
    (3) $K_2[Ni(edta)]$ (4) $K_3[Fe(C_2O_4)_3]$

92. The transition elements and their compounds are known for their catalytic activity because
    (1) they can adopt multiple oxidation state
    (2) they can form complexes
    (3) these compounds provides large surface area due to which concentration of reactants on the surface of catalyst (adsorbent) increases
    (4) all of these

93. C.F.S.E of d^6 cation in an octahedral field in the presence of weak field ligand will have (P = pairing energy)
    (1) $-\dfrac{12}{5}\Delta_0 + P$ (2) $-\dfrac{12}{5}\Delta_0 + 3P$
    (3) $-\dfrac{2}{5}\Delta_0 + 2P$ (4) $-\dfrac{2}{5}\Delta_0 + P$

94. Schotten Baumann reactioniswhen
    (1) PhOH is reacted with CH_3COCl in presence of pyridine
    (2) PhOH is reacted with C_6H_5COCl in presence of H_2SO_4
    (3) PhOH is reacted with C_6H_5COCl in presence of NaOH
    (4) PhOH is reacted with $(CH_3CO)_2O$ in presence of NaOH

95. $Ph-C\equiv C-CH_3 \xrightarrow{Hg^{2+}/H^+} A$, A is

    (1) $Ph-C\underset{H_3C}{\overset{O}{<}}$ (2) $\underset{H_3C}{\overset{Ph-C}{>}}=O$

    (3) $\underset{H_3C}{\overset{Ph-}{\diagdown}}\overset{OH}{<}$ (4) $\underset{H_3C}{\overset{Ph}{\diagdown}}=\overset{}{OH}$

96. Match the reactions given in column-I with the statements given in column-II

Column-I		Column-II	
a.	Ammonolysis	i.	Amine with lesser number of carbon atoms
b.	Gabriel phthalimide synthesis	ii.	Detector test for primary amines
c.	Hoffmann Bromamide	iii.	Reaction of phthalimide with KOH and R–X
d.	Carbylamine reaction	iv.	Reaction of alkylhalides with NH_3

    (1) a-iv, b-iii, c-i, d-ii   (2) a-ii, b-i, c-iii, d-iv
    (3) a-i, b-ii, c-iii, d-iv   (4) a-iii, b-i, c-iv, d-ii

97. Which of the following pair of oxides are amphoteric?
    (1) V_2O_5, Cr_2O_3
    (2) Mn_2O_7, CrO_3
    (3) V_2O_5, CrO
    (4) V_2O_5, Mn_2O_7

98. I. $CH_3CH_2-O-CH_3$
    II. CH_3CH_2CHO
    III. CH_3COCH_3
    IV. $CH_3CH_2CH_2OH$

    The correct order of their boiling points is

    (1) $III > II > IV > I$
    (2) $IV > III > II > I$
    (3) $I > IV > III > II$
    (4) $IV > II > III > I$

99. Cuprammonium ion $[Cu(NH_3)_4]^{2+}$ is
    (1) tetrahedral
    (2) square planar
    (3) triangular bipyramid
    (4) octahedral

100. $CH_3COOH \xrightarrow[\text{}]{\text{Red P, Cl}_2} A \xrightarrow[\text{KCN}]{\text{alc.}} B \xrightarrow{\text{H}_2\text{O}^+} C \xrightarrow{\Delta} D$

    In the above reaction, the final product D is
    (1) CH_3COOH
    (2) CH_3CH_2COOH
    (3) $CH_3-\overset{\overset{\text{O}}{\|}}{C}-CH_3$
    (4) $\overset{\text{}}{CH_2}-COOH$ with CN

ZOOLOGY : SECTION-A

All questions are compulsory in section A

101. Which one of the following pallindromic base sequences in DNA can be easily cut by *Eco* RI.
    (1) 5' CACGTA 3' ; 3'CTCAGT 5'
    (2) 5' CFTTCG 3' ; 3' ATGGTA 5'
    (3) 5' GATATC 3' ; 3' CTACTA 5'
    (4) 5' GAATTC 3' ; 3' CTTAAG 5'

102. **Directional, minor, discontinuous, inheritable, random, directionless, spontaneous, continuous.** How many of the above describe saltations of de Vries?
    (1) four
    (2) five
    (3) three
    (4) six

103. All statements are correct regarding bioreactors except one i.e.
    (1) Agitator system helps in uniform distribution of oxygen and nutrients throughout the vessel
    (2) Addition of antibiotic to bioreactor prevents growth of other bacteria in the medium
    (3) Sampling port is for addition of raw material to the culture to maintain exponential growth of host cells
    (4) Optimum conditions can be maintained in the culture medium by pH and temperature control system

104. Consider following statements
    a. Plasmid vector with two selectable markers for X and Y antibiotics resistance is taken
    b. Alien DNA is ligated at restriction site within the gene for X and rDNA is induced to enter host cell.
    The addition of only antibiotic Y to the medium will help to identify the
    (1) Recombinant
    (2) Non-recombinant
    (3) Transformant
    (4) All of the above

105. Choose the correct set
    (1) Selectable marker gene – carries restriction enzymes
    (2) Cloning vector – is always circular DNA molecule
    (3) Ori–origin of transcription of DNA on vector
    (4) Hind II – 1st restriction endonuclease to be isolated which recognises 6 base pair sequence on DNA

106. Practice of mating within same breed but having no common ancestors on either side of their pedigree upto 4–6 generations is known as
    (1) Cross breeding
    (2) Outcrossing
    (3) Inbreeding
    (4) Interspecific hybridization

107. Taq polymerase is one _____ enzyme extracted from one thermophillic bacterium and it catalysis addition of _____ to the primer
    (1) thermolabile; nucleotides
    (2) thermostable; nucleosides
    (3) thermolabile; nucleosides
    (4) thermostable; nucleotides

108. In pBR322, rop codes for proteins involved in ____ and carries restriction site for _____
    (1) Transcription, Pvu II
    (2) Plasmid replication, Bam HI
    (3) DNA polymerisation, Sal I
    (4) Replication of plasmid, Pvu II

109. Identify the incorrect statements
    (1) Bt-toxins are insect-group specific
    (2) Proteins encoded by gene cry I Ab controls corn borer
    (3) cry I Ac & cry IIAb genes encode proteins that control cotton bollworm
    (4) Bt-toxin genes have not been yet introduced in food crops

110. In the given structure of proinsulin identify the incorrectly marked disulphide bond
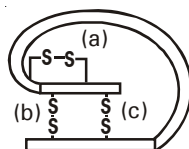
(1) a   (2) b
(3) c   (4) all

111. **Assertion**: PCR and ELISA are molecular diagnosis techniques, which help in early diagnosis of a disease hence help in early treatment.
Reason: PCR and ELISA are used in cases where the amount of DNA is very small.
(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Assertion is false

112. A young couple lost their lower limbs in an accident, their children will be having
(1) normal and well developed limbs
(2) well developed upper limbs but underdeveloped lower limbs
(3) underdeveloped both upper and lower limbs
(4) normal lower but underdeveloped upper limbs

113. Find the correct statement regarding human evolution
(1) Few fossils of ape-like bones have been discovered in Ethopia and Tanzania
(2) 3-4 mya, man like primates walked in eastern Asia
(3) Two mya, Australopithecus probably lived in East African glasslands
(4) All of these

1114. A cross between *Elephas maximus indicus* and *Elephas maximus maximus* would be
(1) inbreeding and would lead to inbreeding depression
(2) cross breeding and may create a new breed
(3) interspecific hybridization and would be sterile
(4) both (1) and (2)

115. Human evolution is
(1) adaptive convergence as well as phyletic speciation
(2) phyletic evolution, adaptive convergence
(3) phyletic evolution and progresive evolution
(4) phyletic evolution and retrogressive evolution as there is decline in cranial capacity

116. Choose the correct statement about skulls a, b, c
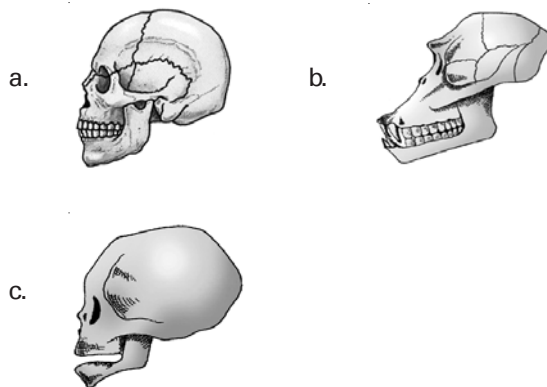
(1) skull 'b' is of an adult chimpanzee
(2) skull 'c' is of baby chimpanzee
(3) skull 'a' is of an adult human being and is more like 'c' than 'b'
(4) all the above
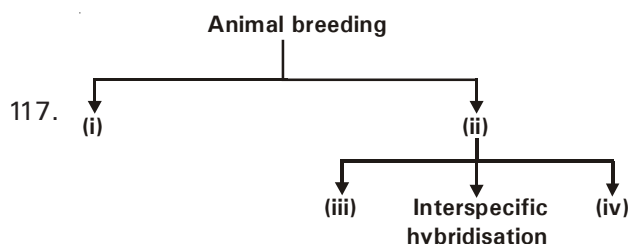
117.

In the above flow chart, (i) to (iv) represents
(1) Inbreeding, cross breeding, out crossing, outbreeding
(2) Inbreeding, cross breeding, outbreeding, out crossing
(3) Inbreeding, out crossing, outbreeding, cross breeding
(4) Inbreeding, outbreeding, out crossing, cross breeding

118. Which is not an economic importance of honey?
(1) It is used as a natural sweetener
(2) Its use in the indigenous system of medicine is wide spread
(3) In the preparation of creams, ointments, paints etc.
(4) As a tonic and a source of energy

119. Natural selection is a process that may result in evolution. If evolution is to occur which of the following must be true ?
a. individuals within a species are variable
b. some variations within species are inherited
c. only a fraction of the offspring produced in each generation survive to reproduce
d. the survival and reproduction of individuals is not random, individuals with most favourable variations survive and reproduce.
(1) a, b and c   (2) a, b and d
(3) a, b, c and d   (4) c only

120. Incorrect match for gel electrophoresis is
    (1) sieving effect–agarose gel
    (2) basis of resolution of fragments – size
    (3) force for DNA movement – electric field
    (4) none of these

121. Fill in the blanks and choose the correct option?

    Since DNA fragments are _____(a)_____ charged. They

    move under _____(b)_____ field towards _____(c)_____
    (1) a–positively, b–electric, c–cathode
    (2) a–positively, b–magnetic, c–anode
    (3) a–negatively, b–electric, c–anode
    (4) a–negatively, b–magnetic, c–cathode

122. Recognition sites of enzymes w, x, y or z are given below. Which of these can be used for genetic engineering

    ↓
    5'-C-C-T-G-G-3'
    3'-G-G-A-C-C-5'
      W ↑

    ↓
    5'-A-G-T-A-C-T-3'
    3'-T-C-A-T-G-A-5'
              ↑ X

    ↓
    5'-A-A-G-C-T-T-3'
    3'-T-T-C-G-A-A-5'
        Y ↑

    ↓
    5'-A-G-A-A-C-T-3'
    3'-T-C-T-T-G-A-5'
        Z ↑
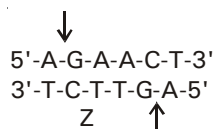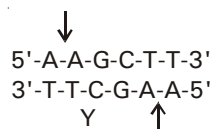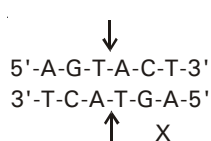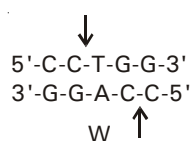
    (1) W & X   (2) X & Y
    (3) Y & Z   (4) W & Z

123. Two key concepts of Darwin's theory of evolution was
    (1) Branching descent and natural selection
    (2) Branching descent and homology
    (3) Natural selection and reproductive fitness
    (4) Reproductive fitness and adaptations

124. Match the columns

Column-I	Column-II
a. Transduction	i. BAC
b. Shuttle vector	ii. YEp
c. Artificial vector to carry insert with size maximum upto 300 kb	iii. Bacteriophage

    (1) a–i, b–ii, c–iii   (2) a–iii, b–i, c–ii
    (3) a–ii, b–i, c–iii   (4) a–iii, b–ii, c–i

125.
    | ds DNA |
    ↓
    denaturation
    at (a)
    ↓
    (b) at 40° to 60°C
    (c) │ DNA polymerase
        │   +
        ↓ deoxynucleotides
    Extension
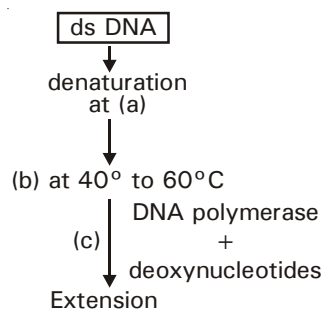
    Identify a, b and c in above flowchart regarding PCR
    (1) 94°C; primer annealing; Mg^{2+}
    (2) 96°C; primer extension; Zn^{2+}
    (3) 94°C; primer extension; Mg^{2+}
    (4) 96°C; primer annealing; Zn^{2+}

