Dated : 27-04-2023

M.L. Syal's Helix Institute

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

Test Series HMC-8 [Option -2]

Test - 08

MM : 720 Time : 3 hrs. 20 min.

PHYSICS	:	DUAL NATURE OF RAD & MATTER, ATOMS AND NUCLEI, SEMICONDUCTOR DEVICES, EM WAVES
CHEMISTRY	:	D & F BLOCK ELEMENTS, COORDINATION COMPUNDS, CHEMICAL KINETICS, SOLID STATE, SURFACE CHEMISTRY
ZOOLOGY	:	BIOTECHNOLOGY & MICROBES IN HUMAN WELFARE
BOTANY	:	ECOLOGY

PHYSICS : SECTION-A

All questions are compulsory in section A

1. The consituent radiation of electromagnetic spectrum which is used for studying crystal structure is
   (1) X-rays
   (2) Microwaves
   (3) Gamma
   (4) Ultra-violet

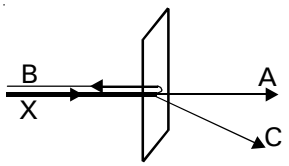
2. Consider α particles, β particles and γ -rays, each having an energy of 0.5 MeV. In increasing order of penetrating power, the radiations are
   (1) α , β , γ
   (2) γ , β , α
   (3) β , γ , α
   (4) all have same

3. There are n_1 photons of frequency γ_1 in a beam of light. In an equally energetic beam, there are n_2 photons of frequency γ_2. Then $n_1 : n_2$ is equal to
   (1) 1 : 1
   (2) $\gamma_1 : \gamma_2$
   (3) $\gamma_2 : \gamma_1$
   (4) $\gamma_1^2 : \gamma_2^2$

4. Neutron decay in free space is given as follows
   ${}_0n^1 \rightarrow {}_1H^1 + {}_{-1}e^0 + [\,]$
   Then the particle in the bracket is
   (1) neutrino
   (2) photon
   (3) anti-neutrino
   (4) graviton

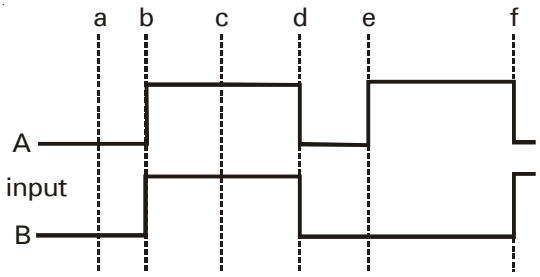
5. Two amplifiers are connected one after the other in series (cascaded). The first amplifier has a voltage gain of 10 and the second has a voltage gain of 20. If the input signal is 0.01 volt, calculate the output ac signal.
   (1) 1 V
   (2) 2 V
   (3) 3 V
   (4) 4 V

6. Nuclear volume of nucleus
   (1) varies inversely with mass number
   (2) varies directly with square of mass number
   (3) is constant for all nuclei
   (4) varies directly with mass number

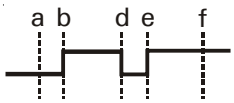
7. 

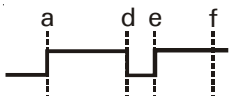
   A beam X of fast moving alpha particles was directed towards a thin film of gold and splits into parts A, B and C after scattering as shown. The number of alpha particles in
   (1) B will be minimum and in C maximum
   (2) A will be maximum and in B minimum
   (3) A will be minimum and in B maximum
   (4) C will be minimum and in B maximum

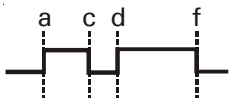
8. In a p - n junction diode not connected to any circuit,
   (1) the potential is the same everywhere
   (2) the p - type side is at a higher potential than the n - type side
   (3) there is an electric field in the junction directed from the n - type side to the p - type side
   (4) none of these

9. 

For the above inputs A and B, which is the output waveform of the OR Gate?

(1) 

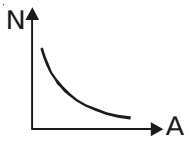
(2) 

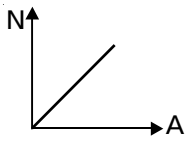
(3) 

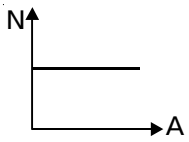
(4) none of the above

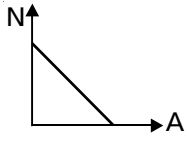
10. The work function of caesium metal is 2.14 eV. When light of frequency 6×10^{14} Hz is incident on the metal surface, photoemission of electrons occurs. The maximum kinetic energy of the emitted electrons is
(1) 0.4 eV
(2) 0.34 eV
(3) 0.68 eV
(4) 0.8 eV

11. The plot of the number (N) of decayed atoms in a radioactive sample versus activity (A) of the sample is

(1) 

(2) 

(3) 

(4) 

12. A radioactive material has a half-life 1 minute. If one of nuclei decays now, next one will decay
(1) after 1 minute
(2) after $(1/\log_e 2)$ minute
(3) after (1/N) minute, where N is the number of nuclei present at that moment
(4) after any time

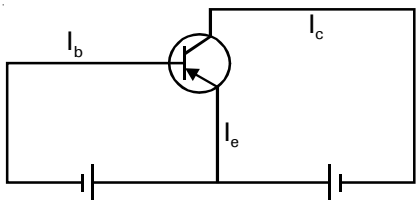
13. A sample contains 16 g of a radioactive material, mean life of which is 2 days. 1 gram of radioactive material will be left in the sample after
(1) 8 days
(2) 10 days
(3) 4.2 days
(4) 5.5 days

