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Test Series HMC-8 [Option -2]
Test - 02

MM : 720

Time : 3 hrs. 20 min.

PHYSICS	:	LAWS OF MOTION AND FRICTION, WEP, CIRCULAR AND ROTATIONAL MOTION
CHEMISTRY	:	MOLE CONCEPT, SOLUTIONS, REDOX REACTIONS, ELECTROCHEMISTRY
ZOOLOGY	:	DIGESTION AND ABSORPTION, NERVOUS SYSTEM, SENSE ORGANS, CHEMICAL COORDINATION AND INTEGRATION
BOTANY	:	TRANSPORT IN PLANTS, PHOTOSYNTHESIS, RESPIRATION

PHYSICS : SECTION-A

All questions are compulsory in section A

1. Work-energy theorem is applicable for
    (1) only conservative forces
    (2) only non-conservative forces
    (3) both conservative and non-conservative forces
    (4) neither conservative nor non-conservative forces

2.
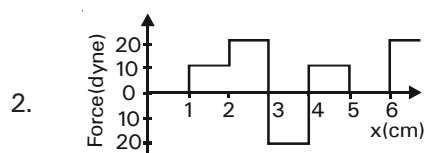
    The relationship between force and position is shown in the figure given (in one dimensional case). The work done by the force in displacing a body from x = 1 cm to x = 5 cm is
    (1) 20 ergs   (2) 60 ergs
    (3) 70 ergs   (4) 700 ergs

3. When a body is projected up on the rough inclined plane of inclination θ to the horizontal, its retardation is
    (1) $g(\sin\theta + \cos\theta)$ (2) $g(\sin\theta + \mu\cos\theta)$
    (3) $g(\mu\sin\theta + \cos\theta)$ (4) $g\mu(\sin\theta + \cos\theta)$

4. The radius of gyration of a thin rod of length L about an axis passing through one of its ends and perpendicular to it is

    (1) $L\sqrt{6}$ (2) $\dfrac{L}{\sqrt{3}}$

    (3) $\dfrac{L}{2\sqrt{3}}$ (4) $\dfrac{L}{4}$

5. Two oxygen atoms, moving in opposite directions with speed of 200 m/s and 300 m/s, combine to form an oxygen molecule. The speed with which the oxygen molecule will move is
    (1) 50 m/s   (2) 75 m/s
    (3) 100 m/s   (4) 150 m/s

6.

A sphere is filled with water is suspended vertically. Water is dripping out from the sphere through small hole at its base. The centre of mass of the sphere with the water
(1) rises continuously
(2) remains unchanged in the process
(3) first rises & then falls to the original position
(4) first falls & then rises to the original position

7. What is the maximum acceleration of the train in which a box lying on its floor will remain stationary, given that the co-efficient of static friction between the box and the train's floor is 0.15?
(1) 15 m s^{-2} (2) 1.5 m s^{-2}
(3) 3 m s^{-2} (4) 4.5 m s^{-2}

8.
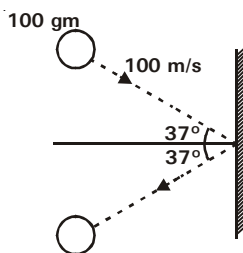
A 100 gm iron ball having velocity 100 m/s collides with a wall at an angle $37°$ to the normal and rebounds with the same speed and angle as shown. If the period of contact between the ball and wall is 0.08 s, then force experienced by the wall is
(1) 10 N   (2) 100 N
(3) 200 N   (4) 20 N

9. A uniform rope of length L lies on a table. If the coefficient of friction is μ, then the maximum length of the part of this rope which can overhang from the edge of the table without sliding down is
(1) $\dfrac{L}{\mu}$ (2) $\dfrac{L}{\mu + 1}$
(3) $\dfrac{\mu L}{1 + \mu}$ (4) $\dfrac{\mu L}{\mu - 1}$

10. If the angular momentum of the body is changing with time t as $L = (3t^2 - 2t)$. Then torque acting on the body at t = 1 sec will be
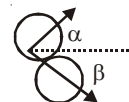(1) 4 N-m   (2) 2 N-m
(3) 1 N-m   (4) None of these

11. Find the acceleration of 3 kg mass when acceleration of 2 kg mass is 2 ms^{-2} in the forward direction as shown in figure.
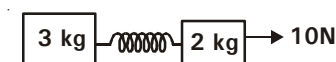
(1) 3 ms^{-2} (2) 2 ms^{-2}
(3) 0.5 ms^{-2} (4) zero

12. Two balls of same mass, one at rest and another moving, have an oblique elastic collision. The situtation after collision is shown below. Which of the following is correct?

(1) $\alpha + \beta = 90°$ (2) $\alpha + \beta > 90°$
(3) $\alpha + \beta < 90°$ (4) $\alpha + \beta = 180°$

13. If the work done to project a body with speed v is W, the work done to project it with 2v is
(1) 2 W   (2) 4 W
(3) 6 W   (4) 8 W

14. What is the optimum speed for a car, when friction is not required to negotiate a curve of radius r with angle of banking θ ?

    (1) $r^2 g \tan\theta$ (2) $\sqrt{rg \tan\theta}$

    (3) $(r\, g \tan\theta)^2$ (4) none of the above

15. A pendulum is suspended from the ceiling of a truck moving horizontaly with an acceleration $\dfrac{10}{\sqrt{3}}$ m/s^2.

    The angle of inclination of the pendulum string with the vertical will be

    (1) 30°   (2) 45°

    (3) 60°   (4) 0°

16. Two particles of mass 1 kg and 2 kg are projected simultaneously upwards and downwards respectively with same speed from top of a tower. Acceleration of centre of mass of these particles is

    (1) g   (2) 0.5 g

    (3) 1.5 g   (4) zero

17. A pump motor is used to deliver water at a certain rate from a given pipe. To obtain twice as much water from the same pipe in the same time, power of the motor has to be increased to

    (1) 16 times   (2) 4 times

    (3) 8 times   (4) 2 times

18. At a certain instant of time the mass of a rocket going up vertically close to the ground is 400 kg. If it is ejecting 5 kg of gas per second at a speed of 2000 m/s, the acceleration of the rocket would be

    (1) 20 m/s^2 (2) 10 m/s^2

    (3) 25 m/s^2 (4) 15 m/s^2

19. **Assertion** : $\vec{F} = m\vec{a}$ is not Newton's second law.
    Reason : $\vec{F} = m\vec{a}$ is only valid if mass of moving body does not change.

    (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

20.
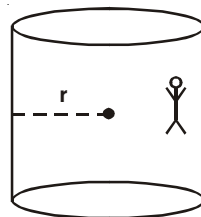
    A hollow cylinder of radius 'r' rotates about its axis with a frequency 'f' such that a person on the wall does not fall. The minimum value of coefficient of friction is

    (1) $\dfrac{4\pi^2 f^2 r}{g}$ (2) $\dfrac{f^2 r}{g}$

    (3) $\dfrac{\pi^2 f^2 r}{g}$ (4) $\dfrac{g}{4\pi^2 r f^2}$

21. The potential energy (in joule) of a body moving in a force field is given by, $U = 4 + 2x^3$, where x is the displacement in metre. The force acting on the body at $x = 1$ metre is

    (1) −6 newton   (2) −10 newton

    (3) −2 newton   (4) zero

22. A block of mass 30 kg is placed on rough horizontal surface with $\mu = 0.2$. When a horizontal force of magnitude 100 N is applied, the value of friction force is
(1) 20 N
(2) 60 N
(3) 80 N
(4) 100 N