126. A DNA tagged with radioactive molecule is allowed to hybridize to DNA in a clone of cells followed by detection using radiography. The DNA from clone which appears on photographic film is
    (1) Mutated gene
    (2) Normal gene
    (3) Non complimentary gene
    (4) Both (1) and (2)

127. Bt toxin gene has been cloned from _____ & expessed in _____
    (1) plants ; animals   (2) bacteria ; plants
    (3) animals ; bacteria   (4) bacteria ; animals

128. Genetic drift occurs when a few individuals of a species colonize an island. This particular phenomenon is known as
    (1) Bottle neck effect
    (2) Natural selection
    (3) Founder's effect
    (4) Reproductive isolation

129. Choose the incorrect match
    (1) Microinjection — direct injection of r-DNA in nucleus
    (2) Biolistic—bombardment of microparticles with DNA
    (3) Gene gun — transfer of disarmed pathogen
    (4) PCR—multiple copies of DNA *in vitro*

130. In an area of black rocks as well as white rocks the rabbits with black fur (BB) could hide amongst black rocks & survive, likewise rabbits with white fur (bb) survived amongst white rocks. The rabbits with grey fur (Bb), however could stand out and get noticed in all areas of habitat & suffered greater predation. What type of selection could be operating in that area?
    (1) Disruptive selection that favours both the extremes
    (2) Disruptive selection that favours either extreme
    (3) Stablising selection that favours mean
    (4) Directional selection that favours extreme character

131. In genetic engineering restriction enzymes are used for cutting
    (1) bacterial DNA only
    (2) eukaryotic DNA only
    (3) viral DNA only
    (4) any DNA fragment

132. The average circumference of sunflowers collected from an area is 5 cm. If stabilizing selection is operating then there would be sunflower with circumference of
    (1) 5 cm with fewer variations than before
    (2) 5 cm with greater variations than before
    (3) less than 5 cm with fewer variations
    (4) either less or more than 5 cm

133. Evolution by anthropogenic action includes development of
    a. Pesticide resistant varieties
    b. Drug resistance in eukaryotic organisms
    c. Webbed feet in aquatic birds
    d. Dark variety of moth in polluted area
    (1) b and c   (2) a, b and d
    (3) a, c and d   (4) c and d

134. Arrange the given events in field of biotechnology as these occured in time?
    A. The first transgenic cow produced human protein-enriched milk
    B. Eli lilly produced chains A & B of human insulin separately
    C. First clinical gene therapy given to a 4 year old girl with ADA deficiency
    (1) B–C–A   (2) B–A–C
    (3) C–B–A   (4) A–B–C

135. **Statement- I** : Keeping beehives in crop fields during flowering period increases pollination efficiency.
    Statement- II : Bees are the pollinators of many crop species such as sunflower, *Brassica*, apple and pear.
    (1) Both statement-I and statement-II are correct
    (2) Both statement- I and statement-II are incorrect
    (3) Statement-I is correct but statement-II is incorrect
    (4) Statement-I is incorrect but statement-II is correct

ZOOLOGY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

136. Match the hominids with their correct brain size :
    (a) *Homo habilis*   (i) 900 cc
    (b) *Homo neanderthalensis* (ii) 1350 cc
    (c) *Homo erectus*   (iii) 650-800 cc
    (d) *Homo sapiens*   (iv) 1400 cc
    Select the correct option.

	(a)	(b)	(c)	(d)
(1)	(iii)	(i)	(iv)	(ii)
(2)	(iii)	(ii)	(i)	(iv)
(3)	(iii)	(iv)	(i)	(ii)
(4)	(iv)	(iii)	(i)	(ii)

137. How traditional hybridization procedures are different from genetic engineering?
    (1) Former provides opportunities for variations
    (2) Inclusion and multiplication of undesirable genes along with desirable occurs in later
    (3) Inclusion and multiplication of only desirable genes occurs in latter
    (4) Both (1) and (3)

138. Outcross is an individual produced from mating between animals of
    (1) same breed which are closely related
    (2) different breeds with same species
    (3) same breed but not closely related
    (4) different species

139. The protein Hirudin prevents blood clotting and its gene was introduced into a plant to obtain it from plants. The source of Hirudin gene was
    (1) *Hirudinaria* (common leech)
    (2) *Brassica napus*
    (3) Retrovirus
    (4) Artificially synthesized

140. Yield potential of cattle can be realised by
    a. proper housing of cattle
    b. taking care of quality but not the quantity of feed
    c. maintaining cleanliness
    d. regular visits to veterinary doctor
    (1) b and d   (2) b, c, and d
    (3) a, c and d   (4) a, b, c and d

141. After electrophoresis the separated DNA fragments can be visualised in ethidium bromide when gel is exposed to UV light. The DNA fragments appear as _____ coloured bands. Process of their extraction from gel is known as _____
    (1) Orange, spooling   (2) Blue, spooling
    (3) Orange, elution   (4) Blue, elution

142. Identify the correct statement
    (1) DNA being hydrophobic easily passes through the cell membrane
    (2) Bacterial cells are made competent by treating them with divalent cations like Ca^{++}
    (3) Recombinant eukaryotic proteins are only produced by using prokaryotic hosts
    (4) All of these are correct

143. Darwin failed to explain all except for
    (1) Inheritance of vestigeal organ
    (2) Cause of variation and hybrid sterlity
    (3) Inheritance of over specialised organs like tusk in antlers
    (4) Change in length of insect proboscis with change in position of plant nectary

144. An incorrect statement is

(1) the rate of appearance of new forms is linked to life span of the organisms

(2) there must be a genetic basis for any trait to be selected naturally in order to evolve

(3) new alleles added to a population by genetic recombination always enhance the effect of selection

(4) sampling errors often reduce the genetic variability of the population

145. The type of selection observed in peppered moth during industrial melanism is

(1) stabilising   (2) directional

(3) disruptive   (4) normalising

146. In multiple ovulation embryo transfer

(1) fertilized eggs are removed at 64 celled stage

(2) 16 eggs are produced due to administration of FSH

(3) embryos are recovered surgically and transferred to surrogate mother

(4) used for herd improvement in short span of time

147. Find the incorrect match

(1) Rearing of aquatic organisms–Aquaculture

(2) Growing and harvesting prawns–Fishery

(3) Culturing & harvesting of fishes–Pisciculture

(4) Egg production–White revolution

148. There are three samples of DNA - A, B & C. After treating them with enzymes, they were subjective to electrophoresis. Based on clues, select the lane which has A, B & C samples respectively
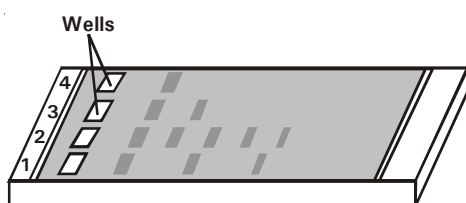
A. Linear DNA was given two cuts with EcoR1 and two with Hind II

B. Circular DNA was given two cuts

C. Plasmid DNA was treated with exonuclease

(1) Lane 2-A, Lane 3-B, Lane 4-C

(2) Lane 1-A, Lane 3-B, Lane 4-C

(3) Lane 1-A, Lane 2-B, Lane 3-C

(4) Lane 2-A, Lane 4-B, Lane 3-C

149. Foreign gene that codes for enzyme which can convert the substrate into orange colour was introduced in a plasmid. After introduction of plasmid in bacteria present in the petridish containing substrate.

(1) recombinants will give orange colour and non-recombinants will give white colour

(2) recombinants and non-recombinants both produced white colour

(3) recombinants and non-recombinants both produced orange colour

(4) recombinants will give white colour and non-recombinants will give orange colour

150. **Assertion**: Modification enzymes present in *E.coli* as part of its Restriction Modification system protect its own DNA from being cleaved.

Reason: Modification enzymes catalyze the addition of a methyl group to one or two bases usually within the recognition sequence of the restriction enzyme making it unreconzable.

(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion

(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion

(3) Assertion is true statement but Reason is false

(4) Assertion is false

BOTANY : SECTION-A

All questions are compulsory in section A

151. In a mutational event, when adenine is replaced by cytosine, it is the case of

(1) frame shift mutation   (2) transcription

(3) transition   (4) transversion

152. Given below is the inverted pyramid

Which of the following is correct for this pyramid.
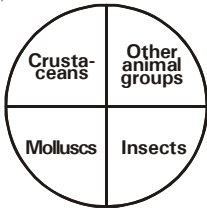
(1) Aquatic ecosystem – pyramid of biomass

(2) Grassland ecosystem – pyramid of energy

(3) Forest ecosystem – pyramid of energy

(4) Forest ecosystem – pyramid of biomass.

153. In temperate forest as compared to a tropical forest, rate of decomposition will be

(1) faster as moisture is sufficient

(2) very fast as pH and temperature both are good

(3) slow as pH is less

(4) slower as temperature is low

154. Frameshift insertion or deletion mutation forms the genetic basis of proof that
(1) code is triplet and it is read in a contiguous manner
(2) code is universal
(3) code is degenerate
(4) code is triplet and unambiguous

155. Protection of biodiversity hot spots alone can reduce the current rate of extinction upto 30% because these regions have
(1) high species diversity
(2) high degree of endemism
(3) large populations of plants and animals
(4) both (1) & (2)

156. *Calotropis* in order to protect themselves from herbivores
(1) develop mealy coatings on leaves
(2) produces poisonous cardiac glycosides
(3) produces bitter fruits
(4) develop stiff hairs

157. Lac operon in *E.coli*, is induced by
(1) I gene
(2) Promoter gene
(3) β-galactosidase
(4) Lactose

158. Which is not a mutagen?
(1) Acetic acid
(2) Gamma rays
(2) Nitrous acid
(4) Colchicine

159. Which statement is true regarding the flow of energy?
a. The energy from sun reaches the food chain through herbivores
b. The energy transfer in food chain follow 10% law, where only 10% of energy is transferred from one trophic level to the next trophic level successively
c. Movement of energy occurs from lower to higher trophic level
d. The flow of energy in various trophic levels is unidirectional
(1) a & b
(2) b, c & d
(3) a only
(4) d only

160. Phosphorus cycle is different from carbon cycle in
(1) atmospheric input of phosphorus through rainfall are much smaller than carbon input.
(2) gaseous exchanges of phosphorus between organism and environment are negligible
(3) plants obtain phosphorus from soil and carbon from air.
(4) all of these

161. Which is the most crucial step for the success of breeding programme?
(1) Selection of parents
(2) Selection and testing of superior recombinants
(3) Collection of variability
(4) Cross hybridisation of two different plants

162. Rivet popper hypothesis proposed by Paul Ehlrich is for
(1) the effect of decrease in biodiversity on the ecosystem
(2) the effect of increase in biodiversity on the ecosystem
(3) alien species invasions
(4) over exploitation

163. Which of the following statement is incorrect?
(1) India has more ecosystem diversity than Norway
(2) Fungal diversity is much more than the diversity of mammals, fishes, reptiles and amphibians
(3) More than 1000 varieties of mango grow in India indicating a high level of species diversity
(4) Western Ghats have a much greater amphibian diversity than Eastern Ghats

164. 'Himgiri' developed by hybridisation and selection for disease resistance against rust pathogen is a variety of
(1) sugarcane
(2) wheat
(3) chilli
(4) maize

165. Calculate the death rate of lotus plant if there were 30 lotus plants last year and current population is 20.
(1) 0.33 per lotus per year
(2) 0.66 per lotus per year
(3) 16 per lotus per year
(4) 0.016 per lotus per year

166. Which is incorrect w.r.t. growth curve given below?
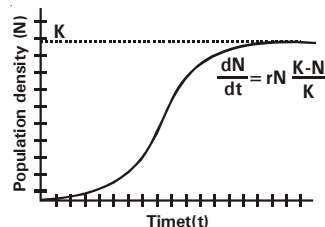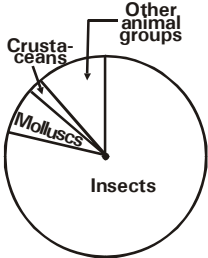
(1) It is found in stable type of population
(2) An equilibrium is reached when size of population approaches carrying capacity of area
(3) Environmental resistance does not operate to slow down exponential phase
(4) A phase of deceleration occurs before equilibrium is reached

167. At higher altitudes, many persons often feel altitude sickness, but after some time it is overcome by
(1) increasing red blood cell production
(2) decreasing binding affinity of haemoglobin
(3) increasing breathing rate
(4) all of these
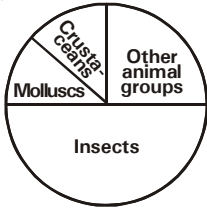
168. Select the incorrect statement
    (1) Von Humboldt observed that within a region, species richness increased with increasing explored area, without a limit
    (2) On a log scale species area relationship is a straight line given by equation
    $\log S = \log C + Z \log A$
    (3) Value of Z lies in the range of 0.1 to 0.2 regardless of taxonomic group/region
    (4) Steeper slopes signifies that number of species found increases faster than the area explored in very large areas like the entire continents