14. A hydrogen atom and a Li^{++} ion are both in the second excited state. If L_H and L_{Li} are the respective electronic angular momenta, and E_H and E_{Li} the respective energies of electron, then
(1) $L_H > L_{Li}$ & $E_H > E_{Li}$
(2) $L_H = L_{Li}$ & $E_H < E_{Li}$
(3) $L_H = L_{Li}$ & $E_H > E_{Li}$
(4) $L_H < L_{Li}$ & $E_H < E_{Li}$

15. An electron, an α-particle, and a proton have the same kinetic energy. Which of the following expression is correct for de Broglie wavelengths of these particles?
(1) $\lambda_\alpha > \lambda_e > \lambda_p$
(2) $\lambda_p > \lambda_e > \lambda_\alpha$
(3) $\lambda_e > \lambda_\alpha > \lambda_p$
(4) $\lambda_e > \lambda_p > \lambda_\alpha$

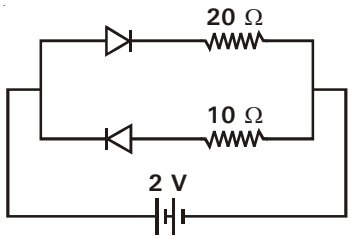
16. Radiations of intensity 0.5 W/m^2 are striking an absorbing plane surface perpendicularly. The pressure on the surface is
(1) 0.166×10^{-8} N/m^2
(2) 0.332×10^{-8} N/m^2
(3) 0.111×10^{-8} N/m^2
(4) 0.083×10^{-8} N/m^2

17. In α-scattering experiment, the distance of closest approach for the α-particle
(1) decreases with increase in its KE
(2) decreases with decrease in its KE
(3) decreases with increase in atomic number of target body
(4) is independent of KE and atomic number

18. 

In the transistor circuit shown in above figure, the emitter, collector and base currents are I_e, I_c and I_b respectively. Correct relation between them is

(1) $I_b > I_c > I_e$
(2) $I_b < I_c < I_e$
(3) $I_b < I_e < I_c$
(4) $I_c < I_e < I_b$

19. 

In the above figure, the current supplied by the battery is

(1) 0.1 A
(2) 0.2 A
(3) 0.3 A
(4) 0.4 A

20. Maximum energy of photoelectrons emitted in a photocell is 2 eV. For no photoelectrons to reach the anode, the potential of anode with respect to emitter should be

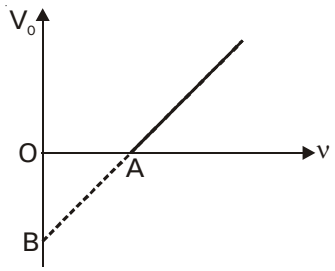
(1) 2 V
(2) −2 V
(3) 4 V
(4) −4 V

21. The peak voltage in the output of a half-wave diode rectifier fed with a sinusoidal signal without filter is 10V. The dc component of the output voltage is

(1) $\frac{10}{\sqrt{2}}$ V
(2) $\frac{10}{\pi}$ V
(3) 10 V
(4) $\frac{20}{\pi}$ V

22. The innermost orbit of the hydrogen atom has a diameter of 1.06 Å . What is the diameter of the tenth orbit ?

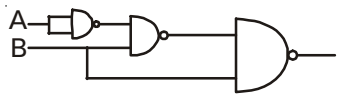
(1) 5.3 Å
(2) 10.6 Å
(3) 53 Å
(4) 106 Å

23. 

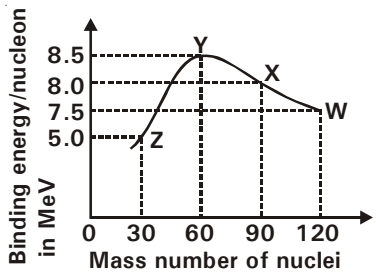
In the above graph plotted for a photoelectric experiment, the work function of the photoelectric surface is given by

(1) (OB)h
(2) (OA)h
(3) slope of line AB
(4) none of these

24. The arrangment of NAND gates shown below effectively works as



(1) an AND gate
(2) an OR gate
(3) a NAND gate
(4) a NOR gate

25. 

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) $X \rightarrow Y + Z$

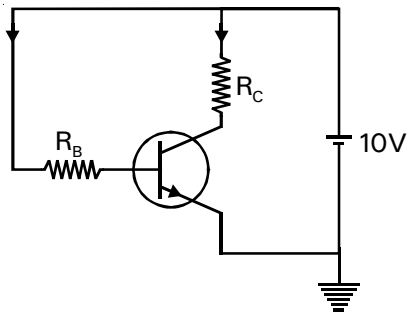
26. $_1^2H + _1^2H \rightarrow _2^4He + Q$

Energy released in the above fusion reaction is (Binding energy of deuteron $_1^2H$ is 1.112 MeV per nucleon and an that of α-particle is 7.047 MeV per nucleon)

(1) 17.8 MeV
(2) 21.9 MeV
(3) 23.8 MeV
(4) 931 MeV

27. 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

28.



In the above circuit, $\beta = 100$, $R_C = 2\ k\Omega$ and $V_{CE} = 7$ V. If $R_B = 300\ k\Omega$, V_{BE} =
(1) 5.5 V
(2) 6.5 V
(3) 3 V
(4) 4.5 V

29. N_1 atoms of a radioactive element emit N_2 number of β^- particle per second. The decay constant of element (in s^{-1}) is

(1) $\frac{N_1}{N_2}$

(2) $\frac{N_2}{N_1}$

(3) $\frac{N_1}{N_2}\ln(2)$

(4) $\frac{N_2}{N_1}\ln(2)$

30. Which of the following transitions in a hydrogen atom emits photons of the highest frequency?
(1) $n = 4$ to $n = 3$
(2) $n = 2$ to $n = 1$
(3) $n = \infty$ to $n = 2$
(4) $n = 6$ to $n = 2$

31. 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

32. The speed of an electron in the n^{th} orbit of hydrogen atom is

(1) $\frac{c}{n}$

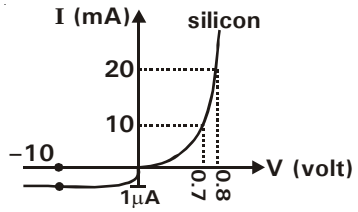
(2) nc

(3) $\frac{c}{2n}$

(4) $\frac{c}{137n}$

33. **Assertion** : As the accelerating potential in a coolidge tube is increased, the wavelength of characteristic X-ray decreases.
Reason : Increasing accelerating potential increases the kinetic energy of electrons and hence energy of emitted characteristic X-rays.
(1) Assertion is true statement but Reason is false
(2) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(3) Assertion is false
(4) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion

34.