23. A machine delivers power proportional to instantaneous velocity 'v' to a body moving in a straight line . If the body starts from negligibly small velocity, the distance covered by the body is proportional to
(1) v^2
(2) $\sqrt{v}$
(3) $v^{1/3}$
(4) $v^{5/3}$

24. A mass M is suspended by a rope from a rigid support at P as shown in the figure. Another rope is tied at the end Q and it is pulled horizontally with a force F. If the rope PQ makes angle q with the vertical then the tension in the string PQ is
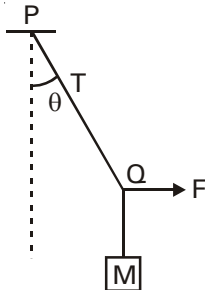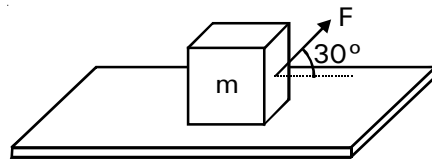

(1) $\dfrac{F}{\cos\theta}$
(2) $F\cos\theta$
(3) $F\sin\theta$
(4) $\dfrac{F}{\sin\theta}$

25. Three point masses each of mass 'm' are placed at ends of equilateral triangle of side 'a'. The moment of inertia of system about an axis passing through centre of mass and perpendicular to plane will be
(1) ma^2
(2) $\dfrac{2}{3}ma^2$
(3) $\dfrac{3}{2}ma^2$
(4) $3ma^2$

26.

A body of mass m rests on horizontal surface. The coefficient of friction between the body and the surface is μ. If the mass is pulled by a force F as shown in the figure, the limiting friction between body and surface will be
(1) $\mu\,mg$
(2) $\mu\,(mg + 0.5F)$
(3) $\mu\,(mg - 0.5F)$
(4) $\mu\,(mg - F)$

27. With what minimum acceleration can a fireman slide down a rope whose breaking strength is 3/5th of his weight
(1) $5\ m/s^2$
(2) $4\ m/s^2$
(3) $6\ m/s^2$
(4) 0

28. A billiard ball is hit by a cue at a point distance 'h' above the centre. It acquires a linear velocity 'v_0'. Let m be the mass and 'r' be the radius of the ball. The angular speed acquired by the ball immediately after impact is
(1) $\dfrac{5v_0 h}{2r^2}$
(2) $\dfrac{2v_0 h}{3r^2}$
(3) $\dfrac{2v_0 h}{5r^2}$
(4) $\dfrac{2v_0 h}{r^2}$

29.
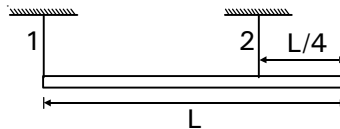
A uniform rod of length L and weight W is suspended horizontally by two vertical ropes as shown. The first rope is attached to the left end of the rod while the second rope is attached a distance $\dfrac{L}{4}$ from the right end. The tension in the second rope is
(1) W/2
(2) W/4
(3) W/3
(4) 2W/3

30. A stone of mass 1 kg is tied to the end of a string 1 m long. It is whirled in a vertical circle. If the velocity of stone at the top be 4 m/s, the tension in the string at the lowest point is

Take $g = 10$ m/s^2

(1) 6 N   (2) 66 N

(3) 16 N   (4) 76 N

31. A rotating body has a time period of π second. Then its rotational kinetic energy is numerically

(1) equal to its moment of inertia

(2) double of its moment of inertia

(3) half of its moment of inertia

(4) four times its moment of inertia

32. Let $\vec{F}$ be a force acting on a particle having position vector $\vec{r}$. Let $\vec{\tau}$ be the torque of this force about the origin, then

(1) $\vec{r} \cdot \vec{\tau} = 0$ and $\vec{F} \cdot \vec{\tau} = 0$

(2) $\vec{r} \cdot \vec{\tau} = 0$ but $\vec{F} \cdot \vec{\tau} \neq 0$

(3) $\vec{r} \cdot \vec{\tau} \neq 0$ but $\vec{F} \cdot \vec{\tau} = 0$

(4) $\vec{r} \cdot \vec{\tau} \neq 0$ and $\vec{F} \cdot \vec{\tau} \neq 0$

33. If earth were to contract suddenly to half of its present size without any change in its mass, the duration of day will be nearly

(1) 3 hrs   (2) 6 hrs

(3) 12 hrs   (4) 2 hrs

34. A curved road with radius of curvature 200m is banked at an angle $\tan^{-1}(0.2)$. Now if the traffic is moving at double the speed for which the road is designed, the minimum value of coefficient of friction needed for stability is

(1) 0.52   (2) 0.35

(3) 0.94   (4) 0.80

35. A car of mass 800 kg moving with a speed of 36 km/h on a smooth road collides with a horizontally mounted spring of spring constant 5×10^3 N-m^{-1}. The maximum compression in the spring is

(1) 2 m   (2) 1 m

(3) 3 m   (4) 4 m

PHYSICS : SECTION-B

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

36.

A block is released from height h = 2m as shown. The horizontal surface is rough having coefficient of friction 0.2. Distance moved by the block on horizontal surface before coming to rest is

(1) 10 m   (2) 5 m

(3) 2 m   (4) 0.4 m

37. A body at rest explodes into three pieces in the mass ratio of 1 : 1 : 3. Two pieces of same masses are thrown off in perpendicular directions with velocities of 3 m/s and 4 m/s respectively. The third piece will be thrown off with a velocity of

(1) 1.66 m/s   (2) 2 m/s

(3) 3.32 m/s   (4) 0.83 m/s

38. A ball of mass m is thrown vertically upwards. What is the rate at which the momentum of the ball changes?

(1) Zero   (2) mg

(3) Infinity   (4) Data insufficient

39. A particle of mass 'm' is made to move with uniform speed 'v' along the perimeter of a regular hexagon. Magnitude of impulse applied at each corner is

(1) mv (2) $mv\sqrt{3}$

(3) $\dfrac{mv}{2}$ (4) $\dfrac{mv}{\sqrt{3}}$

40. An engine pulls a train with 80 compartments with a force 8000 N. What is the tension in the cable connecting 50th and 51st compartment starting from engine?

(1) 8000 N   (2) 5000 N

(3) 3000 N   (4) Zero

41. Two masses of 1 gm and 4 gm are moving with equal kinetic energies. The ratio of the magnitudes of their linear momenta is

(1) 4 : 1
(2) $\sqrt{2}$: 1
(3) 1 : 2
(4) 1 : 16

42. A sphere is in a pure rolling as shown below. After entering into a smooth surface it will
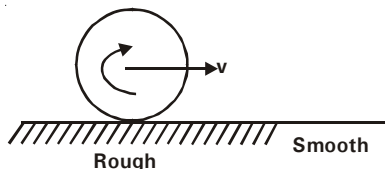
(1) Remain in a pure rolling
(2) Slip
(3) Be in a rotation motion
(4) None of these

43. **Statement-I** : The radius of gyration of a rigid body does not change with change of axis of rotation.
Statement-II : In a couple, total external force is zero, but total torque is non-zero.
(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

44. A given object takes n times as much time to slide down a 45° rough incline as it takes to slide down a perfectly smooth 45° incline. The coefficient of kinetic friction between the object and the incline is given by

(1) $\left(1-\dfrac{1}{n^2}\right)$
(2) $\dfrac{1}{1-n^2}$
(3) $\sqrt{\left(1-\dfrac{1}{n^2}\right)}$
(4) $\sqrt{\dfrac{1}{1-n^2}}$

45. Two solid sphere of different sizes roll down an incline. Then
(1) the bigger sphere reaches the bottom first
(2) the smaller sphere reaches the bottom first
(3) both spheres reach the bottom simultaneously
(4) the heavier sphere reaches the bottom first