169. What will happen to an ecosystem if producers are removed?
    (1) Increase in primary productivity and biomass
    (2) Increase in number of herbivores
    (3) Reduction in primary productivity, no biomass available for consumption by heterotroph
    (4) All of these

170. Which is of following is correct example of Batesian mimicry?
    (1) Grasshopper resembles green leaf
    (2) Viceroy butterfly resembles Monarch butterfly
    (3) African Lizard modifies corners of its mouth like a flower
    (4) Monarch & queen butterfly resemble each other

171. Number of wildlife sanctuaries and National Parks set up in India respectively are
    (1) 513 & 90   (2) 448 & 90
    (3) 294 & 80   (4) 316 & 85

172. On analysing species-area relationships among very large areas like entire continents, it is found that for furgivorous (fruit-eating) birds and mammals in tropical forests of different continents, the slope is
    (1) 1.50   (2) 0.6
    (3) 1.15   (4) 0.75

173. Pollination where a plant species requires a specific species as a pollinating agent is result of
    (1) co-evolution
    (2) progressive evolution
    (3) organic evolution
    (4) selective evolution

174. Which of the following is not an example of secondary succession?
    (1) Pond freshly filled with water after a dry phase
    (2) Freshly cleared crop field
    (3) Newly exposed habitat with no record of earlier vegetation
    (4) Forest cleared after devastating fire

175. According to May's global estimates, total species recorded are only _____ of the total species existing in nature.
    (1) 50%   (2) 20%
    (3) 40%   (4) 22%

176. Which of the following is correct representation of proportionate number of species of invertebrates?

177. Match the items of column-I with those of column-II

	Column-I		Column-II
a.	Grass	i.	Decomposer
b.	Grasshopper	ii.	Secondary carnivore
c.	Frog	iii.	Producer
d.	Hawk	iv.	Primary consumer
		v.	Primary carnivore

    (1) a-iii, b-i, c-v, d-iv   (2) a-iii, b-iv, c-ii, d-i
    (3) a-iii, b-iv, c-v, d-ii   (4) a-i, b-ii, c-iii, d-iv

178. Which of the following statements is not correct for a stable community?
    (1) There is not much variation in productivity from year to year.
    (2) It is resistant or resilient to occasional disturbances
    (3) It shows decreased productivity
    (4) It is resistant to invasion by alien species

179. Which of the following statements are correct?
    a. A very low level of expression of lac operon has to be present in bacterial cell all the time
    b. Polycistronic structural gene is regulated by a common promotor & regulator gene
    c. The development & differentiation of embryo into adult organism are a result of coordinated regulation & expression of very few gene
    d. Inducible enzymes are usually involved in anabolic pathways
    (1) a and b   (2) c and d
    (3) a, c and b   (4) c and d

180. Which of the following is incorrect for net primary productivity (NPP)?
    (1) NPP = GPP-R
    (2) NPP is available biomass for the consumption by heterotrophs
    (3) NPP is rate of biomass production
    (4) It is the rate at which plants accumulate biomass
181. During the period 1960-2000, wheat production has increased from
    (1) 11 million tonnes to 75 million tonnes
    (2) 20 million tonnes to 89.5 million tonnes
    (3) 35 million tonnes to 89.5 million tonnes
    (4) 40 million tonnes to 90 million tonnes
182. Logistic population growth is represented by
    (1) $\frac{dN}{dt} = rN$ (2) $\frac{dt}{dN} = rN$
    (3) $\frac{dN}{rN} = dt$ (4) $\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$
183. Which is incorrect with respect to humus?
    (1) It is a dark coloured amorphous substance
    (2) It is highly resistant to microbial action
    (3) It undergoes decomposition at an extremely fast rate
    (4) Being colloidal in nature it serves as a reservoir of nutrients
184. **Assertion** : In eukaryotes gene expression can be regulated at several levels .
    Reason : In prokaryotes there are operons of both inducible type as well as repressible type.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false
185. Which one of the following animals may occupy more than one trophic levels in the same ecosystem at the same time.
    (1) Goat   (2) Sparrow
    (3) Frog   (4) Lion

BOTANY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

186. It was observed that if experimentally *Balanus* is removed from the coastal region and not allowed to enter into the part *Chathamalus* occupies then *Chathamalus* expands its range dramatically. It indicates that
    (1) *Balanus* is competitively inferior species
    (2) *Chathamalus* is competitively superior species
    (3) *Chathamalus* got a release in competition so expanded its geographical distribution
    (4) *Chathamalus* competitively excluded the *Balanus* species

187. Select correct match with respect to lac-operon model
    (1) Active repressor + inducer → Inactive repressor
    (2) Active repressor + co-repressor → Inactive repressor
    (3) Inactive repressor + Inducer → Active repressor
    (4) Inactive repressor + corepressor → Active repressor
188. Which one of the following statements cannot be connected to predation?
    (1) It helps in maintaining species diversity in a community
    (2) It might lead to extinction of a species
    (3) Both the interacting species are negatively impacted
    (4) It is necessitated by nature to maintain the ecological balance
189. Select the type of succession in following habitats-newly created pond and abandoned farm lands respectively
    (1) Primary and secondary
    (2) Secondary and primary
    (3) Primary and primary
    (4) Secondary and secondary
190. In the following graph, what are a, b and c representing on the basis of organismic response?
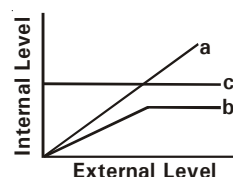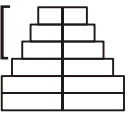
    (1) a-conformers, b-partial regulator, c-regulator
    (2) a-conformers, b-regulator, c- partial regulator
    (3) a-regulator, b-conformers, c- partial regulator
    (4) a-partial regulator, b-conformers, c-regulator
191. Which of the following is not a key criteria for hot spot determination?
    (1) High degree of endemism
    (2) Accelerated habitat loss
    (3) High levels of species richness
    (4) High levels of alien species invasion
192. **Statement-I :** Darwin was convinced that interspecific competition is a potent force in organic evolution.
    Statement-II : The most spectacular and evolutionarily fascinating examples of mutualism are found in plant-animal relationships.
    (1) Both statement-I and statement-II are correct
    (2) Both statement-I and statement-II are incorrect
    (3) Statement-I is correct but statement-II is incorrect
    (4) Statement-I is incorrect but statement-II is correct
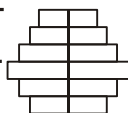
193. If population of 25 *Paramoecium* present in a pool increases to 100 after an hour. What would be birth rate per individual per hour of this population?
    (1) 75   (2) 50
    (3) 3   (4) 2

194. Pusa Komal is a variety of _____ and resistant to _____
    (1) Cowpea, bacterial blight
    (2) Brassica, Black rot
    (3) Wheat, leaf rust
    (4) Cowpea, white rust

195. The segment of DNA has the base sequence AAG, GAG, GAC, CAA, CCA which one of the following sequence represents a frame shift mutation?
    (1) AAG CAG GAC CAA CCA
    (2) AAG GAG ACC AAC CA
    (3) AAG AAG GAC CAA CCA
    (4) AAG GAG GAC CAA CCA

196. Annual photosynthetic fixation of carbon in the biosphere is
    (1) 4×10^{13} kg   (2) 170 million tons
    (3) 55 billion tons   (4) 70 billion tons.

197. Match representation of age pyramids for human population in column-I with their growth status in column-II.

Column I	Column II
a. Post reproductive / Reproductive / Pre reproductive	p. expanding
b. Post reproductive / Reproductive / Pre reproductive	q. declining
c. Post reproductive / Reproductive / Pre reproductive	r. stable

    (1) a-p, b-q, c-r   (2) a-r, b-p, c-q
    (3) a-q, b-p, c-r   (4) a-p, b-r, c-q

198. The number of base substitutions that can possibly occur in all the 64 codons are
    (1) 549   (2) 535
    (3) 261   (4) 576

199. Pick the odd one
    (1) Elephant – Simlipal Sanctuary, Orissa
    (2) Rhino – Manas sanctuary, Assam
    (3) Tiger – Hazaribagh sanctuary, Jharkhand
    (4) Snow leopard – Gir National park, Gujrat

200. What is not true for ecological sucession?
    (1) Both hydrarch and xerarch succession lead to mesic conditions
    (2) It usually focuses on changes in vegetation
    (3) Succession does not affect the number and types of animals and decomposers
    (4) As succession proceeds there is increase in the number of species as well as increase in biomass

M.L. Syal's Helix Institute

S.C.O. 343-345, Top Floor, Sector 34-A, Chandigarh. Ph : 0172-2623155

XII cum Competition Course for Medical – Test - 14

1.	(3)	51.	(1)	101.	(4)	151.	(4)
2.	(3)	52.	(1)	102.	(2)	152.	(1)
3.	(2)	53.	(2)	103.	(3)	153.	(4)
4.	(3)	54.	(1)	104.	(3)	154.	(1)
5.	(2)	55.	(4)	105.	(4)	155.	(4)
6.	(2)	56.	(4)	106.	(2)	156.	(2)
7.	(2)	57.	(3)	107.	(4)	157.	(4)
8.	(3)	58.	(3)	108.	(4)	158.	(1)
9.	(1)	59.	(3)	109.	(4)	159.	(2)
10.	(4)	60.	(4)	110.	(1)	160.	(4)
11.	(1)	61.	(3)	111.	(3)	161.	(2)
12.	(1)	62.	(3)	112.	(1)	162.	(1)
13.	(2)	63.	(3)	113.	(3)	163.	(3)
14.	(3)	64.	(2)	114.	(2)	164.	(2)
15.	(3)	65.	(3)	115.	(3)	165.	(1)
16.	(1)	66.	(3)	116.	(4)	166.	(3)
17.	(2)	67.	(3)	117.	(4)	167.	(4)
18.	(4)	68.	(3)	118.	(3)	168.	(1)
19.	(3)	69.	(4)	119.	(3)	169.	(3)
20.	(3)	70.	(4)	120.	(4)	170.	(2)
21.	(1)	71.	(3)	121.	(3)	171.	(2)
22.	(3)	72.	(1)	122.	(2)	172.	(3)
23.	(1)	73.	(3)	123.	(1)	173.	(1)
24.	(3)	74.	(4)	124.	(4)	174.	(3)
25.	(4)	75.	(3)	125.	(1)	175.	(4)
26.	(2)	76.	(1)	126.	(2)	176.	(2)
27.	(3)	77.	(2)	127.	(2)	177.	(3)
28.	(2)	78.	(2)	128.	(3)	178.	(3)
29.	(1)	79.	(1)	129.	(3)	179.	(1)
30.	(1)	80.	(2)	130.	(1)	180.	(3)
31.	(4)	81.	(3)	131.	(4)	181.	(1)
32.	(3)	82.	(3)	132.	(1)	182.	(4)
33.	(3)	83.	(3)	133.	(2)	183.	(3)
34.	(3)	84.	(4)	134.	(1)	184.	(2)
35.	(4)	85.	(2)	135.	(1)	185.	(2)
36.	(4)	86.	(1)	136.	(3)	186.	(3)
37.	(1)	87.	(3)	137.	(3)	187.	(1)
38.	(4)	88.	(4)	138.	(3)	188.	(3)
39.	(3)	89.	(1)	139.	(4)	189.	(1)
40.	(4)	90.	(4)	140.	(3)	190.	(1)
41.	(1)	91.	(3)	141.	(3)	191.	(4)
42.	(1)	92.	(4)	142.	(2)	192.	(1)
43.	(1)	93.	(4)	143.	(4)	193.	(3)
44.	(2)	94.	(3)	144.	(3)	194.	(1)
45.	(2)	95.	(1)	145.	(2)	195.	(2)
46.	(4)	96.	(1)	146.	(4)	196.	(1)
47.	(4)	97.	(1)	147.	(4)	197.	(4)
48.	(2)	98.	(2)	148.	(1)	198.	(4)
49.	(4)	99.	(2)	149.	(1)	199.	(4)
50.	(1)	100.	(1)	150.	(1)	200.	(3)

Dated :
10-11-2022

M.L. Syal's Helix Institute
S.C.O. 343-345, Top Floor, Sector 34-A, Chandigarh. Ph : 0172-2623155

Test Booklet Code

A

Name of Candidate : ………………………….