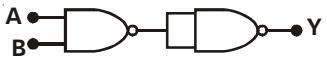
V-I characteristic of a silicon diode is shown in the figure.What is the resistane of diode at a forward current of 15 mA?
(1) 40 Ω
(2) 1 Ω
(3) 20 Ω
(4) 10 Ω

35. Why we do not use materials like PbS with $E_g \sim 0.4$ eV, which satisfy the condition $h\nu > E_g$ for most of the radiation present in the solar radiation spectum?
a. To let solar radiations to be absorbed on top-layer of the solar cell
b. To make radiations reach in or near the depletion region
c. Occurance of photo-generation is required only in the junction region
(1) a and c
(2) b and c
(3) a and b
(4) a, b and c

PHYSICS : SECTION-B

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

36. During a nuclear fusion reaction
    (1) a heavy nucleus breaks into two fragments by itself
    (2) a light nucleus bombarded by thermal neutrons breaks up
    (3) a heavy nucleus bombarded by thermal neutrons breaks up
    (4) two light nuclei combine to give a heavier nucleus and possibly other products

37. 

The above circuit consists of NAND gates. What is the logic operation carried out by it?

(1)

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

(2)

A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

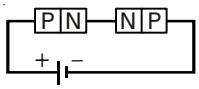
(3)

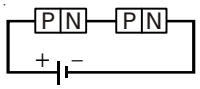
A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

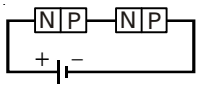
(4)

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

38. 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 possible circuit is

(i) 

(ii) 

(iii) 

    (1) (i) and (ii)
    (2) (ii) and (iii)
    (3) (i) and (iii)
    (4) (i) only

39. Let K_1 be the maximum kinetic energy of photoelectrons emitted by a light of wavelength λ_1 and K_2 corresponding to λ_2. Given $\lambda_1 = 0.5\lambda_2$ then
    (1) $2K_1 = K_2$
    (2) $K_1 = 2K_2$
    (3) $K_1 < \frac{K_2}{2}$
    (4) $K_1 > 2K_2$

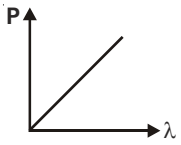
40. Which of the following in not known as Maxwell's equation?
    (1) $\oint_s \vec{E}.\vec{ds} = \frac{Q}{\varepsilon_0}$
    (2) $\oint_c \vec{E}.\vec{dl} = -\frac{d\phi_B}{dt}$
    (3) $\oint_s \vec{B}.\vec{ds} = 0$
    (4) $\oint_c \vec{B}.\vec{dl} = \mu_0 I_C$

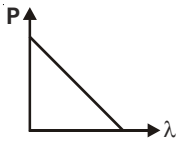
41. The electron in a hydrogen atom makes a transition from an excited state to the ground state. Which of the following statements is true?
    (1) Its kinetic energy increases and its potential and total energies decreases
    (2) Its kinetic energy decreases, potential energy increases & its total energy remains same
    (3) Its kinetic and total energies decrease and its potential energy increases
    (4) Its kinetic, potential and total energies decrease

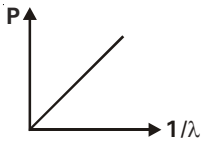
42. Let a sample of He^+ ions in ground state absorb photons of energy 48.35 eV. Then number of spectral lines emitted by the sample will be
    (1) 4
    (2) 3
    (3) 6
    (4) 12

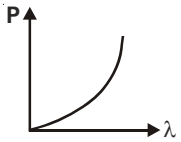
43. **Assertion** : In β^--decay, an electron comes out of nucleus.
    Reason : Electrons exist inside the nucleus.
    (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is false
    (4) Assertion is true statement but Reason is false

44. Which graph represent the variations of particle momentum & associated de-Broglie wavelength?

(1) 

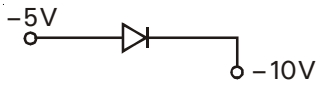
(2) 

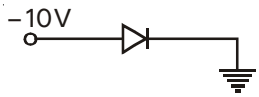
(3) 

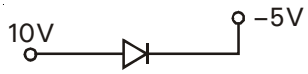
(4) 

45. Which of the following p-n junctions is reverse-biased?

(1) 

(2) 

(3) 

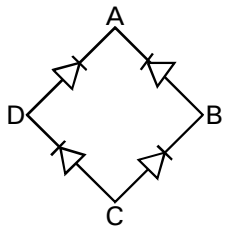
(4) 

46. In an atomic reactor fast moving neutrons are slowed down to thermal energies by colliding them with
(1) oxygen atoms of heavy water
(2) lead atoms
(3) paraffin-hydrogen
(4) cadmium-atoms

47. Average magnetic energy density in an em wave is 5 $\mu J/m^3$. The intensity of the wave is
(1) 1500 W/m^2
(2) 3000 W/m^2
(3) 2500 W/m^2
(4) zero

48. The shortest wavelength in the Paschen series of spectral lines of hydrogen atom is
(1) 6.56 nm
(2) 890 nm
(3) 820 nm
(4) 640 nm

49. 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) $n_e >> n_h$

50. 