46. Two forces, one with a magnitude of 3N and the other with a magnitude of 5N, are applied to an object in gravity-free space in four different ways. For which orientations of the forces shown in the diagrams is the magnitude of the acceleration of the object the least?
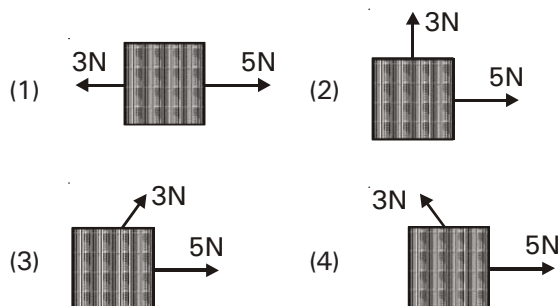
47. Water in a bucket is whirled in a vertical circle with a string attached to it. Water does not fall down even when bucket is inverted at the top of its path. We conclude that in this position

(1) $mg = \dfrac{mv^2}{r}$

(2) mg is greater than $\dfrac{mv^2}{r}$

(3) mg is not greater than $\dfrac{mv^2}{r}$

(4) mg is not less than $\dfrac{mv^2}{r}$

48.
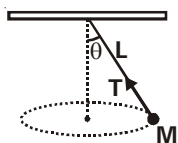
A string of length L is fixed at one end and carries a mass M at the other end. The string makes $2/\pi$ revolutions per second around the vertical axis through the fixed end as shown in the figure above, then tension in the string is

(1) ML   (2) 2 ML

(3) 4 ML   (4) 16 ML

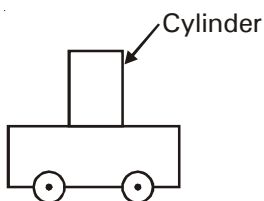49. A 2kg cylinder rest on a cart as shown in the figure. The coefficient of static friction between cylinder and the cart is 0.5. The cylinder is 4 cm in diameter and 10 cm is height. Taking $g = 10$ m/s^2, the minimum acceleration of the cart needed to make the cylinder tip over is about

(1) 2 m/s^2 (2) 4 m/s^2

(3) 8 m/s^2 (4) 6 m/s^2

50. A body of mass M_1 collides elastically with another mass M_2 at rest. There is maximum transfer of energy when

(1) $M_1 > M_2$

(2) $M_1 < M_2$

(3) $M_1 = M_2$

(4) Same for all values of M_1 and M_2

CHEMISTRY : SECTION-A

All questions are compulsory in section A

51. The empirical formula and molecular mass of a compound are CH_2O and 180g respectively. What will be the molecular formula of the compound?

(1) $C_9H_{18}O_9$ (2) CH_2O

(3) $C_6H_{12}O_6$ (4) $C_2H_4O_2$

52. The moles of methane required to produce 81 gm of water after complete combustion of methane is

(1) 2.25 mole   (2) 3.5 mole

(3) 6.29 mole   (4) 1.5 mole

53. A daniell cell has cell potential of 1.1 V. Identify the false statement among the following

(1) when $E_{ext} = 1.1$ V ; No flow of electrons occurs

(2) when $E_{ext} > 1.1$ V ; Zn is deposited at zinc electrode

(3) when $E_{ext} < 1.1$ V ; Cu dissolves at copper electrode

(4) when $E_{ext} < 1.1$ V ; Zn is anode & Cu is cathode

54. In comparison to a 0.01 m aq.solution of glucose, the depression in freezing point of a 0.01 m aq. $Al_2(SO_4)_3$ solution is

(1) the same   (2) about twice

(3) about three times   (4) about five times

55. Following reaction describes the rusting of Fe

$$4Fe + 3O_2 \rightarrow 4Fe^{+3} + 6O^{-2}$$

Which one of following statement incorrect ?

(1) This is an example of a redox reaction

(2) Metallic iron is reduced to Fe^{+3}

(3) O_2 is an oxidizing agent

(4) Metallic iron is reducing agent

56. The correct formula of the compound Thallium (I) sulphate is

(1) $TISO_4$ (2) Tl_2SO_4

(3) $Tl_2(SO_4)_3$ (4) $Tl(SO_4)_2$

57. How many of the following concentration terms are temperature independent?
Mole fraction, mass percentage, molarity, molality, ppm and volume percentage
(1) 1   (2) 2
(3) 3   (4) 4

58. In the half reaction
$$x\, Cr_2O_7^{2-} + yH^+ + ze^- \rightarrow a\, Cr^{+3} + b\, H_2O$$
y and z respectively are
(1) 1 & 3   (2) 1 & 6
(3) 8 & 6   (4) 14 & 6

59. On the basis of reaction, $4Al + 3O_2 \rightarrow 2Al_2O_3$;
$\Delta G = -827\, KJ$ per mole of O_2; the minimum EMF required to carry out electrolysis of Al_2O_3 will be
(1) 8.5V   (2) 2.14 V
(3) 2.83V   (4) 1.42V

60. Match column-I with column-II for the oxidation states of the central atoms.

Column-I		Column-II	
i.	$Cr_2O_7^{2-}$	a.	$+3$
ii.	MnO_4^-	b.	$+4$
iii.	VO_3^-	c.	$+5$
iv.	FeF_6^{3-}	d.	$+6$
		e.	$+7$

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

61. 142 g of chlorine represents
(1) two g-molecules of chlorine
(2) 4 moles of chlorine atoms
(3) two moles of Cl atoms
(4) both (1) and (2)

62. **Statement-I :** Mixture of acetone and chloroform shows negative deviation from ideal behaviour.
Statement-II : Chloroform molecule form hydrogen bond with acetone molecule, thus decreasing the escaping tendency of molecules .
(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. Mixture of volatile components A and B has total vapour pressure (in torr)
$$P = 254 - 119\, x_A$$
where x_A is mol fraction of A in mixture. Hence p_A^0 and p_B^0 are (in torr)
(1) 254, 119   (2) 119, 254
(3) 135, 254   (4) 154, 119

64. The number of moles of Fe^{2+} ion oxidised by one mole of MnO_4^- ions is (in acidic medium)
(1) $\dfrac{1}{5}$ (2) $\dfrac{2}{3}$
(3) 5   (4) $\dfrac{3}{2}$

65. When a concentrated solution of an electrolyte is diluted, its specific conductance _____ and equivalent conductance _____
(1) increases, decreases
(2) decreases, decreases
(3) decreases, increases
(4) increases, increases

66. 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) $\dfrac{1}{3}\lambda^o Al^{3+} + \dfrac{1}{2}\lambda^o SO_4^{2-}$

67. The molarity of concentrated nitric acid which is 68% by mass in aqueous solution (density of aq. solution is 1.504 g ml^{-1}) is

   (1) 16.23 M   (2) 15.71 M

   (3) 17.71 M   (4) 59.85 M

68. What volume of CO_2 is produced at STP when 100 gm of 10% pure lime stone is heated?

   (1) 22.4 L   (2) 44.8 L

   (3) 2.24 L   (4) 4.48 L

69. 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

70. The vapour pressure curves of the same solvent are shown. The curves are parallel to each other and do not intersect. The net concentration of solutions are in order of
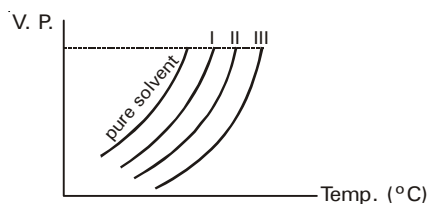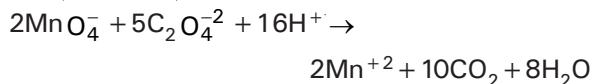