Roll No. : ………………………………………

Signature ………………

Batch : ………………

MM : 720

XII cum Competition Course for Medical
Test - 15

Time : 3 hrs. 20 min

Physics	:	Optical Instruments, Wave Optics
Chemistry	:	Biomolecules, Surface Chemistry, p-block elements
Zoology	:	Earthworm, Frog, Breathing & respiration
Botany	:	Environmental issue, Molecular basis of inheritance (HGP & DNA finger printing)

PHYSICS : SECTION-A

All questions are compulsory in section A

1. For the waves reaching second minimum in single slit diffraction pattern, path difference between the waves reaching from the two edges of the slit is
   (1) λ
   (2) 2λ
   (3) 0.5λ
   (4) 1.5λ

2. A person has his near point at 50 cm. The power of the lens that he should use to read a book at a distance of 25 cm is
   (1) + 1 D
   (2) + 4 D
   (3) − 1 D
   (4) + 2 D

3. Match the eye defect in column-I with the corresponding remedy in column-II.

Column-I	Column-II
a. Myopia	p. Sphero-cylindrical lens
b. Hypermetropia	q. Convex lens
c. Astigmatism	r. Concave lens

   (1) a-p; b-r; c-q
   (2) a-q; b-p; c-r
   (3) a-r; b-q; c-p
   (4) a-q; b-r; c-p

4. Magnifying power of simple microscope of focal length 10 cm, if final image is at infinity, is (least distance of distinct vision is 25 cm)
   (1) 4
   (2) 5
   (3) 2.5
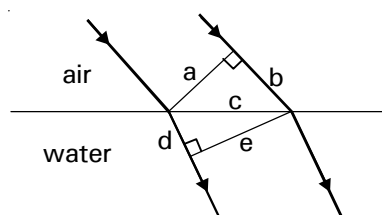   (4) 6

5.

Figure shows plane waves refracted from air to water. If v is the velocity of light in air, then the velocity of light in water will be

   (1) $\dfrac{av}{e}$
   (2) $\dfrac{bv}{e}$
   (3) $\dfrac{bv}{d}$
   (4) $\dfrac{dv}{b}$

6. In Young's double-slit experement using monochromatic light of wavelength λ and slits of same size, intensity of light at a point on the screen where path difference is λ is K units. What is the intensity of light where path differnece is $\lambda/2$?
   (1) 0.25 K
   (2) 0.33 K
   (3) 0.5 K
   (4) zero

7. Two coherent monochromatic light beams of intensities l and 9 l are superposed. The maximum and minimum possible intensities in the resulting beam are
   (1) 8 l and l
   (2) 16 l and 4 l
   (3) 4 l and l
   (4) 8 l and 4 l

8. Magnification of a compound microscope can be increased by
   (1) increasing focal length of objective lens
   (2) decreasing focal length of objective lens
   (3) increasing focal length of eye lens
   (4) increasing aperture of eye lens

9. Three light rays P, Q and R with intensity I_0 each superimpose in a region. Rays P and Q are coherent and R is incoherent. At a point where phase difference between P and Q is zero, intensity is
   (1) $3I_0$
   (2) $9I_0$
   (3) $5I_0$
   (4) $6I_0$

10. Condition of observable diffraction pattern is
    (1) $\dfrac{a}{\lambda} \approx 1$
    (2) $\dfrac{a}{\lambda} \gg 1$
    (3) $\dfrac{a}{\lambda} \ll 1$
    (4) None of these

11. Which of the following statements is true ?
    (1) Two coherent sources of light can be obtained by two different lamps of same power and having the same colour.
    (2) Light waves are transverse is indicated by the fact that they can be diffracted.
    (3) Refractive index of material is equal to sine of polarising angle.
    (4) In case of linearly polarized light, the electric field vector oscillates in a single plane.

12. For destructive interference to take place between two monochromatic light waves of wavelength λ, the path difference should be
    (1) $(2n-1)\dfrac{\lambda}{4}$
    (2) $(2n-1)\dfrac{\lambda}{2}$
    (3) $n\lambda$
    (4) $(2n-1)\lambda$

13.
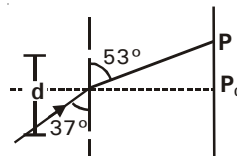
    In YDSE with wavelength λ, plane wavefront strikes the slits. Both slits produce an intensity I_0 individually on the screen. If intensity at point P is found to be $2I_0$ with both slits open, then d =
    (1) $\dfrac{3\lambda}{4}$
    (2) $\dfrac{5\lambda}{4}$
    (3) $\dfrac{7\lambda}{4}$
    (4) $\dfrac{7\lambda}{2}$

14.
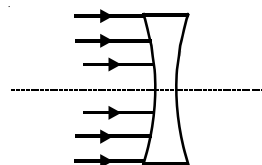
    A parallel beam of light is incident on face of a biconcave lens. The refracted ray will have wave front as
    (1)
    (2)
    (3)
    (4)
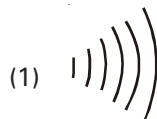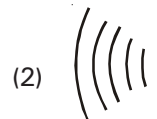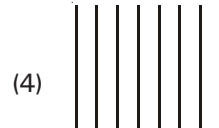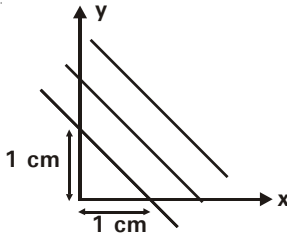
15. The first diffraction minima due to a single slit diffraction is at 37° for a light of wavelength 5000 Å . The width of the slit is
(1) 5×10^{-7} m (2) 7.5×10^{-7} m
(3) 2.5×10^{-6} m (4) 8.3×10^{-7} m

16. If slit to screen distance is increased by 20% in YDSE, percentage change in wavelength of light required to keep fringe width same, provided distance between slits does not change is
(1) −15.3% (2) −20%
(3) −18% (4) −16.7%

17. **Statement-I** : If the red light is replaced by blue light in diffraction experiment, then bands will be narrower.
Statement-II : Angular width of central maximum of a diffraction pattern of a single slit depends upon distance between slit and screen.
(1) Both statement-I and statement-II are correct
(2) Both statement-I and statement-II are incorrect
(3) Statement-I is correct but statement-II is incorrect
(4) Statement-I is incorrect but statement-II is correct

18. In a Young's double slit experiment, the width of central bright fringe is
(1) same as other bright fringes
(2) more than other bright fringes
(3) less than other bright fringes
(4) zero

19. A ray of light enters a glass slab from air and bends towards normal. Explanation of this phenomenon requires knowledge of
(1) change in speed of light upon entering glass
(2) Huygen's concept of wave front
(3) any one of (1) or (2)
(4) both (1) and (2)

20. A polaroid is placed at 30° to an incoming plane polarised light of intensity I_0. Now the intensity of light passing through polaroid after polarisation would be
(1) I_0 (2) $\dfrac{I_0}{2}$
(3) $\dfrac{I_0}{4}$ (4) $\dfrac{3I_0}{4}$

21. Light of wavelength λ is incident on a slit of width 'd' and distance between screen and slit is D. Then width of central maxima and width of slit will be equal if D is
(1) $\dfrac{d^2}{\lambda}$ (2) $\dfrac{2d}{\lambda}$
(3) $\dfrac{2d^2}{\lambda}$ (4) $\dfrac{d^2}{2\lambda}$

22. In Young's double slit experiment using blue light, angular width of fringes is $0.3°$. If the apparatus is dipped in water ($\mu = \dfrac{4}{3}$), angular width of fringes becomes
(1) 0.3° (2) 0.225°
(3) 0.4° (4) 0.15°

23. In a YDSE, spacing between two slits is 0.2 mm. If the screen is kept at a distance of 1m from the slits and the wavelength of light is 4000 Å , then the fringe width is
(1) 0.1 cm (2) 1.2 cm
(3) 0.4 cm (4) 0.2 cm

24. In a two slit experiment with white light, the central fringe will be obtained
(1) of white colour with blue colour next to it
(2) of white colour with red colour next to it
(3) of blue colour
(4) only of white colour with no coloured boundary

25. In a double slit experiment, slits are of equal width. Now, the width of one slit is made twice. Then in the interference pattern, intensity of
    (1) both the maxima and the minima increase
    (2) maxima increases and the minima has zero intensity
    (3) maxima decreases and that of the minima increases
    (4) maxima decreases and the minima has zero intensity

26. Using Huygen's principle of secondary wavelets, we can
    (1) find the velocity of light in vacuum
    (2) explain the particle behaviour of light
    (3) find the new position of the wavefront
    (4) explain photoelectric effect

27. The dispersive powers of glasses of lenses used in a convergent achromatic pair are in the ratio 4 : 3. If the focal length of the concave lens is 16 cm, then the nature and focal length of the other lens would be
    (1) convex, 21 cm   (2) concave, 12 cm
    (3) convex, 12 cm   (4) concave, 21 cm

28. **Assertion** : A myopic person's near point gets shifted when he wears glasses to see distant objects clearly.
    Reason : Glasses shift the apparent position of the object for nearer objects.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

29. A calcite crystal is placed over a dot on a piece of paper and rotated, on seeing through the calcite one will see
    (1) one dot
    (2) two stationary dots
    (3) two rotating dots
    (4) one dot rotating about the other

30.

    A wavefront is represented by the planes shown. The propagation of wave can take place at
    (1) 45° with the +ve x-direction
    (2) 135° with the +ve x-direction
    (3) 60° with the +ve x-direction
    (4) not sufficient data

31. When unpolarised light beam is incident from air onto glass at the polarising angle,
    (1) reflected beam is polarised 100 percent
    (2) refracted beam is partially polarised
    (3) both (1) and (2)
    (4) neither (1) nor (2)

32. A thin mica sheet of thickness 2×10^{-6} m and refractive index, $\mu = 1.5$ is introduced in front of the upper slit. The wavelength of the wave used is 5000 Å. The central bright maximum will shift
    (1) 2 fringes upward
    (2) 2 fringes downward
    (3) 10 fringes upward
    (4) none of these

33. Two Nicol prisms are first crossed and then one of them is rotated through $60°$. The percentage of incident unpolarised light intensity transmitted in the final arrangement is
(1) 1.25
(2) 25.0
(3) 37.5
(4) 50

34. If the polarising angle for light entering a medium from air is $60°$, the refractive index for this medium is
(1) $\sqrt{3}$
(2) $\sqrt{2}$
(3) $\dfrac{1}{\sqrt{2}}$
(4) 2

35. Using a light of wavelength $6000\,\text{Å}$, resolving power of a telescope with an objective lens of diameter 0.122 metre will be
(1) 1.6×10^5
(2) 1.6×10^6
(3) 6×10^5
(4) 6×10^6

PHYSICS : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

36. Two incoherent sources of amplitude A_0 each superimpose at a point. The amplitude at the point is
(1) $2A_0$
(2) A_0
(3) $\sqrt{2}\,A_0$
(4) none of these

37. In an astronomical telescope, the focal lengths of two lenses are 200 cm and 5 cm respectively. In normal adjustment, the magnifying power will be
(1) 205
(2) 1000
(3) 30
(4) 40

38. Which statement is correct w.r.t. wavefront?
a. It is defined as a surface of constant phase
b. Speed with which it moves outwards from the source is the speed of the wave
c. Energy of the wave travels in a direction perpendicular to the wavefront
(1) both a & b
(2) both b & c
(3) a, b & c
(4) a only

39. In a YDSE, a beam of light consisting of two wavelengths, 650 nm and 520 nm, is used to obtain interference fringes. If third bright fringe of wavelength 650 nm is formed 1.17 mm away from the central maximum, then what is the least distance from the central maximum where the bright fringes due to both the wavelengths coincide?
(1) 1.56 mm
(2) 1.17 mm
(3) 1.72 mm
(4) 1.34 mm

40. If air is replaced by water while performing YDSE and single slit diffraction experiment, the pattern formed on the screen
(1) expands for both
(2) shrinks for both
(3) expands for YDSE and shrinks for diffraction
(4) shrinks for YDSE and expands for diffraction

41. What is the distance for which ray optics is good approximation for an aperture of 2 mm and wavelength 500 nm?
(1) 8 m
(2) 6 m
(3) 4 m
(4) 10 m

42. When two coherent waves interfere, energy is
(1) created
(2) destroyed
(3) conserved but is redistributed
(4) none of the above

43. In Young's experiment when sodium light of wavelength $5000\,\text{Å}$ is used, then 75 fringes are seen in the field of view. Instead, if violet light of wavelength $4000\,\text{Å}$ is used then the number of fringes that will be seen in the field of view will be about
(1) 84
(2) 90
(3) 88
(4) 94

44. In YDSE, light of wavelength $4000\,\text{Å}$ is used and distance between the slits is $6000\,\text{Å}$. How many maxima can be obtained on a screen including the central maximum?
    (1) 1   (2) 2
    (3) 3   (4) 4

45. Which of the following can result in polarization of unpolarized light
    (1) scattering
    (2) reflection
    (3) both (1) and (2)
    (4) neither (1) nor (2)

46. A person P has a near point at 25 cm and person Q has near point at 30 cm. Both use magnifying glass of focal length 10 cm to see a small object. Assuming final image at infinity, image seen by
    (1) P is bigger
    (2) Q is bigger
    (3) P and Q is of same finite size
    (4) P and Q is of infinite size

47. Angular width of central maximum of a diffraction pattern on a single slit does not depend upon
    (1) distance between slit and screen
    (2) wavelength of light used
    (3) width of the slit
    (4) frequency of light used