In the diagram, if the input is applied across the terminals D and B, then output across the terminals A and C is
(1) zero
(2) same as input
(3) same as output of full wave rectifier
(4) same as output of half wave rectifier

CHEMISTRY : SECTION-A

All questions are compulsory in section A

51. The axial angles in triclinic crystal system are
(1) $\alpha = \beta = \gamma = 90^0$
(2) $\alpha = \beta = \gamma, \beta \neq 90^0$
(3) $\alpha \neq \beta \neq \gamma \neq 90^0$
(4) $\alpha = \beta = \gamma \neq 90^0$

52. Bronze is an alloy of
(1) Cu, Zn
(2) Cu, Sn
(3) Cu, Zn, Ni
(4) Cu, Ni

53. CFSE for high spin d^4 octahedral complexes is
(1) $-1.8\ \Delta_0$
(2) $-1.6\Delta_0 + P$
(3) $-1.2\Delta_0$
(4) $-0.6\Delta_0$

54. The atomic number of V, Cr, Mn and Fe are respectively 23, 24, 25 and 26. Which one of these may be expected to have highest second ionization enthalpy?
(1) Cr
(2) Mn
(3) Fe
(4) V

55. Time taken for the initial concentration of a reactant to reduce to half is 4 hrs following first order kinetics. The amount of the reactant left after 32 hrs is

(1) $\frac{1}{16}$

(2) $\frac{1}{32}$

(3) $\frac{1}{64}$

(4) $\frac{1}{256}$

56. **Statement-I** : According to CFT, ligands are treated as point charges in case of anions or dipoles in case of neutral molecules.

Statement-II : d^4 to d^7 co-ordination entities are more stable as strong field as compared to weak field cases..

(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

57. 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) $Cl^- < F^- < OH^- < H_2O$

58. Mist is an example of colloidal system of

(1) Liquid dispersed in gas

(2) Gas dispersed in gas

(3) Solid dispersed in gas

(4) Solid dispersed in liquid

59. The rate of appearance of NO_2 (in atm min^{-1}) in the following reaction, $N_2O_4 \rightarrow 2NO_2$ when initial pressure of N_2O_4 is reduced from 0.5 atm to 0.25 atm in 5 min. is

(1) 0.1

(2) 0.05

(3) 0.25

(4) 0.3

60. At the equilibrium position in the process of adsorption _____.

(1) $\Delta H > 0$

(2) $\Delta H = T\Delta S$

(3) $\Delta H > T\Delta S$

(4) $\Delta H < T\Delta S$

61. Identify the True statement

(1) in an fcc unit cell, tetrahedral voids are at the body centre and edge centre

(2) the ccp is more efficient close packing than h.c.p.

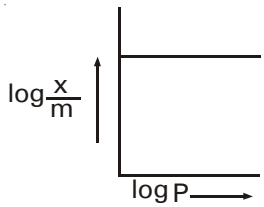
(3) in a ccp, the total number of octahedral and tetrahedral voids is three times the number of spheres

(4) co-ordination number in a bcc packing in two layers is 8

62. Identify mismatch

	Metal	**Characteristic**
(1)	Cd	d-block element
(2)	La	f-block element
(3)	U	Actinide
(4)	Ce	Lanthanide

63. Following graph will be true when



(1) $P = 0$

(2) $P = 1$

(3) $\frac{1}{n} = 0$

(4) $\frac{1}{n} = \infty$

64. The total number of vacant sites of tetrahedral voids and octahedral voids in a NaCl unit cell is

(1) 8

(2) 12

(3) 4

(4) 6

65. Large energy gap between the valence band and the conduction band exists in

(1) conductors

(2) semi-conductors

(3) Insulators

(4) super conductors

66. What is the charge on the complex $[Cr(C_2O_4)_2(H_2O)_2]$ formed by Cr(III)?

(1) $+4$

(2) $+1$

(3) $+2$

(4) -1

67. In a close packed structure of mixed oxides, the lattice is composed of oxide ions, one eighth of tetrahedral voids are occupied by divalent cations (A^{2+}) while one half of octahedral voids are occupied by trivalent (B^{3+})cations. The formula of the oxide is
(1) AB_2O_4
(2) A_2BO_4
(3) ABO_3
(4) AB_2O_2

68. At pH = 11, $Cr_2O_7^{-2}$ changes to
(1) CrO_3
(2) CrO_4^{-2}
(3) Cr^{+3}
(4) CrO_2^{+2}

69. Which of the following is a high-spin (spin-free) complex?
(1) $[Co(NH_3)_6]^{3+}$
(2) $Fe(CN)_6]^{4-}$
(3) $[CoF_6]^{3-}$
(4) $[Zn(NH_3)_6]^{2+}$

70. Pyrolusite in MnO_2 used to prepare $KMnO_4$ steps are :

$$MnO_2 \xrightarrow{(I)} MnO_4^{-2} \xrightarrow{(II)} MnO_4^-$$

Step (I) and (II) are
(1) fuse with KOH/air; electrolytic oxidation
(2) fuse with $K_2Cr_2O_7$/air; electrolytic oxidation
(3) fuse with HNO3/air; electrolytic reduction
(4) dissolve in H_2O; oxidation

71. Match the complex ions given in Column I with the hybridisation and number of unpaired electrons given in Column II.

Column I		**Column II**	
a.	$[Cr(H_2O)_6]^{3+}$	i.	dsp^2, 1
b.	$[Co(CN)_4]^{2-}$	ii.	sp^3d^2, 5
c.	$[Ni(NH_3)_6]^{2+}$	iii.	d^2sp^3, 3
d.	$[MnF_6]^{4-}$	iv.	sp^3, 4
		v.	sp^3d^2, 2