   (1) I < II < III   (2) I = II = III

   (3) I > II > III   (4) I > III > II

71. When electric current is passed through aqueous solution of silver nitrate, what happens?

   (1) O_2 is evolved at cathode

   (2) O_2 is evolved at anode

   (3) pH of solution gradually decreases

   (4) Both (2) and (3)

72. $KMnO_4$ reacts with oxalic acid according to equation

   $2MnO_4^- + 5C_2O_4^{-2} + 16H^+ \rightarrow$
   $$2Mn^{+2} + 10CO_2 + 8H_2O$$

   Here 20ml of 0.1M $KMnO_4$ is equivalent to

   (1) 120 ml of 0.25M $H_2C_2O_4$

   (2) 150 ml of 0.1M $H_2C_2O_4$

   (3) 25 ml of 0.2M $H_2C_2O_4$

   (4) 50 ml of 0.2M $H_2C_2O_4$

73. The standard reduction potentials of Cu^{2+}/Cu and Cu^{2+}/Cu^+ are 0.337 and 0.153 V respectively. The standard electrode potential of Cu^+/Cu half cell is

   (1) 0.184 V   (2) 0.827 V

   (3) 0.521 V   (4) 0.490 V

74. The reduction of which of the following species will occur at the fastest rate?

   (1) $Au^{3+} + 3e^- \rightarrow Au$; $E^0 = 1.4V$

   (2) $V^{2+} + 2e^- \rightarrow V$; $E^0 = -1.19V$

   (3) $Ce^{4+} + 4e^- \rightarrow Ce$; $E^0 = +1.6V$

   (4) unpredictable

75. Resistance of a decimolar solution between two electrodes which are 0.02m apart (each of 0.0004 m^2 in area) was found to be 50 ohm. Then specific conductance of solution is

   (1) 0.1 S m^{-1} (2) 1 Sm^{-1}

   (3) 10 S m^{-1} (4) 4×10^{-4} S m^{-1}

76. Given : $E^0_{Cr_2O_7^{2-}/Cr^{3+}} = 1.33$ V ; $E^0_{Cl_2/Cl^-} = 1.36$ V

   $E^0_{Cr^{3+}/Cr} = -0.74$ V

   Which of the following is the strongest oxidising agent?

   (1) Cl^- (2) Cl_2

   (3) $Cr_2O_7^{2-}$ (4) Cr^{3+}

77. Actual oxidation numbers of Pb in Pb_3O_4 are
    (1) $-8/3$
    (2) $+2$ & $+3$
    (3) $+2$ & $+4$
    (4) $+4$ & $+8$

78. The cell potential of the following cell
    Ni/Ni^{+2} (0.01 M) $||Cu^{+2}$(0.1 M)$|Cu$ is

    Given $E^0_{Cu^{+2}/Cu} = 0.34$ V

    $E^0_{Ni^{+2}/Ni} = -0.22$ V

    (1) 0.4895 V
    (2) 0.5895 V
    (3) 0.56 V
    (4) 0.3214 V

79. The advantages of the fuel cells over primary and secondary batteries is/are
    (1) primary batteries contain a limited amount of reactants and are discharged when the reactants have been consumed
    (2) secondary batteries can be recharged but take time to recharge
    (3) fuel cell runs continuously as long as the reactants are supplied to it and products are removed continuously
    (4) all of these

80. When a metal is burnt in oxygen its weight is increased by 20%. The equivalent weight of metal will be
    (1) 120
    (2) 80
    (3) 60
    (4) 40

81. $NaOH + H_3PO_4 \longrightarrow NaH_2PO_4 + H_2O$

    What is equivalent weight of H_3PO_4 in the above chemical reaction?

    (1) $\dfrac{\text{molecular weight}}{2} = \text{equivalent weight}$

    (2) molecular weight $=$ equivalent weight

    (3) $\dfrac{\text{molecular weight}}{3} = \text{equivalent weight}$

    (4) 2 molecular weight $=$ equivalent

82. **Assertion** : Electrode potential of hydrogen electrode at pH $= 0$ and $pH_2 = 1$, is always zero irrespective of temperature.
    Reason : Hydrogen electrode is a reversible electrode.
    (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. 6 moles each of X and Y are taken to form 4 mole of Z. The percentage yield of following reaction is
    $$X + 3Y \rightarrow 4Z$$
    (1) 30
    (2) 50
    (3) 100
    (4) 56.2

84. Limiting reagent is the reactant which is
    (1) in excess
    (2) used up early in the reaction
    (3) pure solid reactant
    (4) in excess and used up early in the reaction

85. Which of the following statements is true for a Daniel cell as it gets discharged?
    (1) R.P. of anode goes on decreasing
    (2) R.P of cathode goes on increasing
    (3) At a stage, Q_C becomes equal to K_C (where $Q_C = $ Reaction quotient)
    (4) Current is carried by electrons in the internal circuit

CHEMISTRY : SECTION-B

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

86. An aqueous solution of a non-electrolyte containing 3.01×10^{23} molecules of solute in 250 g of water will freeze at ($K_f = 1.86$ K kg mol^{-1})
    (1) 273 K
    (2) 271.14
    (3) 269.28
    (4) 274.1 K

87. Identify the correct statement(s) w.r.t. disproportionation?
    (1) The reacting species much contain an element which can exist in atleast three oxidation states
    (2) The same species is simultaneously both oxidised and reduced
    (3) The same element undergoes both increase and decrease in oxidation state
    (4) All of these

88. Value of Henry's constant K_H
    (1) increases with increase in temperature.
    (2) decreases with increase in temperature.
    (3) remains constant.
    (4) first increases then decreases.

89. **Assertion** : 1 mole of $H_2O(l)$ has N_A atoms of O and $2N_A$ atoms of H and volume equal to 22.4L at STP.

    Reason : 1 mole of any substance at STP occupies 22.4 L volume.
    (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. Limiting molar conductivity of which of the following ion is maximum
    (1) H^+ (2) Na^+
    (3) K^+ (4) Li^+

91. For a strong electrolyte, Λ_m versus $\sqrt{C}$ gives a straight line. Then the
    (1) slope is equal to $+A$
    (2) intercept is equal to $-\Lambda_m^0$
    (3) slope is equal to $-A$
    (4) intercept is equal to $+\Lambda_m$

92. Identify the mismatch

a.	Rast method	(i)	Isotonic with blood
b.	Antifreeze	(ii)	Minimum boiling azeotrope
c.	0.91% (w/v) NaCl	(iii)	Camphor
d	95.37% ethyl alcohol (by volume)	(iv)	Ethylene glycol

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

93. $2C_2H_2 + 5O_2 \rightarrow 4CO_2 + 2H_2O$

    What volume of oxygen at STP is required to affect complete combustion of 200 cm^3 of acetylene and what would be the volume of carbon dioxide formed?
    (1) 500 cm^3 & 300 cm^3
    (2) 300 cm^3 & 400 cm^3
    (3) 500 cm^3 & 400 cm^3
    (4) 500 cm^3 & 500 cm^3

94. A set of solutions is prepared using 180 g of H_2O as a solvent and 10g of different non-volatile solutes A, B and C. The relative lowering in vapour pressure in the presence of these solutes are in the order (Given molar mass of A, B and C are 100 g/mol, 200 g/mol and 10,0000 g/mol)
    (1) B > C > A   (2) C > B > A
    (3) A > C > B   (4) A > B > C

95. The number of molecules in 16 g of methane is
    (1) 3.0×10^{23} (2) 6.02×10^{23}
    (3) $\dfrac{16}{6.02} \times 10^{23}$ (4) $\dfrac{16}{3.0} \times 10^{23}$

96. **Statement-I** : pH of the aqueous solution of potassium sulphate remains constant during electrolysis.