48. In Young's double slit experiment the distance between slits is 1×10^{-4} m. The adjacent maxima of interference pattern subtends an angle of 18 minutes at the midpoint between slits. The wavelength of light used in the experiment is nearly
    (1) $5648\,\text{Å}$ (2) $6034\,\text{Å}$
    (3) $5233\,\text{Å}$ (4) $4867\,\text{Å}$

49. **Assertion** : In practise, resolving power of telescope is increased by using light of smaller wavelength.
    Reason : Resolving power of telescope is inversely proportional to wavelength of light.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

50. Plane polarised light of intensity I_0 passes through a polaroid placed at $37°$ with plane of incident of light. Light transmitted from polaroid falls on a plane mirror, retraces its path and passes through polaroid again. Assuming no loss of intensity in reflection from mirror, final intensity is
    (1) $0.64\,I_0$ (2) $0.41\,I_0$
    (3) Zero   (4) $0.23\,I_0$

CHEMISTRY : SECTION-A

All questions are compulsory in section A

51. Pick the correct statement
    (1) S can form SF_6 but O cannot
    (2) Group 16 elements can form both dioxide and trioxide
    (3) SO_3 is a planar molecule
    (4) All are correct

52. For the coagulation of 500 ml of As_2S_3 solution 2ml of 1M NaCl is required. The flocculation value of NaCl is
    (1) 3   (2) 40
    (3) 4   (4) 30

53. $C_6H_{12}O_6 + Br_2(\text{water}) \rightarrow A$.
    A is?
    (1) Gluconic acid   (2) Saccharic acid
    (3) Sulphonic acid   (4) glyceric acid

54. **Assertion** : PCl_3 on hydrolysis form H_3PO_3 and HCl whereas NCl_3 forms NH_3 and HOCl.
Reason : H_2O attacks into d-orbitals of P in PCl_3 and of Cl in NCl_3 .
(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Assertion is false

55. The principle of Cottrell precipitator is
(1) Hardy – schulze rule
(2) Adsorption
(3) Electrophoresis
(4) Peptisation

56. Which of the following is **incorrectly** ordered?
(1) $HClO < HClO_2 < HClO_3 < HClO_4$ (Acidic character)
(2) $PH_3 < AsH_3 < NH_3 < SbH_3 < BiH_3$ (Boiling point)
(3) $H_4P_2O_5 < H_3PO_3 < H_3PO_2$ (Number of P-H bonds)
(4) $N_2O < NO < N_2O_4 < N_2O_3 < N_2O_5$ (Oxidation state)

57. **Statement-I** : Addition of NaCl to hydrated ferric oxide sol, zetapotential of the sol decreases.
Statement-II : In NaCl, chloride ion is coagulating ion for the ferric oxide sol.
(1) Both statement-I and statement-II are correct
(2) Both statement-I and statement-II are incorrect
(3) Statement-I is correct but statement-II is incorrect
(4) Statement-I is incorrect but statement-II is correct

58. Which of the following is phosphonic acid ?
(1) H_3PO_3 (2) $H_4P_2O_7$
(3) H_3PO_4 (4) H_3PO_2

59. Arrange P_4O_6, Sb_4O_6, As_4O_6, Bi_2O_3, N_2O_3 in the decreasing order of their acidic character
(1) $N_2O_3 > P_4O_6 > As_4O_6 > Sb_4O_6 > Bi_2O_3$
(2) $P_4O_6 > N_2O_3 > As_4O_6 > Bi_2O_3 > Sb_4O_6$
(3) $As_4O_6 > Sb_4O_6 > N_2O_3 > P_4O_6 > Bi_2O_3$
(4) $As_4O_6 > Sb_4O_6 > Bi_2O_3 > N_2O_3 > P_4O_6$

60. When zinc reacts with very dilute HNO_3, the oxidation state of nitrogen changes from
(1) $+5$ to $+1$ (2) $+5$ to -3
(3) $+5$ to $+4$ (4) $+5$ to $+3$

61. A particular adsorption process has the following characterisics :
(i) It arises due to van der waals forces
(ii) It is reversible.
Identity the correct statement that describes the above adsorption process.
(1) Adsorption is monolayer.
(2) Adsorption increases with increase in temperature.
(3) Energy of activation is low.
(4) Enthalpy of absorption is greater than 100 kJ mol^{-1}.

62. Which of the following cannot be linked to the high reactivity and high volatility of white phosphorus
(1) absence of $p(\pi)-p(\pi)$ bonds in phosphorus
(2) bond angle of $60°$
(3) weak van der Waals forces of attraction
(4) Both (2)and (3)

63. Structure of a disaccharide formed by glucose and fructose is given below. Identify anomeric carbon atoms in monosaccharide units.
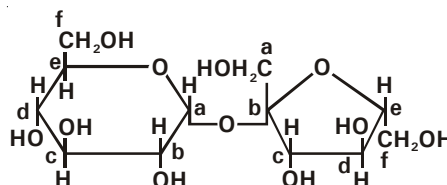
(1) 'a' carbon of glucose & 'a' carbon of fructose.
(2) 'a' carbon of glucose & 'e' carbon of fructose.
(3) 'a' carbon of glucose & 'b' carbon of fructose.
(4) 'f ' carbon of glucose & 'f ' carbon of fructose.

64. Flourine gas is yellow in colour because the molecules of flourine
    (1) in vapour phase absorb violet radiations and appear of complimentary yellow colour
    (2) absorb and emit violet radiations
    (3) absorb ultraviolet radiations
    (4) absorb yellow radiations and then emit violet

65. Flocculation value of $BaCl_2$ is much less than that of KCl for sol A and flocculation value of Na_2SO_4 is much less than that of NaBr for sol B. Which of the following is correct statement
    (1) Sol A is positively charged and Sol B is negatively charged
    (2) Both the sols A and B are positively charged
    (3) Both the sols A and B are negatively charged
    (4) Sol A is negatively charged and sol B is positively charged

66. In aqueous solutions, amino acids mostly exist as
    (1) NH_2–CHR–COOH
    (2) NH_2–CHR–COO^-
    (3) $\overset{+}{N}H_3$CHRCOOH
    (4) H_3N^+CHRCOO$^-$

67. In which one of the following pairs, the second compound has more number of $p\pi$–$d\pi$ bonds than the first one ?
    (1) XeO_2F_4, $XeOF_4$
    (2) XeO_2F_4, XeO_4
    (3) XeO_3F_2, XeO_2F_2
    (4) XeO_4 , XeO_2F_2

68. Which of the following ion forms the fixed layer on the colloidal particle formed by passing excess of H_2S on As_2O_3?
    (1) As^{+3}
    (2) S^{2-}
    (3) H^+
    (4) OH^-

69. Match the entry in column-I with corresponding entry in column-II

	Column-I		Column-II
i.	Milk	p.	Solid dispersed in a gas
ii.	Cold cream	q.	Liquid dispersed in a solid
iii.	Smoke	r.	Emulsion of fat in water
iv.	Cheese	s.	Emulsion of water in oil

    (1) i–p, ii–s, iii–r, iv–q
    (2) i–r, ii–s, iii–p, iv–q
    (3) i–p, ii–q, iii–r, iv–s
    (4) i–s, ii–r, iii–q, iv–p

70. Which phenomenon occurs when an electric field is applied to a colloidal solution and electrophoresis is prevented?
    a. Reverse osmosis takes place.
    b. Electroosmosis takes place.
    c. Dispersion medium begins to move.
    d. Dispersion medium becomes stationary.
    (1) a & b
    (2) b & c
    (3) c & d
    (4) a & d

71. The acid, that does not contain oxygen in oxidation state of -1 is
    (1) Caro's acid
    (2) Marshall's acid
    (3) Peroxomonophosphoric acid
    (4) Hypophosphorous acid

72. The open chain structure of D(+) glucose could not explain
    (1) the formation of glucose penta acetate by reaction of glucose with acetic anhydride
    (2) the formation of saccharic acid on oxidation with conc. HNO_3
    (3) the existence of glucose in α and β forms
    (4) the formation of glucose cyanohydrin on reaction of glucose with conc. HNO_3

73. Which one of the following is incorrect formation of products?
    (1) $P_4 + NaOH \longrightarrow Na_2HPO_2 + PH_3$
    (2) $NH_4NO_2 \overset{\Delta}{\longrightarrow} N_2 + 2H_2O$
    (3) $P_4 + SOCl_2 \longrightarrow PCl_3 + SO_2 + S_2Cl_2$
    (4) $PCl_5 + H_2O \longrightarrow H_3PO_4 + HCl$

74. For A, B and C , the CMC values are 10^{-4} mol/litre, 10^{-3} mol/litre and 10^{-1} mol/litre respectively. Micelles formation will be
    (1) fastest in A
    (2) fastest in B
    (3) fastest in C
    (4) at the same rate in A, B & C

75. Amongst the compounds given below, which can show disproportionation under the specified conditons?
   a. H_3PO_3 on heating
   b. I_2 on reaction with NaOH
   c. HNO_2 on heating in acidic medium
   d. F_2 on reaction with NaOH

   (1) a, b, c (2) b, c, d
   (3) a, d, c (4) d, b, a

76. A cube of side 1 cm is equally divided into 10^{12} cubes, then each cube would be the size of large colloidal particle. The total surface area of all the colloidal particles shall be
   (1) 60,000 cm² (2) 6 cm²
   (3) 6000 cm² (4) 600 cm²

77. Which one of the following is correct for brown ring test?
   (1) It is used to detect NO_3^- ions by the addition of HNO_3 to the solution
   (2) Its brown colour is due to the excitation of electron in Fe^{2+} from lower state to higher state
   (3) Its colour is due to the formation of $[Fe(H_2O)_5(NO_2)]^{2+}$
   (4) The colour of ring is due to charge transfer from NO to Fe^{2+} ion

78. The composition of bleaching powder is
   (1) $Ca(OCl_2).Ca(OH)_2$
   (2) $Ca(OCl)_2Ca(OH)_2.2H_2O$
   (3) $Ca(OCl)_2.CaCl_2.Ca(OH)_22H_2O$
   (4) $Ca(OCl)_2$

79. Graph between $\log \dfrac{x}{m}$ and log p is a straight line inclined at an angle of 45° at the pressure of 0.5 atm and log k = 0.699. The amount of solute adsorbed per g adsorbent will be
   (1) 1 g (2) 1.5 g
   (3) 2.5 g (4) 0.25 g

80. Which of the following is not true?
   (1) In solid state, PCl_5 exists as PCl_4^+ and PCl_6^-
   (2) In solid state, PBr_5 exists as PBr_4^+ and PBr_6^-
   (3) In solid state, PBr_5 exists as PBr_4^+ and Br^-
   (4) In gaseous state, PCl_5 has trigonal bipyramidal structure

81. "PH_3 is a weaker base than NH_3". The correct reason for this is
   (1) larger size of P leading to lower electron density
   (2) larger size of P leading to larger H-P-H bond angle
   (3) N−H bond in NH_4^+ is weaker than P−H bond in PH_4^+
   (4) higher ionisation energy of P

82. Which of following pairs of compound are epimers?
   a. Glucose and mannose
   b. Mannose and galactose
   c. Glucose and galactose
   d. Mannitol and sorbitol

   (1) a & c but not b & d (2) a, c & d but not b
   (3) a & d but not b & c (4) a, b, c & d

83. When Cl_2 reacts with hot concentrated KOH solution, it gives an oxoacid X. Hybridisation number of lone pairs and geometry of central atom in X is
   (1) sp^3d, one lone pair and trigonal bipyramidal
   (2) sp^3, one lone pair and tetrahedral
   (3) sp^3d^2, two lone pair and octrahedral
   (4) sp^3, two lone pair and tetrahedral

84. $2F_2 + 2H_2O \rightarrow 4H^+ + 4F^- + O_2$
   $Cl_2 + H_2O \rightarrow HCl + HOCl$
   The difference between the behaviour of F_2 and Cl_2 is due to higher
   (1) solubility of F_2 and Cl_2 in H_2O
   (2) oxidising power of F_2 and Cl_2
   (3) reducing power of F^- and Cl^-
   (4) electron gain enthalpy of F_2 & Cl_2

85. The most efficient catalyst for the manufacture of SO_3 from SO_2 in contact process is
   (1) Pt
   (2) V_2O_5
   (3) Fe/Mo
   (4) P_2O_5

CHEMISTRY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

86. The correct order of liquification of noble gases is
   (1) Xe > Kr > Ar > Ne > He
   (2) He > Ne > Ar > Kr > Xe
   (3) Xe > Ar > Kr > Ne > He
   (4) Kr > Ar > Ne > Xe > He

87. Anhydride of perchloric acid is
   (1) Cl_2O
   (2) ClO_2
   (3) Cl_2O_7
   (4) ClO_3

88. **Statement-I** : Maltose is a reducing sugar while sucrose is not.
   Statement-II : Maltose is a monosaccharide and sucrose is disaccharide.
   (1) Both statement-I and statement-II are correct
   (2) Both statement-I and statement-II are incorrect
   (3) Statement-I is correct but statement-II is incorrect
   (4) Statement-I is incorrect but statement-II is correct