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

72. Silicon (At.wt = 28) has same crystal structure as diamond. If C–C bond length in diamond is 1.5 Å and Si–Si bond length in silicon is 2.25 Å, then the ratio of density of diamond & density of silicon is (Atomic weight of C = 12, Si = 28)
(1) 1.76
(2) 1.45
(3) 3.37
(4) 0.72

73. Which of the following is correct w.r.t. catalytic properties of transition metals?
(1) Vanadium (V) oxide is used as catalyst in contact process
(2) Finely divided iron is used as catalyst in Haber's process
(3) Iron (III) can be used to catalyse the reaction between iodide and persulphate ions
(4) All these are correct

74. Which of the following is a heteroleptic complex?
(1) $[Cu(CN)_4]^{3-}$
(2) $[Ni(H_2O)_6]^{2+}$
(3) $[Co(NH_3)_4\ Cl_2]^{+}$
(4) $[Pt\ Cl_4]^{2-}$

75. **Assertion** : Specific rate constant increases with increase in molecularity.

Reason : Rate of reaction increases with increase in molecularity..
(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. For the reaction $X + Y \rightarrow Z$, the rate expression is

Rate = $k\,[X]^2\,[Y]^{1/2}$

If the concentrations of X and Y are both increased by a factor of 4, by what factor will the rate increase?
(1) 4
(2) 8
(3) 16
(4) 32

77. For an endothermic reaction. If $\Delta H = x$ and $E_a = y$ is activation energy for forward reaction, then activation energy for backward reaction is
(1) xy
(2) x–y
(3) y–x
(4) x+y

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

79. In the coagulation of a positive sol, the flocculation power is in the order

(1) $Cl^- > SO_4^{-2} > PO_4^{-3} > [Fe(CN)_6]^{4-}$

(2) $[Fe(CN)_6]^{4-} > SO_4^{-2} > PO_4^{-3} > Cl^-$

(3) $PO_4^{-3} > SO_4^{-2} > Cl^- > [Fe(CN)_6]^{4-}$

(4) $[Fe(CN)_6]^{4-} > PO_4^{-3} > SO_4^{-2} > Cl^-$

80. The complex $[Cr(H_2O)_4Br_2]Cl$ gives the test for

(1) Br^-
(2) Cl^-
(3) Cr^{+3}
(4) Both (1) and (2)

81. Which of the following statements is correct?

(1) The rate of a reaction decreases with passage of time as the concentration of reactants decreases except for zero order reactions.
(2) The rate of a reaction is same at any time during the first order reaction.
(3) The rate of a reaction is independent of temperature change.
(4) The rate of a reaction decreases with increase in concentration of reactant(s).

82. 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

83. A metal crystallizes into a lattice containing a sequence of atoms as ABABAB..... The percentage by volume which is empty is

(1) 26
(2) 74
(3) 56
(4) 54

84. Movement of dispersion medium relative to dispersion phase under the influence of electric field through SPM is known as

(1) Electrophoresis
(2) Electrodialysis
(3) Electro osmosis
(4) None

85. 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) hydrate

CHEMISTRY : SECTION-B

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

86. A colloidal sol of substance 'X' is a reversible sol and is highly stable towards coagulation by addition of electrolyte. 'X' may be colloidal sol of

(1) metal
(2) metal sulphide
(3) gum
(4) sulphur

87. Which of the following complexes formed by Cu^{2+} ions is most stable?

(1) $Cu^{2+} + 4NH_3 \rightleftharpoons [Cu(NH_3)_4]^{2+}$, $\log K = 11.6$
(2) $Cu^{2+} + 4CN^- \rightleftharpoons [Cu(CN)_4]^{2-}$, $\log K = 27.3$
(3) $Cu^{2+} + 2en \rightleftharpoons [Cu(en)_2]^{2+}$, $\log K = 15.4$
(4) $Cu^{2+} + 4H_2O \rightleftharpoons [Cu(H_2O)_4]^{2+}$, $\log K = 8.9$

88. When CO_2 is passed into aqueous

(1) Na_2CrO_4 solution, its yellow colour change to orange
(2) K_2MnO_4 solution, it reduce to $KMnO_4$ and MnO_2
(3) $NaCr_2O_7$ solution, its orange colour change to green
(4) $KMnO_4$ solution, its pink colour change to green

89. 15. $A \rightarrow B$

$k_A = 10^{15}\, e^{-2000/T}$

$C \rightarrow D$ $\qquad k_C = 10^{14}\, e^{-1000/T}$

Temperature T/K at which $(k_A = k_C)$is

(1) 1000 K
(2) 2000 K
(3) $\dfrac{2000}{2.303}$
(4) $\dfrac{1000}{2.303}$

90. Match the types of defect given in Column I with the statement given in Column II.

	Column I		Column II
i.	Impurity defect	a.	NaCl with anionic sites called F-centres
ii.	Metal excess defect	b.	FeO with Fe^{3+}
iii.	Metal deficiency defect	c.	NaCl with Sr^{2+} and some cationic sites vacant

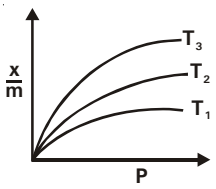
(1) (i-a), (ii-c), (iii-b) (2) (i-c), (ii-b), (iii-a)
(3) (i-c), (ii-a), (iii-b) (4) (i-b), (ii-a), (iii-c)

91. Which of the following statements is incorrect about enzyme catalysis?
(1) An optimum temperature is needed
(2) An optimum pH is needed
(3) They are substrate specific
(4) They always increase the activation energy

92. Which has maximum conductance in water?
(1) $[Co(NH_3)_3Cl_3]$
(2) $[Co(NH_3)_4Cl_2]Cl$
(3) $[Co(NH_3)_6]Cl_3$
(4) $[Co(NH_3)_5Cl]Cl_2$

93. Which of the following pairs contain ferromagnetic and ferrimagnetic substance respectively?
(1) Fe_2O_3, Fe_3O_4
(2) Fe_3O_4, Cr_2O_3
(3) Cr_2O_3, CrO_2
(4) CrO_2, Fe_3O_4

94. **Assertion** : $[PtCl_4]^{2-}$ is a diamagnetic complex.
Reason : Chloride ion is a strong field ligand.
(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

95. 