    Statement-II : Potassium sulphate does not undergo hydrolysis.

    (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. 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

98. Deduce from the following E^0 values of half cells, what combination of two half cells would result in a cell with the largest potential?
    i. $A + e \rightarrow A^-$; $E^0 = -0.24$ V
    ii. $B^- + e \rightarrow B^{2-}$; $E^0 = +1.25$ V
    iii. $C^- + 2e \rightarrow C^{3-}$; $E^0 = -1.25$ V
    iv. $D + 2e \rightarrow D^{2-}$; $E^0 = +0.68$ V
    (1) ii and iii   (2) ii and iv
    (3) i and iii   (4) i and iv

99. What is Van't Hoff factor in case of an aqueous $K_4[Fe(CN)_6]$ which is 20% ionised?
    (1) 1.8   (2) 3.0
    (3) 5.0   (4) 2.5

100. If cost of electricity for the production of 'n' litres of H_2 at NTP at cathode is rupees 'x', then the cost of production of 'n' litres of O_2 at NTP at anode will be rupees
    (1) 2 x   (2) 4 x
    (3) 16 x   (4) 32 x

ZOOLOGY : SECTION-A

All questions are compulsory in section A

101. Which among the following is maximum in number?
    (1) Pancreas   (2) Thymus
    (3) Adrenal gland (4) Parathyroid gland

102. The absorbed glycerol, fatty acid & monoglycerides ultimately enter into
    (1) blood stream
    (2) lacteals
    (3) wall of large intestine
    (4) wall of stomach

103. Which of the given sets of hormones is not produced by same endocrine gland?
    (1) ADH and somatostatin
    (2) Prolactin and Somatotrophic hormone
    (3) PTH and TCT
    (4) GH and TSH

104. Which of the following is an incorrect match?
    (1) Brain – Command & control system of body
    (2) Piamater – Innermost meninx which is in contact with brain tissue
    (3) Hypothalamus – Floor of diencephalon
    (4) Corpora quadrigenina – Ventral side of midbrain

105. Which hormone increases the blood glucose level
    (1) Epinephrine   (2) Glucagon
    (3) Cortisol   (4) All of the above

106. In the following diagram, region A and B represents area of polarization and depolarization respectively. What is status of Na^+ and K^+ exchange pump at regions A and B

    ```
    A      B      C
    + + + +  - - - -  + + + +
    - - - -  + + + +  - - - -
    ```

    (1) Working in both regions
    (2) Closed in both regions
    (3) Working at A, not working at B site
    (4) Closed at B, opened at B site

107. Which one of the following pairs of hormones are the examples of those that can easily pass through the cell membrane of the target cell and bind to a receptor inside it (mostly in the nucleus)?
    (1) Insulin, glucagon
    (2) Thyroxin, insulin
   (3) Somatostatin, oxytocin
    (4) Cortisol, testosterone

108. **Statement-I** : The bony labyrinth is a series of channels and inside these channels lies the membranous labyrinth.

   Statement-II : Membranous labyrinth is surrounded by a fluid called endolymph .

   (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

109. If for some reason our goblet cells are nonfunctional, this will adversely affect
   (1) Production of proenzymes
   (2) Absorption of nutrients in the small intestine
   (3) Activation of pancreatic proteolytic enzymes
   (4) Smooth peristalsis of food in the gut

110. Hormones from adrenal medulla usually increase
   (1) cardiac output   (2) sweating
   (3) glycogenolysis   (4) all of these

111. Match the associated gland with its respective hormone as well as function

	Source gland	Hormone	Function
(1)	Thyroid	Thyroxine	Regulates blood calcium level
(2)	Anterior pituitary	Oxytocin	Contraction of uterus muscles during child birth
(3)	Posterior pituitary	Vasopressin	Stimulates reabsorption of water in the distal tubules in the nephron
(4)	Corpus luteum	Estrogen	Supports pregnancy

112. Photoreceptor cells
   (1) are rods that contain visual violet pigment
   (2) contain the light sensitive proteins called photo pigments
   (3) are cones that contain a purplish red protein
   (4) are of three types

113. Which one of the following endocrine gland functions as a biological clock?
   (1) Adrenal gland   (2) Thyroid gland
   (3) Pineal gland   (4) Thymus gland

114. Identify the correctly matched pair
   (1) zona glomerulosa - androgens
   (2) zona fasciculata - cortisol
   (3) zona reticularis - adrenaline
   (4) adrenal medulla - aldosterone

115. How many of the following are related to forebrain?
   Memory, Intelligence, Thermoregulation, Vomiting centre, Hunger centre, Swallowing centre, Respiratory rhythm centre, Thirst centre, control of gastric secretions
   (1) Six   (2) Eight
   (3) Five   (4) Seven

116. Which of the following group of hormones contains secretion of anterior pituitary only?
   (1) ADH, GH, PRL
   (2) LH, MSH, PTH
   (3) ACTH, PRL, TSH
   (4) FSH, ICSH, TCT

117. Which of the following is/are correct
   a. TSH is secreted by thyroid and stimulate further secretion of T_3, T_4
   b. Ruptured graafian follicle change into corpus luteum under the influence of progestrone
   c. Milk ejecting hormone is progestrone
   d. Alveoli for milk secretions develop under the influence of progestrone
   (1) a, b, c, d   (2) b, c, d
   (3) c, d   (4) only d

118.
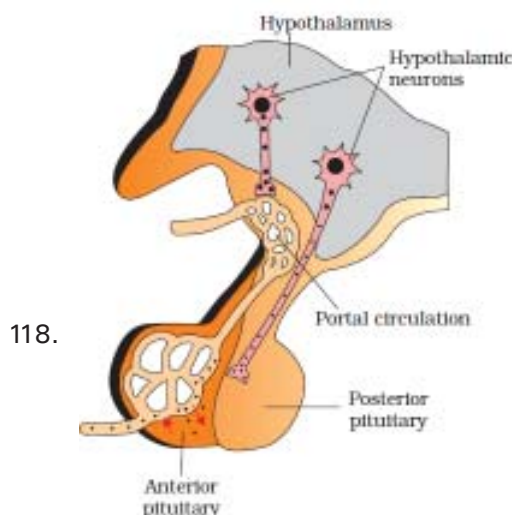
   Which of the following statment is incorrect?
   (1) Hypothalamus – contains neurosecretory cells
   (2) Hormone originating in hypothalamic neurons pass through axons and released from nerve endings
   (3) Anterior pitulary is under regulation of hypothalamus
   (4) Hormone produced from hypothalamic nuclei regulate synthesis and secretion of posterior pitutary

119. What is true w.r.t blood supply to liver?
   (1) There is a unique vascular connection that starts from liver and ends in digestive system
   (2) Hepatic portal vein carries blood from liver to heart
   (3) Liver receives oxygenated blood from hepatic artery and deoxygenated blood from hepatic portal vein
   (4) None of these

120. Match Column I & Column II

	Column I		Column II
(a)	Gastrin	(i)	Inhibits gastric secretion
(b)	Secretin	(ii)	Secretion of Pancreatic juice
(c)	CCK	(iii)	Secretion of water & bicarbonate ions
(d)	GIP	(iv)	Stimulates gastric glands

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

121. Correct sequence of action of proteases on food is
    (1) Trypsin–Aminopeptidase–Dipeptidase
    (2) Trypsin–Dipeptidase–Aminopeptidase
    (3) Trypsin–Rennin–Aminopeptidase
    (4) Chymotrypsin–Trypsin–Pepsin

122. **Assertion** : Some hormones generate second messengers to regulate cellular metabolism.