89. Which of the following reactions is incorrect?
   (1) $2KClO_3(s) \xrightarrow[420K]{MnO_2(catalyst)} 2KCl(s) + 3O_2(g)$
   (2) $2Na_2O_2(s) + 2H_2O(l) \rightarrow 4NaOH(aq) + O_2(g)$
   (3) $Ag_2O(s) \xrightarrow{heat} 2Ag(s) + 1/2O_2(g)$
   (4) $2KNO_3(s) \xrightarrow{heat} 2KO_2(s) + 2NO_2(g)$

90. Select incorrect statement about group 16 elements
   (1) Sulphur has a strong tendency to catenate
   (2) OF_2 is called fluoride of oxygen and not oxide of fluorine
   (3) Monohalides of sulphur are dimeric
   (4) Sulphur is either sp^3 or sp^2 hybridised in its oxyacids

91. Mutarotation is change of specific rotation of aqueous solution of
   a. β-glucose from $+19.2°$ to $+52.5°$
   b. α-glucose from $+111°$ to $+52.5°$
   c. sucrose from dextrorotatory to levorotatory
   (1) both a & b
   (2) both b & c
   (3) both c & a
   (4) a, b and c

92. The stability of lyophobic colloids is due to
   (1) charge on their particles
   (2) a layer of medium of dispersion medium on their particles
   (3) the smaller size of their particles
   (4) the large size of their particles

93. Identify the mismatch
   (1) HF < HCl < HBr – acid strength
   (2) $I_2 < Br_2 < F_2$ – bond dissociation enthalpy
   (3) $H_2Te < H_2Se < H_2S$ – thermal stability of hydrides
   (4) He < Xe < Kr < Ne – electron gain enthalpy

94. Nitrogen can show maximum covalency of
   (1) 1
   (2) 2
   (3) 3
   (4) 4

95. **Assertion** : A gas with higher critical temperature is adsorbed more than a gas with lower critical temperature.
   Reason :Higher critical temperature implies that the gas is more easily liquefiable .
   (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
   (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
   (3) Assertion is true statement but Reason is false
   (4) Assertion is false

96. The catenation tendency is stronger in phosphorus than in nitrogen due to
   (1) weaker N ≡ N bond than P–P bond
   (2) weaker N – N bond than P–P bond
   (3) tendency of N to form $p(\pi)-p(\pi)$ bonds
   (4) lower electronegativity of phosphorus

97. Which of the following curves is in accordance with Freundlich adsorption isotherm?

(1)   (2)   (3)   (4)
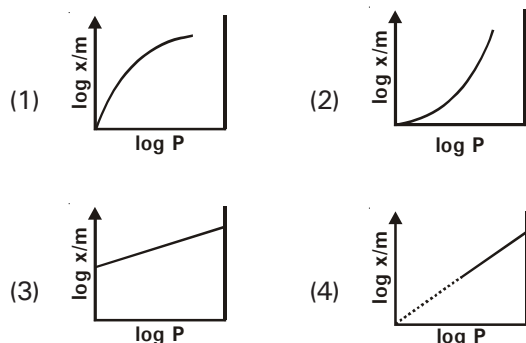
98. Which of the following statement is correct?
   a. Glucose gives 2,4-DNP test, Schiff's test as it has one aldehyde group.
   b. β-form of glucose is obtained by crystalisation from hot and saturated aqueous solution at 371 K.
   c. Glucose exist in cyclic hemiacetal form in which $-OH$ at C-6 is involved in ring formation.
   d. Fructose belongs to D-series and is a leavorotatory compound.
   (1) a & b   (2) a, b & c
   (3) b & c   (4) b & d

99. Zeolites are good shape selective catalysts. Which of the following is not applicable to zeolites?
   (1) They have honey comb like structure
   (2) They are microporous aluminosilicates with 3-D network of silicates in which some silicon atoms are replaced by aluminimum atoms giving $Al-O-Si$ framework.
   (3) The reactions taking place in zeolites depend upon the size and shape of reactant and product molecules as well as upon the pores and cavities of the zeolites
   (4) All the features are applicable to zeolites.

100. The products obtained on reaction of xenon tetrafluoride with water in acid medium is
   (1) Xe and XeO_3 (2) Xe and XeO_2
   (3) Xe and XeO_4 (4) Xe and $XeOF_4$

ZOOLOGY : SECTION-A

All questions are compulsory in section A

101. The sum of inspiratory capacity and functional residual capacity can be referred to as
   (1) functional capacity
   (2) total lung capacity
   (3) vital capacity
   (4) respiratory capacity

102. Locomotion occurs is Earthworm with the help of
   (1) Setae
   (2) Setae and circular muscles
   (3) Parapodia
   (4) Setae, circular muscles & longitudinal muscles

103. Which of the following is correct ascending order of pO_2 in mmHg in different regions?
   a. Alveolar air
   b. Oxygenated blood
   c. Deoxygenated blood
   d. Expired air
   (1) $a < d < b < c$ (2) $d < a < b < c$
   (3) $c < b < d < a$ (4) $c < b < a < d$

104. What is common to *Pheretima* and *Rana tigrina*?
   (1) Lives in water
   (2) Cutaneous respiration
   (3) Closed circulatory system
   (4) Both (2) & (3)

105. The total volume of air inhaled by a person after normal expiration and after forceful expiration is 3500 ml and 4500 ml respectively. If the volume of air inhaled per breath is 500 ml, what is the additional volume of air that can be inhaled forcefully?
   (1) 500 ml   (2) 1000 ml
   (3) 3000 ml   (4) 3500 ml

106. Which of the following is not likely to change in a frog?
   (1) Its color, when it moves from grasses to dry land
   (2) Body temperature in summer and winter
   (3) Mode of respiration, as it wakes from hibernation to move on land
   (4) Excretory waste, when frog is in water & on land

107. How many of the following features is/are not observed in frogs?

Poikilotherms, Mimicry, Sexual dimorphism, Internal fertilisation, Shelled eggs, Aestivation, Hibernation, Complete double circulation, Ureoletic

(1) 3 (2) 2
(3) 4 (4) 1

108. Select correct curve for arterial blood (a) and venous blood (b)

(1) (2) (3) (4)
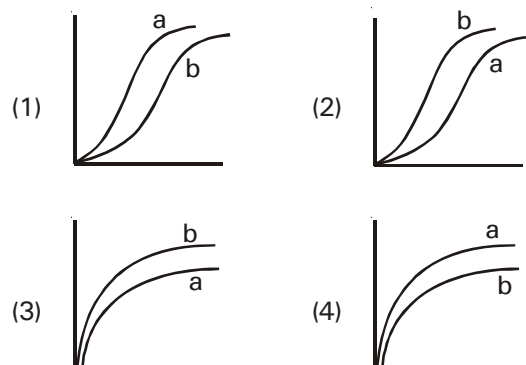
109. Which of the following produces positive pressure within your thoracic cavity?
(1) Contraction of diaphragm muscles
(2) Contraction of external intercostal muscles
(3) Expansion of the cavity
(4) Contraction of internal intercostal muscles

110.
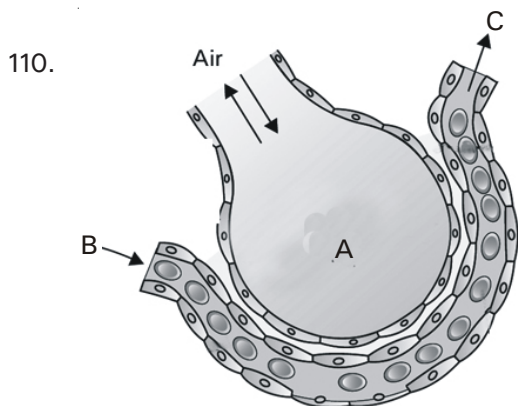
The above diagram shows alveoli and capillary interface where exchange takes place. How many statements are correct?
i. The pO_2 at C is lower than at B
ii. The pO_2 at A is higher than at B & C
iii. The pCO_2 at B is lower than at C
iv. The exchange takes place by active transport
v. The pO_2 at A and C are higher than B
(1) 2 (2) 3
(3) 5 (4) 4

111. Which of the following organ can be used by frog for respiration on land ?
(1) Buccal cavity (2) Skin
(3) Lungs (4) All of these

112. Which of the following pairs has the same value?
(1) pO_2 in alveolar air and pO_2 in expired air
(2) pO_2 in pulmonary vein and pCO_2 in renal artery
(3) pO_2 in pulmonary artery and pCO_2 in hepatic artery
(4) Both (2) and (3)

113. How many of the following statements are correct w.r.t. *Pheretima*?
a. Prostomium is the first segment which is sensory in function
b. Dorsal surface is marked by the presence of dark mid dorsal line
c. Female genital aperture is located in 13th segment on ventral side
d. Dorsal hollow nerve cord is present
e. Blood is red in colour due to presence of haemoglobin in RBC
(1) One (2) Two
(3) Three (4) Four

114. Out of A, B, C and D where would you find 20 mL of O_2 in 100 mL of blood
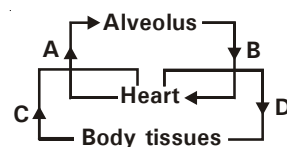
(1) B and A (2) A and C
(3) D and B (4) B and C

115. Which of the following statement is incorrect?
(1) Urinary bladder is present ventral to rectum
(2) 10-12 vasa efferentia arise from each testis and open into Bidder's canal in kidney
(3) During aestivation and hibernation, gaseous exchange take place through lungs
(4) All of these

116. Match the following animals in column-I with their respiratory organs in column-II

	Column-I		Column-II
a.	Lizard	i.	Skin
b.	Frog	ii.	Gills
c.	Earthworm	iii.	Lungs
d.	Crustaceans	iv.	Buccopharyngeal cavity

(1) a–iii, b–ii, c–i, d–iv
(2) a–i, b–iv, c–iii, d–ii
(3) a–iii, b–iv, c–i, d–ii
(4) a–ii, b–iv, c–iii, d–i

117. Large proportion of O_2 is left unused in blood even after its uptake by body tissues because this O_2
    (1) can never be released from HbO_2
    (2) acts as reserve for strenuous muscular exercise
    (3) is irreversibly bound to Hb
    (4) both (1) and (3)

118. A 10% increase in the level of carbon dioxide in the blood will
    (1) decrease the rate of breathing
    (2) decrease pulmonary ventilation
    (3) decrease vital capacity
    (4) increase the rate of respiration

119. Approximately 70% of CO_2 diffused into blood will be transported to the lungs
    (1) as carbaminohaemoglobin
    (2) by binding to RBC
    (3) in the form of dissolved gas in plasma
    (4) as bicarbonate ions

120. Match the column

	Column A		Column B
i.	Oblique fissure	a.	Surfactant
ii.	Space between two lungs	b.	25 mm Hg
iii.	Lecithin	c.	Right lung
iv.	p50	d.	Mediastenum

    (1) i – a, ii – b, iii – c, iv – d
    (2) i – d, ii – c, iii – b, iv – a
    (3) i – c, ii – d, iii – a, iv – b
    (4) i – c, ii – a, iii – b, iv – d

121. One very special feature in the earthworm is that
    (1) it has a long dorsal tubular heart
    (2) fertilisation of eggs occurs inside the body
    (3) the typhlosole greatly increases the effective absorption area of the digested food in the intestine
    (4) the S-shaped setae embedded in the integument are the defensive weapons used against the enemies

122. Identify correct match of blood vessel with pO_2 and character of blood vessel

	Blood vessel	pO_2 value (mm Hg)	Character
(1)	Pulmonary artery	95	Takes oxgenated blood to heart
(2)	Systemic vein	40	Brings deoxygenated blood to heart
(3)	Systemic artery	104	Supplies oxygenated blood to tissues
(4)	Pulmonary vein	45	Takes deoxygenated blood from heart

123. Study the reactions given below as they occur during transport of CO_2

    $$CO_2 + H_2O \xrightleftharpoons{E_1} H_2CO_3 \xrightleftharpoons{E_2} HCO_3^- + H^+$$

    What is true for E_1 and E_2?
    (1) E_1 and E_2 represent carbonic anhydrase
    (2) E_1 is found in RBC while E_2 is only in plasma
    (3) E_1 is only in plasma while E_2 is in RBC
    (4) E_1 is carbonic anhydrase while E_2 is carbonic hydrolase

124. Which of the following statement is wrong w.r.t. frog?
    (1) A mature female frog can lay 2500-3000 ova at a time.
    (2) In frog, fertilization is external and development is direct.
    (3) In frog circulatory system is open with single circulation.
    (4) Both (2) &(3).