In the above adsorption isotherm the relation between T_1, T_2, T_3 is
(1) $T_1 > T_3 > T_2$
(2) $T_1 > T_2 > T_3$
(3) $T_1 = T_2 = T_3$
(4) $T_3 > T_2 > T_1$

96. The well known alloy mischmetal consists of
(1) a Lanthanoid metal (~95%) and iron (~5%) & traces of S, C, Ca and Al
(2) a Lanthanoid metal (~90%) & iron (~5%) & 5% of Ca, S & Al
(3) a Lanthanoid metal (~90%) & iron (~10%)
(4) a Lanthoid metal (95%) & iron (5%)

97. The explosive compound is
(1) MnF_4
(2) Cr_2O_3
(3) Mn_2O_7
(4) $K_2Cr_2O_7$

98. **Statement-I** : Tetrahedral voids can be located on face diagonals.
Statement-II : Density of unit cell is given by $= \frac{Z \times M}{a^3}$ (Here M is molar mass).
(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

99. Cloud burst can be due to
(1) strong attraction towards the earth due to opposite charges
(2) high density of clouds of higher altitudes
(3) dark grey colour of some dense clouds
(4) opposite charges on the clouds resulting into coagulation

100. Which of the following is not an application of adsorption?
(1) Heterogenous catalysis
(2) Froth floatation process
(3) Blue colour of sky
(4) Chromatography

ZOOLOGY : SECTION-A

All questions are compulsory in section A

101. Proteinaceous infectious agents are
(1) protozoa
(2) viruses
(3) prions
(4) viroids

102. A correct difference between primary sludge (A) and activated sludge (B) is

	(A)	(B)
(1)	Formed during biological treatment	Formed during primary treatment
(2)	No flocs of decomposer microbes	Has flocs of decomposer microbes
(3)	Aeration required	No aeration required
(4)	More decomposition occurs	Little decomposition occurs

103. What is not true for RNA interference?
(1) It takes place in all eukaryotic and prokaryotes & viruses as a method of cellular defence
(2) It involves silencing of mRNA due to complementary ds RNA
(3) ds RNA prevents translation of mRNA
(4) The source of this cRNA could be because of transposons

104. Which biological product has been produced in transgenic animal that is used for treating emphysema?
(1) Plasminogen activator
(2) α 1-antitrypsin
(3) Casein
(4) Lactoferrin

105. Which among the following is incorrect matching set w.r.t. biological control
(1) *Trichoderma* – Root plant pathogens
(2) *Nucleopolyhedrovirus* – narrow spectrum insecticide
(3) Dragon flies – aphids
(4) *Bacillus thuringiensis* – insecticidal property

106. 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

107. 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)

108. Which among the following is incorrect?
(1) *Acetobacter aceti* – acetc acid
(2) *Saccharomyces cerevisiae* – ethanol
(3) *Clostridium butylicum* – lactic acid
(4) *Aspergillus niger* – citric acid

109. Why does the toxin in protein crystals of *Bacillus thuringiensis* not kill the bacteria?
(1) The toxin cannot pass through bacterial cell wall
(2) It is produced as protoxin which gets activated to toxin in the insect gut
(3) The toxin gets activated to protoxin in the insect gut
(4) The toxin cannot pass through the bacterial cell membrane

110. 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

111. r DNA technology plays role in area of health care by
(1) producing safe and less effective therapeutic drugs
(2) producing large quantities of drugs
(3) not eliciting immune response against any antigen
(4) all of these are correct

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. Biopiracy refers to
(1) use of bioresources without proper authorisation from countries and people
(2) decision regarding validity of GM research
(3) rights given to inventor in lieu of disclosure of invention
(4) passing traditional knowledge to offsprings

114. Choose the correct match and select the option

	Column-I		**Column-II**
a.	Butyric acid	i.	*Trichoderma*
b.	*Monascus*	ii.	*Clostridium*
c.	Cyclosporin	iii.	Statins

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

115. How many of the household products are produced using fungi/ yeast?

Swiss cheese, Curd, Bread, Beer, Roquefort cheese, Wine

(1) Eight
(2) Four
(3) Three
(4) Five

116. Bioactive molecule produced by Fungus *Trichoderma polysporum* is used
(1) in patients having high blood pressure
(2) in patients who have undergone organ transplantation
(3) as clot buster
(4) in patients who have undergone myocardial infarction

117. 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)

118. Which of the following is responsible for the formation of proteins for replication?

(1) selectable marker
(2) RE action site
(3) ori-site
(4) rop

119. Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A): Polymerase chain reaction is used in DNA amplification

Reason (R): The ampicillin resistant gene is used as a selectable marker to check transformation

In the light of the above statements, choose the correct answer from the options given below:

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(2) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

(3) (A) is correct but (R) is not correct

(4) (A) isnot correct but (R) is correct

120. The removal or replacement of tumor causing genes from Ti plasmid is termed as

(1) gene replacement
(2) disarming
(3) insertional inactivation
(4) gene displacement