    Reason : Steroidal hormones have membrane bound receptors
    (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. Which of the following reactions is not catalysed by enzymes present in succus entericus?

    (1) Maltose $\longrightarrow$ glucose and glucose

    (2) Di and monoglycerides $\longrightarrow$ fatty acids and glycerol

    (3) Proteins $\longrightarrow$ peptones

    (4) Nucleosides $\longrightarrow$ sugars and bases.

124. The rise in stimulus induced permeability to Na^+ across the axonal membrane
    (1) is long lived
    (2) is quickly followed by a rise in permeability to K^+
   (3) results in opening of Na^+/K^+ exchange pump
    (4) all of these

125. Cerebrum wraps around a structure which is a major coordinating centre for sensory and motor signals. This structure is called
    (1) Hypothalamus
    (2) Pons
    (3) Thalamus
    (4) Corpora quadrigemina

126. The neural organization of *Hydra* is composed of
    (1) brain and a number of ganglia
    (2) central and peripheral neural system
    (3) network of neurons
    (4) sympathetic and parasympathetic neural system

127. Which of the following is correct w.r.t. ABCD respectively?
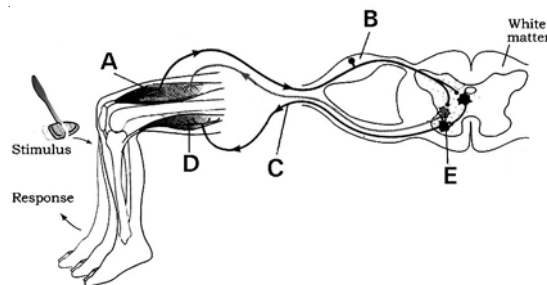
	A	B	C	D
1.	Motor endplate	Dorsal root ganglion	Efferent pathway	Muscle spindle
2.	Muscle spindle	Ventral root ganglion	Afferent pathway	Motor endplate
3.	Muscle spindle	Dorsal root ganglion	Efferent pathway	Motor endplate
4.	Motor endplate	Dorsal root ganglion	Afferent pathway	Muscle spindle

128. The two cerebral hemispheres are connected by
    (1) corpus callosum
    (2) tract of nerve fibres
    (3) nerves
    (4) both (1) and (2)

129. Which exocrine secretion has minimum pH?
    (1) Gastric juice
    (2) Pancreatic juice
    (3) Hepatic secretion/bile
    (4) Succus entericus

130. Identify the correct sequence of events during transmission of impulse across a chemical synapse when neuroinbibitor is released

    A. Na^+ channels open in post synaptic membrane

    B. Binding of neurotransmitter to post synaptic membrane

    C. Ca^{2+} enters presynaptic membrane
    D. K^+ channels open in post synaptic membrane
    (1) $C \rightarrow B \rightarrow A$
    (2) $B \rightarrow C \rightarrow A$
    (3) $D \rightarrow B \rightarrow A$
    (4) $C \rightarrow B \rightarrow D$

131. Identify a, b, c

Digestive juice	Enzyme	Products
Gastric juice	Pepsin	(a)
Succus entericus	(b)	Glucose & Fructose
Gastric juice	Rennin	(c)

(1) large peptides, lactase, calcium paracaseinate

(2) proteoses and peptones, sucrase, paracaesin

(3) dipeptides, sucrase, proteoses

(4) proteoses, sucrase, peptones

132. The somatic neural system relays impulses from CNS to
(1) Muscles associated with gut
(2) Muscles associated with femur
(3) Detrusor muscles
(4) Myometrium

133. Match electrolytes given in column A with its characteristic of absorption mentioned in column B and select correct combination
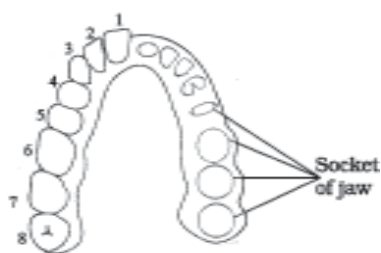
column A		column B	
a.	Fructose	i.	Passive diffusion
b.	Sodium	ii.	Facilitated transport
c.	Fatty acid	iii.	Active transport
d.	Water	iv.	Osmosis

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

134. In the given diagram, arrangement of different types of teeth in jaw on one side is shown. Teeth present at number 3, 4 and 6 are respectively

(1) Incisors, canines and premolars
(2) Canines, premolars and molars
(3) Canines, molars and premolars
(4) Incisors, canines and molars

135. Chemo receptors include
(1) Gustato & olfacto receptors
(2) Calo & Fridgo receptors
(3) Algesi & Stato receptors
(4) Phono & photo receptors

ZOOLOGY : SECTION-B

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

136. Mary is about to face an interview, but during the first five minutes before interview she experiences sweating, increased rate of heart beat, respiration etc. Hormone that is responsible for restlessness are
(1) estrogen and progesterone
(2) oxytocin and vasopressin
(3) adrenaline and noradrenaline
(4) insulin and glucagon

137. Find incorrect statement
(1) Receptors of neurotransmitters are present on post-synaptic membrane
(2) Neuroglial cells make up more than one half the volume of neural tissue in our body
(3) Axon terminal contain vesicles filed with neurotransmitters
(4) The neural system provides an organized network of point to point connections for a slow-co-ordination

138. Fill in the gaps using correct option

"Liver is the largest gland of the body weighing about _____ an adult human. The _____ are the structural and functional units. Each lobule is covered by a thin _____ sheath called the _____".

(1) 1.2 to 1.5g, hepatic lobules, epithelial tissue, Glisson's capsule

(2) 1.2 to 1.5 kg, hepatic lobules, connective tissue, Glisson's capsule

(3) 1.2 to 1.5 kg, hepatic lobules, muscular tissue, Glisson's capsule

(4) 1.2 to 1.5g, hepatic lobules, connective tissue, Glisson's capsule

139. Which of the labelled parts shown does not match its functions/character?
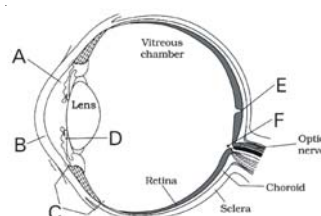
(1) 'B'-is avascular and refracts light maximally
(2) 'F'-lack photoreceptor cells
(3) 'D'-visible coloured portion of eye
(4) 'C'-control amount of light entering the eye

140. **Statement-I** : Stomach, located in the upper left portion of the abdominal cavity, has four major parts – a cardiac, a fundic region, body and a pyloric portion which opens into the first part of small intestine.

Statement-II : The opening of the stomach into the duodenum is guarded by the cardiac sphincter.

(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. Find the incorrect difference

	Chemical synapse	Electrical synapse
(1)	Impulse transmission is slow	Impulse trans- mission is fast
(2)	These are common in our body	Rare in our body
(3)	Fluid filled synaptic cleft may or may not be present	Synaptic cleft usually present
(4)	Neuro transmitters are involved	not involved

142. Find the correct statements

(1) Diphyodont dentition is when temporary milk or deciduous teeth replaced by a set of permanent or adult teeth

(2) An adult human has 32 permanent teeth which are of four different types

(3) Arrangement of teeth in each half of the upper and lower jaw in the order I, C, PM, M is represented by a dental formula

(4) All of these

143. Select the option in which the chemical nature of hormones is correctly given

	Epinephrine	Cortisol	Parathormone
(1)	Peptide	Steroid	Peptide
(2)	Steroid	Peptide	Amino acid derivative
(3)	Amino acid derivative	Peptide	Iodothyronines
(4)	Amino acid derivative	Steroid	Peptide

144. Impulse from semicircular canals and auditory system of ear reaches which part of brain ?

(1) Hypothalamus (2) Cerebellum

(2) Medulla oblongata (4) Pons

145. Hammer like ear ossicle is attached to ___X___ , while smallest ear ossicle is attached to ___Y___ . Identify X and Y respectively

(1) ear drum, round window

(2) incus, ear drum

(3) external auditory meatus, tympanum

(4) tympanum, oval window

146. **Assertion** : Limbic system is concerned with olfaction, autonomic responses, regulation of sexual behaviour, motivation & expression of emotional reactions

Reason : Limbic system is formed by inner parts of cerebellar hemisphers a group of associated deep structures.