125. **Assertion** : Human beings have significant ability to maintain and moderate the respiratory rhythm to suit the demands of body tissues.
    Reason : Normal breathing occurs voluntarily and is controlled by respiratory rhythm centre present in medulla oblongata.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false

126. Find the correct option for the given ODC
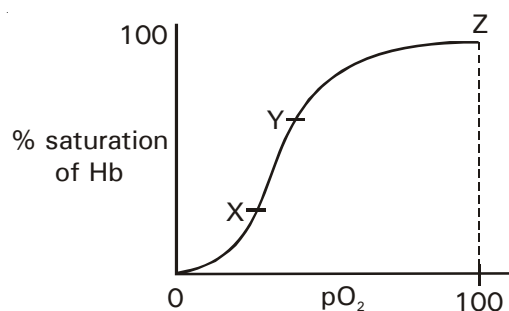
    (1) X– oxygenated blood in dorsal aorta
    (2) Z–deoxygenated blood in inferior vena cava
    (3) Y–de-oxygenated blood in pulmonary vein
    (4) X–deoxygenated blood returning from exercising muscle

127. Breathing disorder
    a. in which there is difficulty in breathing causing wheezing due to inflammation of bronchi and bronchioles
    b. is chronic disorder in which alveolar walls are damaged due to which respiratory surface is decreased, may be due to cigarette smoking are respectively
    (1) emphysema, asthma
    (2) asthma, emphysema
    (3) emphysema, occupational lung disease
    (4) occupational lung disease, asthma

128. The main function of clitellum is
    (1) Coccon formation (2) Locomotion
    (3) Excretion   (4) Copulation

129. Which of the following factors would increase the amount of oxygen discharged by haemoglobin to peripheral tissues?
    a. Decreased temperature
    b. Decreased pH
    c. Increased pO_2
    d. High H^+ conc.
    e. High pCO_2
    f. High pH
    (1) a, b, & c   (2) b, d & e
    (3) a, d & e   (4) a, b & f

130. The mechanism of breathing is depicted in following diagram A and B. What type of condition mentioned is not correct during stage A and B
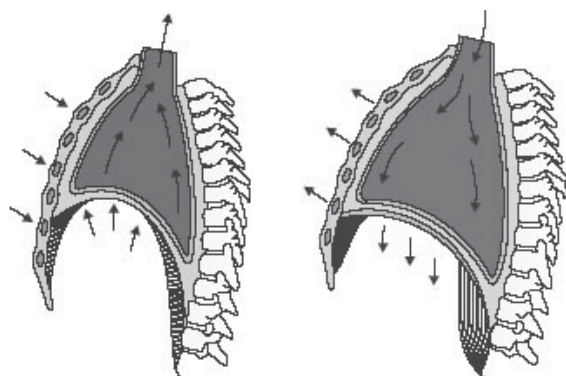
(A)   **(B)**

	Condition	A	B
(1)	Intrapulmonary pressure	More	Less
(2)	Diaphragm	Contracted	Relaxed
(3)	Position of diaphragm	Dome shaped	Flat
(4)	Volume of thorax	decreases	Increases

131. A triangular structure called sinus venosus present in frog heart joins the
    (1) Right atrium   (2) Left atrium
    (3) Ventricle   (4) Conus alteriosus

132. **Statement-I :** ODC is useful to study the effect of pCO_2, H^+ and temperature on binding of oxygen with haemoglobin
    Statement-II : Binding of oxygen with haemoglobin is primarily related to partial pressure of carbon dioxide.
    (1) Both statement-I and statement-II are correct
    (2) Both statement-I and statement-II are incorrect
    (3) Statement-I is correct but statement-II is incorrect
    (4) Statement-I is incorrect but statement-II is correct

133. Respiration in insects is called direct because
    (1) cells exchange O_2 / CO_2 directly with the air in the tubes
    (2) tissues exchange O_2/ CO_2 directly with coelomic fluid
    (3) tissues exchange O_2/CO_2 directly with the air outside through body surface
    (4) tracheal tubes exchange O_2/CO_2 directly with haemocoel which then exchanges these gases with tissues

134. Which of the following statements are correct?
    a. Alveoli are the primary sites of exchange of gases
    b. For efficient exchange, solubility of gases and thickness of membrane involved in diffusion should be more
    c. Oxygen gets bound to haemoglobin in the pulmonary capillaries
    d. Percentage of CO_2 transported as carbamino haemoglobin is nearly equal to oxygen transported as oxyhaemoglobin
    e. There is a positive intrapleural pressure that do not allow lungs to collapse between breaths
    (1) a, b & e   (2) a, c & e
    (3) a & c   (4) a, b & c

135. During one circuit of blood from lungs to the tissue and back through circulatory system, the percentage of haemoglobin which gives up its oxygen to tissues at the time of exercise is
    (1) 25%   (2) less than 25%
    (3) more than 25 % (4) 100 %

ZOOLOGY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

136. Male frog can be distinguished by presence of
    (1) sound producing vocal sacs
    (2) copulatory pad on the first digit of the fore limbs
    (3) presence of tympanum
    (4) both (1) and (2)

137. Find incorrect match
    (1) Histotoxic hypoxia– local vasoconstriction
    (2) Stagnant hypoxia–poor cardiac output
    (3) Hypoxic hypoxia – low arterial pO_2
    (4) Anaemic hypoxia–low haemoglobin

138. Carbon dioxide dissociates from carbamino haemoglobin when
    (1) pO_2 is high and pCO_2 is low
    (2) pCO_2 is high and pO_2 is low
    (3) pO_2 and pCO_2 both are high
    (4) pO_2 and pCO_2 are very low

139. Amount of oxygen delivered by 1 litre of blood to body cells during strenuous activities and amount of CO_2 delivered by 1 litre of deoxygenated blood to the alveoli respectively is
    (1) 15 ml, 4 ml   (2) 5 ml, 4 ml
    (3) 50 ml, 40 ml   (4) 150 ml, 40 ml

140. **Statement-I** : If carbonic anhydrase becomes non-functional, pCO_2 in tissues will increase.
    Statement-II : O_2 is utilised by the organisms to indirectly break down nutrients like glucose.
    (1) Both statement-I and statement-II are correct
    (2) Both statement-I and statement-II are incorrect
    (3) Statement-I is correct but statement-II is incorrect
    (4) Statement-I is incorrect but statement-II is correct

141. Which of the following structure is involved in excretion in *Pheretima*?
    (1) Malpighian tubule   (2) Gills
    (3) Nephridia   (4) Ctenidia

142. Which of the following statements is incorrect?
    (1) Contraction of diaphragm increases volume of thoracic chamber in antero-posterior axis
    (2) Contraction of external intercostal muscles increases volume of thoracic chamber in dorsoventral axis
    (3) Overall increase in thoracic volume causes increase in pulmonary volume
    (4) Decrease in pulmonary volume decreases intra pulmonary pressure

143. Which one of the following correctly describes the location of some body parts in the earthworm *Pheretima*?
    (1) Four pairs of spermathecae in 4-7 segments
    (2) Two pairs of testes in 10th and 11th segments
    (3) Two pairs of accessory glands in 16-18 segments
    (4) One pair of ovaries attached at intersegmental septum of 14th and 15th segment

144. What is true about RBCs in human?
    (1) They transport 99.5% of oxygen
    (2) They do not carry CO_2 at all
    (3) Carry 20–25% of CO_2
    (4) Carry more haemoglobinic acid in oxygenated blood as compared to deoxygenated blood

145. Identify the incorrect statement about breathing?
    (1) It is carried out by creating pressure gradients between the atmosphere and the lungs
    (2) It is always carried out with the help of external intercostal and abdominal muscles
    (3) Inspiration is an active process initiated by diaphragm
    (4) It can cease if there is a puncture in chest cavity during an accident

146. Which of these plays quite an insignificant role in regulation of respiratory rhythm?
    (1) Carbon dioxide   (2) Hydrogen ions
    (3) Oxygen   (4) Both (1) and (2)

147. What is true for pulmonary volume and thoracic volume?
    a. We can directly alter pulmonary volume without affecting thoracic volume
    b. Any change in thoracic cavity volume will be reflected in the pulmonary volume
    c. When the pulmonary volume increases thoracic volume decreases and vice versa
    d. When the thoracic volume decreases, pulmonary pressure becomes negative
    (1) a, b, c, d   (2) b, d
    (3) only b   (4) c, d

148. Which of the following statement is correct w.r.t chloride shift?
    (1) Chloride ions move inside the RBC, at the alveolar interface
    (2) Chloride ions and HCO_3^- ions move outside the RBC, at the alveolar interface
    (3) HCO_3^- ions move outside the RBC and chloride ions moves in at the tissue interface
    (4) Both (1) and (3)

149. A frog lives in water or near water because
    (1) it respires through the skin
    (2) it can get its food easily in water
    (3) its hindlimbs are webbed and help in swimming
    (4) it can see through its transparent eye lids while swimming

150. **Assertion** : The amount of CO_2 that can diffuse through the diffusion membrane per unit difference in partial pressure is much higher compared to that of O_2.

Reason : Solubility of CO_2 is $20-25$ times higher than that of O_2.

(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion

(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion

(3) Assertion is true statement but Reason is false

(4) Assertion is false

BOTANY : SECTION-A

All questions are compulsory in section A

151. Father of DNA fingerprinting is
   (1) Nirenberg   (2) Lalji singh
   (3) Alec Jefferys (4) Crick

152. Eutrophication of water bodies leading to killing of fishes is mainly due to non-availability of
   (1) Oxygen   (2) Food
   (3) Light   (4) Essential minerals

153. Which of the following statements is incorrect w.r.t e -wastes?
   (1) They are buried in landfills or incinerated
   (2) It is transported to developing countries
   (3) Its recycling is the only solution for treatment
   (4) recycling does not involve manual participation

154. Montreal protocol was signed in 1987 for control of:
   (1) emission of ozone depleting substances
   (2) release of Green House gases
   (3) disposal of e-wastes
   (4) transport of Genetically modified organisms from one country to another

155. Which is an incorrect statement?
   (1) DNA fingerprinting helps to settle paternity disputes.
   (2) VNTR belong to a class of DNA called minisatellite.
   (3) Alec Jeffrey started DNA fingerprinting in India.
   (4) VNTR show a high degree of polymorphism.

156. Select the correct sequence of events that take place in eutrophication which are given below
   a. Excessive growth of algae
   b. Depletion of dissolved oxygen
   c. Bacteria feed on dead organic matter
   d. Aquatic body becomes rich in phosphates
   (1) a, d, c, b   (2) d, a, c, b
   (3) a, b, d, c   (4) d, b, c, a

157. Which of the following statement is incorrect?
   (1) The average temperature $15°C$ of earth is maintained with the help of greenhouse gases
   (2) CO_2 and methane are responsible for the greenhouse effect
   (3) Greenhouse gases absorb shortwave radiation from the earth and re-emit towards the earth
   (4) CO_2 is most abundant greenhouse gas

158. Allelic sequence variation has been described as a DNA polymorphism if more than one variant at a locus occurs in human population with a frequency
   (1) lesser than 0.01
   (2) greater than 0.01
   (3) greater than 0.1
   (4) lesser than 0.001

159. Which of the following pollutant is non biodegradable, qualitative and primary in nature?
   (1) Photochemical smog
   (2) DDT
   (3) Municipal sewage
   (4) Carbon dioxide

160. Which observation was not drawn from the human genome project?
   (1) Less than 2% of the genome codes for proteins.
   (2) Chromosome number 22 has the most genes.
   (3) Functions are unknown for over 50% of discovered genes.
   (4) The average gene consists of 3000 bases.

161. Snow-blindness in Antarctic region is due to:
   (1) Inflammation of cornea due to high doses of UV-B radiation
   (2) High reflection of light from snow
   (3) Damage to retina caused by infra-red rays
   (4) Freezing of fluids in the eye by low temperature

162. A brief exposure to extremely high sound level generated by take-off of a jet plane or rocket, may damage ear drums. This sound level is of the order
   (1) ≥ 150 dB   (2) ≤ 120 dB
   (3) ≤ 70 dB   (4) 105 dB

163. Which year is wrongly matched?
    (1) HGP was launched in 1990.
    (2) Sequence of chromosome 1 was completed in 2006.
    (3) The Air Prevention and control of pollution Act came into force in 1971
    (4) HGP was completed in 2003.