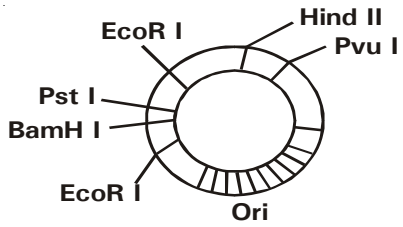
121. Identification of recombinants is difficult if plasmid chosen as a vector is without

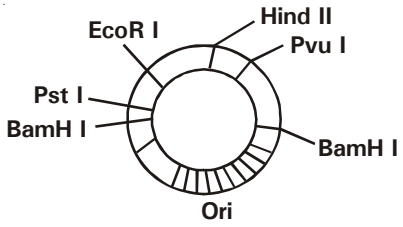
(1) a selectable marker

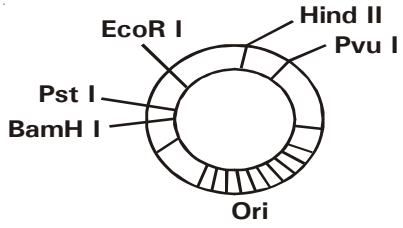
(2) antibiotic synthesising gene

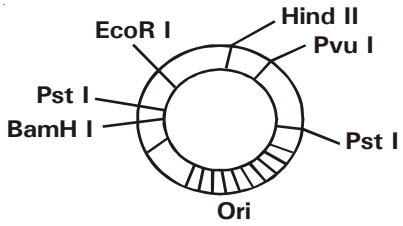
(3) REs
(4) all of the above

122. Use of which plasmid is most advisable in genetic engineering

(1) 

(2) 

(3) 

(4) 

123. Fed Batch bioreactor works on the principle of

(1) products are eliminated time to time from bioreactor
(2) nutrients are added initially in bioreactor and products are eliminated at the end of process
(3) nutrients are added in between but products are collected at the end of process
(4) products are collected at the end and nutrients are added only in middle of process

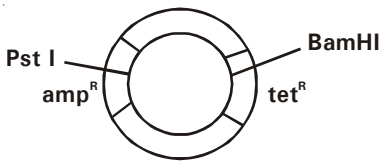
124. Most financially rich nations are

(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

125. A recombinant DNA molecule can be produced in the absence of

(1) *E.coli*
(2) DNA ligase
(3) DNA fragments
(4) Restriction endonuclease

126. In the cloning vector pBR 322 shown below the alien DNA is ligated at Pst I. Which of the following statements are true w.r.t. this ligation?



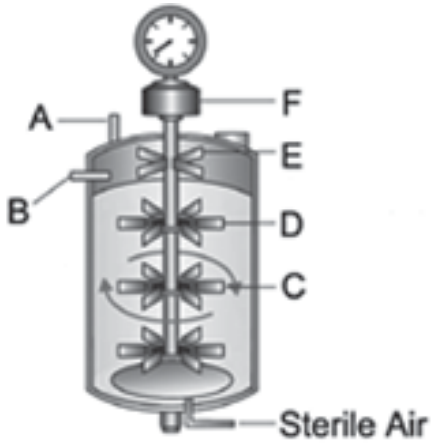
a. The r-plasmid will lose tetracyclin resistance
b. Growing the bacteria on tetracycline medium will help in selection of transformants
c. Growing bacteria on ampicillin medium will help in selection of recombinants

(1) a, b and c
(2) a and b
(3) b and c
(4) a and c

127. Identify the incorrect statement

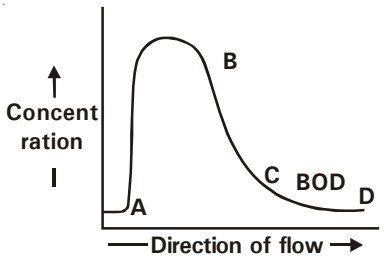
(1) Microbes are diverse– protozoa, bacteria & fungi
(2) All microbes can be artifically cultured & their colonies are visible to naked eye
(3) Several microbes are useful to man in diverse ways
(4) Microbes are not visible to naked eye as these are less than 0.1 mm

128. In the given diagram of the bioreactor, what are the functions of A and E respectively.



(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.

129. If the curve in the following graph represents changing BOD, addition of untreated sewage to river water is indicated at point



(1) A
(2) B
(3) C
(4) D

130. Which one of the following produces nitrogen fixing nodules on the rocts of *Alnus* ?

(1) *Rhizobium*
(2) *Frankia*
(3) *Rhodospirillum*
(4) *Beijernickia*

131. **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

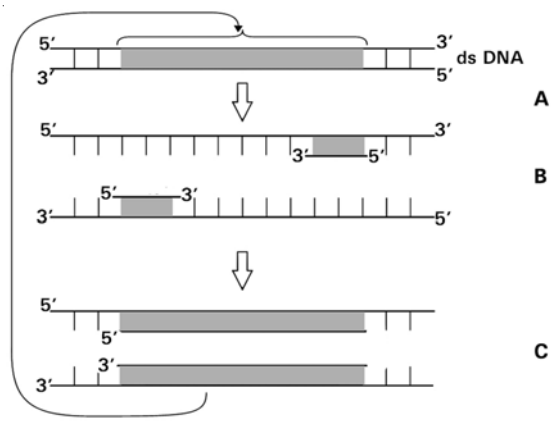
132. Competent host among the following is

(1) *E .coli*
(2) Yeast, animal, plant cell
(3) *Agrobacterium tumefaciens*
(4) Both 1 and 2

133. Biolistics (gene-gun) is suitable for

(1) DNA finger printing
(2) Disarming pathogen vectors
(3) Transformation of plant cells
(4) Constructing recombinant DNA by joning with vectors