(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

147. How many of the given hormones will generate secondary messengers to affect target cells?

MSH, Testosterone, Cortisol, Somatostatin, Aldosterone, FSH, ACTH-RH, TSH

(1) Seven (2) Six

(3) Five (4) Four

148. Which of the following statement is incorrect?

(1) Growth hormones regulate growth and development of somatic tissues

(2) Somatotropin is the pituitary hormone that acts directly on most of the tissues and peripheral glands

(3) MSH hormone from pars distalis acts on the skin pigment cells

(4) Anterior pituitary is stimulated or inhibited by neurosecretion of hypothalamus

149. Which of the following enzymatic reaction occuring in alimentary canal of man is written incorrectly?

(1) Proteins, Peptones, Proteoses $\xrightarrow[\text{Carboxypeptidase}]{\text{Trypsin/chymotrypsin}}$ Dipeptides

(2) Polysaccharides (starch) $\xrightarrow{\text{Amylase}}$ Disaccharides + α - dextrins

(3) Fats (emulsified) $\xrightarrow[\text{(steapsin)}]{\text{Lipase}}$ Diglycerides + fatty acids

(4) Nucleic acids $\xrightarrow{\text{Nucleotidases}}$ Nucleotides

150. What is common between pineal gland and thymus gland?
    (1) Play a role in erythropoiesis
    (2) Two in number
    (3) Release steroidal hormones
   (4) Play a role in defense and immunity of our body

BOTANY : SECTION-A

All questions are compulsory in section A

151. Name the inner boundary of cortex, through which water transport is strictly symplastic
    (1) Endodermis   (2) Epidermis
    (3) Exodermis   (4) Pericycle

152. Which radioactive isotope and organism was taken by Calvin and Benson to work out the complete biosynthetic pathway of dark reaction?
    (1) ^{18}O and *Chlamydomonas*
    (2) ^{18}O and purple sulfur bacteria
    (3) ^{14}N and *Chlorella*
    (4) ^{14}C and *Chlorella*

153. Mitochondria
    (1) is a sausage - shaped organelle
    (2) contain a membrane bound enzyme RubisCO
    (3) contain cristae, infoldings of outer membrane
    (4) has oxysomes where F_0 shows ATP synthase activity

154. Select the number of correct statement
    a. PS-I perform cyclic photophosphorylation independently
    b. Cytochrome b_6-f complex transfer electron to plastocyanin
    c. ATP synthesis occur on the lumen side of the thylakoid membrane
    d. LHC continuously provide energy to reaction centre to meet its frequency of excitation
    (1) 3   (2) 1
    (3) 4   (4) 2

155. Where does link reaction occur in a plant cell?
    (1) Cytoplasm
    (2) Inner membrane of mitochondria
    (3) Outer membrane of mitochondria
    (4) Matrix of mitochondria

156. Which of the following is passive, occurs over short distance, in which molecules move in a random fashion, net result being substances moving from regions of higher concentration to regions of lower concentration and is not dependent on a 'living system'?
    (1) Osmosis
    (2) Active transport
    (3) Facilitated diffusion
    (4) Simple diffusion

157. Select the correct match
    (1) $CoCl_2$ test– guttation
    (2) Priestley experiment–discovered oxygen
    (3) Potato osmoscope–imbibition
    (4) Thistle funnel experiment–plasmolysis

158. For the synthesis of one molecule of glucose, Calvin cycle must rotate_____and requires_____ ATP and_____ NADPH
    (1) 6 times, 12 ATP, 18 NADPH
    (2) 6 times, 3 ATP, 2 NADPH
    (3) 3 times, 12 ATP, 18 NADPH
    (4) 6 times, 18 ATP, 12 NADPH

159. Who gave the first action spectrum of photosynthesis?
    (1) Engelmann   (2) Warburg
    (3) Mitchell   (4) Van Niel

160. In C_4 plants, bundle sheath cells
    (1) have PEPcase enzyme
    (2) have thick wall impermeable to gaseous exchange
    (3) have intercellular spaces
    (4) are arranged only in single layer around vascular bundles

161. Identify the respiratory substrate in the following equation
    $$2(C_{51}H_{98}O_6) + 145O_2 \rightarrow 102CO_2 + 98H_2O + energy$$
    (1) Tripalmitin, protein
    (2) Oxalic acid, fatty acid
    (3) Tripalmitin, fatty acid
    (4) Tripalmitin, organic acid

162. How many NADH will be produced during the production of one molecule of acetyl CoA from one molecule of pyruvic acid?
    (1) 1   (2) 5
    (3) 8   (4) 3

163. **Statement-I** : Mutual attraction between water molecules is called cohesion.
    Statement-II : Attraction of water molecules to polar surfaces is called adhesion.
    (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

164. Lenticels and hydathodes are small pores with following common attributes
    (1) their opening and closing is not regulated
    (2) they allow exchange of gases
    (3) they always remain closed
    (4) they are found on the same organ of plants

165. Which is FALSE w.r.t. photosynthesis?
    (1) It takes place in the green leaves of plants and other green parts also
    (2) Mesophyll cells in the leaves, have a large number of chloroplasts
    (3) Dark reaction occurs in darkness and is not light dependent
    (4) Light reactions are directly driven by light

166. Reaction centre of PS-I is
    (1) P_{700} (2) P_{680}
    (3) P_{400} (4) P_{890}

167. Which one of the following conclusion was drawn on the basis of Ingenhouz's elegant experiment?
    (1) Sunlight is essential for photosynthesis
    (2) Hydrogen from a suitable oxidisable compound reduces carbon dioxide to carbohydrates.
    (3) Glucose is usually stored as starch
    (4) Oxygen evolved by green plants comes from H_2O not from CO_2

168. How many of the following statements are correct?
    a. Aerobic respiration lead to complete oxidation substances in the presence of oxygen and releases large amount of energy present in the substrate
    b. $NADH + H^+$ is oxidised during conversion of pyruvate to lactate
    c. In photophosphorylation, light energy is utilised to break down the proton gradient
    d. Cytochrome c is a small protein attached to outer surface of inner membrane of chloroplast and acts as mobile carrier
    e. Oxaloacetic acid is the first member of krebs cycle
    (1) Two (2) Three
    (3) One (4) Zero

169. **Assertion** : For photosynthesis, light is rarely a limiting factor in nature
    Reason : Light saturation occurs at 10 per cent of the full sunlight.
    (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

170. Glucose is phosphorylated with the help of enzyme
    (1) hexokinase
    (2) enolase
    (3) phosphofructokinase
    (4) pyruvate kinase

171. Cell A has osmotic potential $= -15$ bars and pressure potential $= +8$ bars and cell B has osmotic potential $= -12$ bars and pressure potential $= +2$ bars, what is direction of water flow?
    (1) $A \to B$ (2) $B \to A$
    (3) No movement (4) $A \leftrightarrow B$