164. **Statement-I** : Biodegradable pollutants like DDT get accumulated in tissue in increasing concentrations along the food chain.
    Statement-II : A few toxic substances, often present in industrial waste water can undergo biomagnification.
   (1) Both statement-I and statement-II are correct
    (2) Both statement-I and statement-II are incorrect
    (3) Statement-I is correct but statement-II is incorrect
    (4) Statement-I is incorrect but statement-II is correct

165. What were the measures taken by the government under the Supreme court directives to control air pollution in Delhi?
    a. Switching over the entire fleet of public transport from diesel to petrol by 2002
    b. Phasing out of old vehicles
    c. Use of unleaded petrol, use of low sulphur petrol and diesel
    d. Use of catalytic converters in vehicles
    e. Application of stringent pollution level norms for vehicles
    (1) a, b, d, e   (2) a, b, c, d, e
    (3) b, c, d, e   (4) b, c, d

166. Match the column-I with column-II

	Column-I		Column-II
a.	Pyrolysis	(i)	Methaeglobinemia
b.	Lead	(ii)	Chronic exposure to arsenic
c.	Blue baby syndrome	(iii)	Plumbism
d.	Black foot disease	(iv)	Disposal of hospital waste

    (1) a–(iv), b–(i), c–(ii), d–(iii)
    (2) a–(i), b–(iii), c–(iv), d–(ii)
    (3) a–(iv), b–(iii), c–(ii), d–(i)
    (4) a–(iv), b–(iii), c–(i), d–(ii)

167. Which of the curves in the graph below correctly represents changing BOD in river water, why?
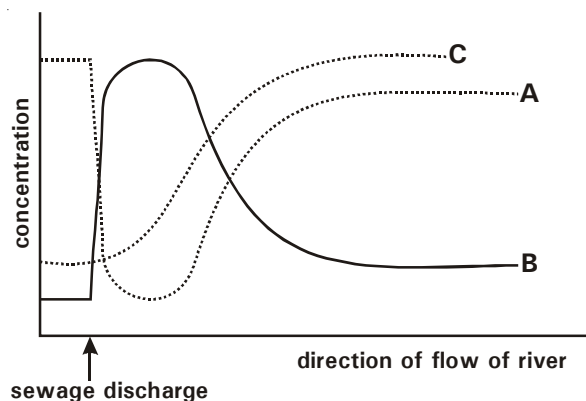
    (1) B- addition of sewage to river water initially increases its BOD which is then brought down by aerobic autotrophs
    (2) B - addition of sewage to river water initially increases its BOD which is then brought down by aerobic heterotrophs
    (3) C - addition of sewage to river water gradually increases BOD which remains high due to absence of microbes in river water
    (4) A - addition of sewage to river water reduces BOD suddenly as the microbes in sewage use all O_2 of water

168. Government of India has introduced a concept to work closely with local communities for protection and management of forests called
    (1) Chipko movement
    (2) Jhum cultivation
    (3) Joint forest management
    (4) Appiko movement

169. Which of the following is correct?
    (1) Size of micro-satellites is 11-60 bp
    (2) Mutation forms one of the basis of polymorphism
    (3) Repetitive sequence shows less degree of polymorphism
    (4) Polymorphism is not the basis of genetic mapping

170. Which of the following was not a methodology used in HGP?
    (1) Expressed Sequence Tags
    (2) Sequence Annotation
    (3) YAC and BAC as Vectors
    (4) Western Blotting

171. Kyoto conference in Japan on 11.12.1997 on climate changes summit was related to
    (1) reduce automobile emission
    (2) cut emission of green house gases
    (3) reduce soil pollution due to plastics
    (4) reduce chances of Gulf wars

172. Prime contaminants leading to cultural or accelerated eutrophication are
    (1) phosphates and nitrates
    (2) nitrates and sulphates
    (3) fecal matter and paper fibres
    (4) sand and clay
173. Pick the incorrect match
    (1) Human genome - 3164.7 million bases
    (2) Dystrophin - 231 bp
    (3) VNTR - 0.1 to 20 kb
    (4) SNPs - 1.4 million
174. **Assertion** : Landfills are not really much of a solution of solid waste management.
    Reason :The amount of garbage is increasing day by day and all the sites of land fills are getting filled, moreover there is a danger of seepage of chemicals from these landfills polluting the water resources .
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false
175. Serious inherent problems associated with use of nuclear energy are
    (1) nuclear energy is lethal and not a potent pollutant
    (2) accidental leakage
    (3) safe disposal of nuclear wastes is a big problem
    (4) both (2) & (3)
176. How many statements are true?
    a. Genome sequencing has been done for *Drosophila* , Rice and *Arabidopsis* .
    b. Automated DNA sequencers worked on the principle of Sanger.
    c. Over 50% of the genome is common in all humans.
    d. Chromosome Y has the fewest genes
    (1) One   (2) Two
    (3) Three   (4) Four
177. About how much particulate matter can be removed through an electrostatic precipitator present in the exhaust from a thermal power plant?
    (1) Over 90 %   (2) Over 99 %
    (3) 100 %   (4) Over 10 %
178. What percentage of forest cover for the plains has been recommended by National Forest Policy (1988) of India?
    (1) 33%   (2) 67%
    (3) 30%   (4) 19.4%

179. What is the correct sequence of DNA fingerprinting?
    (1) Isolation of DNA, Fragmentation, Northern Blotting
    (2) Isolation,Fragmentation,Gel electrophoresis , Southern Blotting, Hybridization using probes, Autoradiography
    (3) Hybridization using Probes, Gel electrophoresis, Autoradiography
    (4) Western Blotting, Autoradiography, Restriction endonucleases
180. 'Good' ozone is found in the upper part of _____ and acts as a shield absorbing UV radiations
    (1) troposphere
    (2) lower atmosphere
    (3) stratosphere
    (4) ionosphere
181. Select the correct statement
    (1) Baggase and rice husk should be directly used as a fuel
    (2) CNG causes more pollution than petrol
    (3) Hybrid technology vehicles can switch over from petrol or diesel to CNG or vice versa
    (4) Euro II norms are applicable in all cities and metros in India presently
182. Select the odd option w.r.t effect of thermal pollution
    (1) Denaturation of enzymes
    (2) Decomposition increases
    (3) Salmon does not spawn
    (4) Trout eggs fail to hatch
183. Water (prevention and control of pollution) act was enacted during
    (1) 1952   (2) 1972
    (3) 1974   (4) 1969
184. Biomagnification of DDT results into
    (1) thinning of eggshell
    (2) disturbed calcium metabolism in birds
    (3) decline in bird population
    (4) all of these
185. Meteropolitan cities are polluted most by
    (1) pesticide residues
    (2) household waste
    (3) automobiles exhaust
    (4) both (1) and (3)

BOTANY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

186. Impurities of domestic sewage which is most difficult to remove is
    (1) suspended solids   (2) colloidal material
    (3) organic material   (4) dissolved salts
187. According to Central Pollution Control Board, greatest harm to human health is caused by particulate size
    (1) 10 μm   (2) 10 μm
    (3) 5 μm   (4) $\leq 2.5 \mu$

188. HGP was called a mega project because
    (1) it was a 13-year long project.
    (2) the total cost of the project was 9 billion US dollars.
    (3) rnormous amount of data was generated.
    (4) all the above.
189. National Forest Commission of India has recommended a larger forest cover for hills than in plains because in hilly areas, forests
    (1) protect soil from erosion and land slides
    (2) help in slow percolation of rain water
    (3) reduces run-off water during raing season and prevents floods
    (4) all of these
190. A lake which is rich in organic waste may result in
    (1) increased population of aquatic organisms due to minerals
    (2) drying of the lake due to algal bloom
    (3) increased population of fish due to lots of nutrients
    (4) mortality of fish due to lack of oxygen
191. Warm ocean surge of the Peru Current recurring every 5-8 years or so in the East Pacific of South America is widely known as
    (1) Biomagnification   (2) Gulf Stream
    (3) El Nino   (4) Eutrophication
192. **Assertion** : Repeated sequences make up very large portion of the human genome .
    Reason : Repeated sequences have direct coding functions.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Assertion is false
193. Arrange following according to the ascending order of BOD.
    i.   Distillery effluent
    ii. Unpolluted pond water
    iii. Distilled water
    (1) i−ii−iii   (2) ii−i−iii
    (3) iii−ii−i   (4) i−iii−ii
194. Find incorrect statement w.r.t. catalytic converter
    (1) Platinum-palladium and rhodium as catalysts
    (2) Lead in petrol activates the catalysts
    (3) Reduced the emission of poisonous gases
    (4) CO and NO_x changed to CO_2 and N_2 gas

195. **Statement-I** : A scrubber in the exhaust of a chemical industrial plant removes gases like sulphur dioxide .
    Statement-II : Bioinformatics is the application of computer technology to the management of biological information.
    (1) Both statement-I and statement-II are correct
    (2) Both statement-I and statement-II are incorrect
    (3) Statement-I is correct but statement-II is incorrect
    (4) Statement-I is incorrect but statement-II is correct
196. A couple (mother-X, father-Y) claim that Alex is their baby. The court issues orders for confirming this by DNA profiling. By observing the DNA profiles of the couple and Alex, what verdict is expected by the judge?
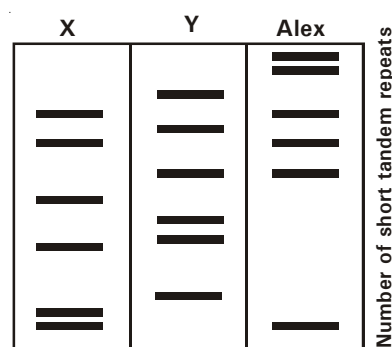
    (1) Alex is their baby
    (2) Alex's mother is X; father is not Y
    (3) Alex's father is Y
    (4) Alex's mother is X; father is Y
197. Polyblend, a fine powder of recycled modified plastic developed by A. Khan and his company, mixed with bitumen is used to lay roads because it
    (1) reduces bitumen's water repellant property
    (2) increases road life by a factor of three
    (3) enchances bitumen's water repellant property
    (4) both (2) and (3)
198. ESTs refer to
    (1) identifying all the genes of human genome
    (2) sequencing the whole set of genome including exons and introns
    (3) identifying only those genes that expressed as RNA
    (4) either (2) or (3)
199. Which one is correct percentage of green house gases?
    (1) N_2O−6%, CO_2−86%
    (2) CO_2 4%, CFC−30%
    (3) CH_4−20%, N_2O−18%
    (4) CFC−14%, Methane−20%
200. Pick the odd one out
    (1) Bio-informatics
    (2) Genomics
    (3) IRGSP(rice genome project)
    (4) Chipko movement

Dated : 10-11-2022

M.L. Syal's Helix Institute
S.C.O. 343-345, Top Floor, Sector 34-A, Chandigarh. Ph : 0172-2623155

Code-A

XII cum Competition Course for Medical – Test - 15

1. (2)	51. (4)	101. (2)	151. (3)
2. (4)	52. (3)	102. (4)	152. (1)
3. (3)	53. (1)	103. (4)	153. (4)
4. (3)	54. (1)	104. (4)	154. (1)
5. (4)	55. (3)	105. (3)	155. (3)
6. (4)	56. (3)g	106. (4)	156. (2)
7. (2)	57. (1)	107. (1)	157. (3)
8. (2)	58. (1)	108. (1)	158. (2)
9. (3)	59. (1)	109. (4)	159. (2)
10. (1)	60. (2)	110. (1)	160. (2)
11. (4)	61. (3)	111. (4)	161. (1)
12. (2)	62. (1)	112. (3)	162. (1)
13. (2)	63. (3)	113. (1)	163. (3)
14. (1)	64. (1)	114. (3)	164. (4)
15. (4)	65. (4)	115. (3)	165. (3)
16. (4)	66. (4)	116. (3)	166. (4)
17. (3)	67. (2)	117. (2)	167. (2)
18. (1)	68. (2)	118. (4)	168. (3)
19. (4)	69. (2)	119. (4)	169. (2)
20. (4)	70. (2)	120. (3)	170. (4)
21. (4)	71. (4)	121. (3)	171. (2)
22. (2)	72. (3)	122. (2)	172. (1)
23. (4)	73. (1)	123. (1)	173. (2)
24. (2)	74. (1)	124. (4)	174. (1)
25. (1)	75. (1)	125. (3)	175. (4)
26. (3)	76. (1)	126. (4)	176. (3)
27. (3)	77. (4)	127. (2)	177. (2)
28. (1)	78. (3)	128. (1)	178. (1)
29. (4)	79. (3)	129. (2)	179. (2)
30. (1)	80. (2)	130. (2)	180. (3)
31. (3)	81. (1)	131. (1)	181. (3)
32. (1)	82. (2)	132. (3)	182. (2)
33. (3)	83. (2)	133. (1)	183. (3)
34. (1)	84. (2)	134. (3)	184. (4)
35. (1)	85. (2)	135. (3)	185. (3)
36. (3)	86. (1)	136. (4)	186. (4)
37. (4)	87. (3)	137. (1)	187. (4)
38. (3)	88. (3)	138. (1)	188. (4)
39. (1)	89. (4)	139. (4)	189. (4)
40. (2)	90. (4)	140. (1)	190. (4)
41. (1)	91. (1)	141. (3)	191. (3)
42. (3)	92. (1)	142. (4)	192. (3)
43. (4)	93. (2)	143. (2)	193. (3)
44. (3)	94. (4)	144. (3)	194. (2)
45. (3)	95. (1)	145. (2)	195. (1)
46. (3)	96. (2)	146. (3)	196. (2)
47. (1)	97. (3)	147. (3)	197. (4)
48. (3)	98. (4)	148. (3)	198. (3)
49. (4)	99. (4)	149. (1)	199. (4)
50. (1)	100. (1)	150. (1)	200. (4)