172. Most CO_2 from catabolism of glucose is released during
    (1) glycolysis
    (2) Krebs cycle
    (3) lactate fermentation
    (4) oxidative phosphorylation

173. How much energy present in glucose is released during fermentation?
    (1) Less than 7% (2) More than 10%
    (3) 9% (4) More than 7%

174. Select the correct option

Wavelength in nm
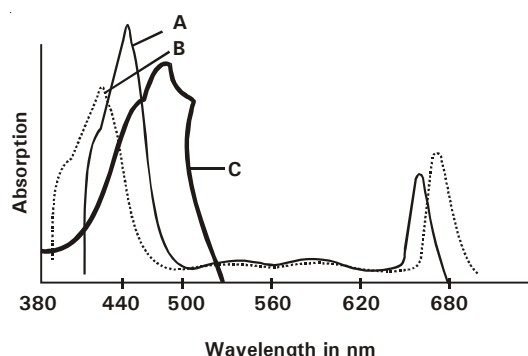
    (1) A–absorption spectrum of carotene
    (2) B–absorption spectrum of chlorophyll-a
    (3) C–absorption spectrum of phycobilins
    (4) A–absorption spectrum of chlorophyll-b in red region

175. The greatest contribution of root pressure is
    (1) ascent of sap
    (2) guttation
    (3) to re-estabilish the continuous chains of water molecuels in xylem
    (4) bleeding

176. What is true for C_4 plants?
    (1) They have a lower temperature optimum
    (2) The current level of CO_2 is limiting for them
    (3) They show saturation at 360 $\mu l\,L^{-1}$ of CO_2
    (4) They show saturation at 450 $\mu l\,L^{-1}$ of CO_2

177. Which of the following statement is incorrect?
    (1) 3 NADH are required in one Kreb's cycle
    (2) Glucose is favoured respiratory substrate
    (3) Respiratory pathway is better to be considered as amphibolic pathway
    (4) Acetyl Co-A is a common intermediate during breakdown of carbohydrates, fats and proteins

178. Which of the following part of plant is chief sink for mineral elements?
    (1) Root
    (2) Apical meristem
    (3) Old leaves
    (4) Bark

179. Read the following features and identify the plant cells on the basis of them
    a. rapidly influenced by turgor changes
    b. dumble shaped in family poaceae
    c. may have thick cellulosic inner walls
    d. contain small chloroplasts
    (1) subsidiary cells
    (2) epidermal cells
    (3) cortical cells
    (4) guard cells

180. Which of the following statement is incorrect ?
    (1) The osmotic behaviour of cell depends upon the outside solution
    (2) Germination of seeds is due to imbibition
    (3) Ringing experiment was done to show that xylem conduct food from leaves to root in downward direction
    (4) Transpiration is the evaporative loss of water by plants

181. The electrons needed to replace those removed from photosystem-I are provided by
    (1) water
    (2) photosystem-II
    (3) NADH
    (4) ferrodoxin

182. What is the net product of one TCA cycle?
    (1) $2NADH_2$ and $1ATP$
    (2) $4NADH_2$, $1FADH_2$ and $1ATP$
    (3) $1NADH_2$, $2FADH_2$, $2ATP$ and $2CO_2$
    (4) $3NADH_2$, $1FADH_2$, $1GTP$ and $2CO_2$

183. Which pigments can protect chl a against photooxidation?
    (1) Chlorophylls
    (2) Carotenoids
    (3) Phaeophytin
    (4) Phycobilins

184. Which statement is FALSE w.r.t. RuBisCO?
    (1) It is the most abundant enzyme in the world
    (2) Its active site can bind to both CO_2 and O_2
    (3) It has much greater affinity for O_2 than for CO_2
    (4) Relative concentration of O_2 and CO_2 determines which will bind to the enzyme

185. The ATP synthase complex concerned with oxidative phosphorylation is
    (1) complex IV
    (2) complex V
    (3) complex III
    (4) complex II

BOTANY : SECTION-B

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

186. Agranal chloroplasts are found in
    (1) mesophyll of pea leaves
    (2) bundle sheath of tomato leaves
    (3) mesophyll of maize leaves
    (4) bundle sheath of sugarcane leaves

187. In which of the following process RuBP instead of being converted to 2 molecules of PGA, form only 1 molecule of PGA?
    (1) C_3 cycle
    (2) C_4 cycle
    (3) C_2 cycle
    (4) CAM pathway

188. Chemiosmosis requires
    a. Transmembrane proton channels
    b. A proton gradient across membrane
    c. Energy to pump protons across ATP synthase
    (1) a, b & c
    (2) a & b
    (3) b & c
    (4) c only

189. Match the following and choose the correct option from those given below.

Column-A		Column-B	
A.	Molecular oxygen	i.	fumarate
B.	Mobile carrier	ii.	hydrogen acceptor
C.	Pyruvate dehydrogenase	iii.	ubiquinone
D.	Succinate dehydrogenase	iv.	acetyl Co A

    (1) A-ii, B-iii, C-iv, D-i
    (2) A-iii, B-iv, C-ii, D-i
    (3) A-ii, B-i, C-iii, D-iv
    (4) A-iv, B-iii, C-i, D-ii

190. In C_3 plants, how many number of carbons are there in the primary CO_2 fixation product?
    (1) 4
    (2) 2
    (3) 3
    (4) 5

191. Tomato plant differs from Sorghum w.r.t. photosynthesis in having
    (1) OAA as the primary CO_2 fixation product
    (2) RuBP as primary CO_2 acceptor
    (3) Two carboxylation reactions, one in mesophyll cell and other in bundle sheath cell
    (4) Calvin cycle in cytoplasm of mesophyll

192. **Statement- I** : Cyclic photo-phosphorylation occurs when only light of wavelength beyond 680 nm are available for excitation

    Statement- II : In cyclic flow of electrons, both ATP and $NADPH + H^+$ are synthesised.
    (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. Transport proteins of endodermal cells are control points, where a plant adjust the

   (1) quantity of solutes that reaches the xylem
   (2) types of solutes that reaches the xylem
   (3) quantity & type of solutes that reaches xylem
   (4) quality of solutes that reaches the xylem

194. Yeast poison themselves to death, when the concentration of alcohol reaches about

   (1) 33%   (2) 23%
   (3) 13%   (4) 15%

195. The term apoplast signifies

   (1) cell wall, intercellular space and water filled channels
   (2) protoplasts inter connected by plasmodesmata
   (3) cell wall, cytoplasm and central vacuole
   (4) cytoplasm and nucleoplasm

196. **Assertion** : Pressure flow or mass flow hypothesis can demonstrate phloem translocation .

   Reason : It requires light as the source of energy.

   (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. Enzymes for Embden-Meyerhof-Parnas pathway are located in

   (1) cytoplasm   (2) mitochondria
   (3) ribosomes   (4) vacuoles

198. In plant cells, which are important determinants of movement of molecules in or out of the cell?

   (1) Cell membrane
   (2) Membrane of the vacuole
   (3) Cell wall
   (4) Both (1) and (2)

199. Choose the incorrect statement

   (1) Pyruvate is formed in the cytoplasm
   (2) During the conversion of succinyl Co-A to succinic acid a molecule of ATP is synthesized.
   (3) Oxygen is vital in respiration for removal of hydrogen.
   (4) NADH is oxidised to NAD^+ slowly in aerobic respiration

200. What is essential for or a prerequisite for imbibition?

   a. Water potential gradient between the absorbant and the liquid imbibed
   b. Affinity between the absorbant and the liquid imbibed
   c. Absorbant should show high degree of hydrophily & ability to form solution

   (1) a & b only   (2) a, b & c
   (3) b only   (4) c only