134. The figrues a, b and c are of polymjerase chain reaction. Select the option giving correct identication



(1) B–denaturation at temperature of 98°C separating the two strands

(2) A–denaturation at temperature of 50°C

(3) C–extension in the presence of heat stable DNA polymerase

(4) A–annealing with two sets of primers

135. Which of the following restriction enzymes are used in rDNA technology?

(1) 5' G–G–A–A 3' / 3' A–A–G–G 5'

(2) 3' GTC GAC 5' / 5' CAG CTG 3'

(3) 3' G AATTC 5' / 5' C TTAA G 3'

(4) 3' G GCCAA 5' / 5' C CGGT T 3'

ZOOLOGY : SECTION-B

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

136. Sterlisation is done in the bioreactor

a. when it is empty

b. after it is filled with nutrient medium

c. after the addition of inoculum.

d. after every 24 hours to prevent contamination

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

137. Identify the correct sequence in which the enzymes/chemicals are used to isolate DNA from bacteria for r-DNA technology
(1) Cellulase–chilled ethanol–RNase
(2) Lysozyme–RNase–chilled ethanol
(3) Cellulase–chitinase–lysozyme
(4) lysozyme–chitinase–chilled ethanol

138. Large holes in swiss cheese are due to
(1) Production of large amount of CO_2 by specific fungi
(2) Production of large amount of O_2 by bacterium
(3) Fermentation action of *Propionibacterium Sharmani*
(4) Both (1) and (3)

139. EFB stands for
(1) European Foundation of Biology
(2) European Federation of Biotechnology
(3) European Foundation of Biostat
(4) European Federation of Biology

140. **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

141. Genetically modified plants have been useful in many ways except
(1) made the crops more tolerant to abiotic stress
(2) increased reliance on chemical pesticide
(3) help to reduce post harvest losses
(4) enhance nutritional value of food

142. The Biochemical oxygen demand test measures
(1) Rate of uptake of CO_2 by micro-organisms
(2) Directly organic matter present in water
(3) Oxygen consumption by bacteria for digestion of organic matter in 1 litre of water
(4) Inorganic matter in 1 litre of water

143. 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 bactria	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

144. *Nucleopolyhedrovirus* are excellent candidates as insecticidal applications as these are
(1) Species specific
(2) No negative impact on non target insects
(3) narrow spectrum
(4) All of these

145. Transgenic animals are created to study all of the following except
(1) regulation and functions of genes
(2) study of diseases
(3) to obtain biological products
(4) diagnostics

146. Which one of the following statements is false?
(1) Baker's yeast is used for bread making
(2) *Saccharomyces cerevisiae* is brewer's yeast
(3) Toddy is produced by the fermentation of cereals
(4) none is false

147. Spooling is
(1) Cutting of separated DNA bands from the agarose gel
(2) Transfer of separated DNA fragments to synthetic membranes
(3) Collection of isolated DNA
(4) Amplification of DNA

148. **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

149. 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

150. With regard to insulin choose correct options
a. C-peptide is not present in mature insulin
b. The insulin produced by rDNA technology has C-peptide
c. The pro-insulin has C-peptide
d. A-peptide and B-peptide of insulin are interconnected by disulphide bridges
(1) a & d only
(2) b & c only
(3) a, c & d only
(4) a & d only

BOTANY : SECTION-A

All questions are compulsory in section A

151. CPCB stands for
(1) Central Prevention & Conservation of Biodiversity
(2) Central Pollution Control Board
(3) Central Pollution & Conservation Board
(4) Central Prevention & Conservation of Biodiversity

152. Which of the given events can lead to desertification?
a. Unrestricted grazing
b. Poor irrigation practice
c. Afforestation
d. Over-cultivation
(1) a & b only
(2) a, b & c only
(3) all except c
(4) all of these

153. Which of the following correctly represent interaction between clown fish and sea anemone?
(1) +, –
(2) +, +
(3) +, 0
(4) –, 0

154. Which of these is not an *ex situ* conservation strategy?
(1) Gene banks
(2) Sacred Lakes
(3) Pollen banks
(4) Tissue culture

155. Bharat stage IV was implemented on 4 wheelers throughout the country since
(1) April 2010
(2) April 2017
(3) May 2017
(4) April 2015

156. 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%

157. The salinity of some hypersaline lagoons is
(1) Less than 5%
(2) 30%–35%
(3) More than 100%
(4) Less than 50%

158. Detritus food chain (DFC) begins with dead organic matter and is made up of decomposers which
(1) are heterotrophic organisms mainly fungi and bacteria
(2) meet their energy and nutrient requirements by degrading detritus
(3) secrete digestive enzymes that breakdown dead & organic waste into simple inorganic materials
(4) all of these

159. The pyramid of biomass in a grassland ecosystem is
(1) upright
(2) inverted
(3) either upright or inverted
(4) irregular

160. Which of the following statements is incorrect w.r.t competition?
(1) Interspecific competition is a potent force in organic evolution
(2) Totally unrelated species could also compete for the same resource
(3) Resources need not be limiting for competition to occur
(4) Carnivores appear to be more adversely affected by competition than herbivores and plants

161. Identify A, B, C and D in the given statements correctly

Majority of (A) and nearly all (B) cannot maintain a constant internal environment. (C) lack the physiological ability that mammals have to deal with the high temperature of their habitat, but manage to keep their body temperature fairly constant by (D) means.

The correct match.
(1) A-Animals, C-Desert kangaroo rat
(2) A-plants, D-physiological
(3) C-desert lizards, D-physiological
(4) B-plants, D-behavioural

162. If '8' *Drosophila* in a laboratry population of '80' died during a week, the death rate in the population is _____ individuals per *Drosophila* per week
(1) 0.1
(2) 10
(3) 1.0
(4) zero

163. Which of the following statement is correct w.r.t energy flow?
(1) sun is the only source of energy for all ecosystems on Earth
(2) ecosystems are exempted from Second Law of thermodynamics
(3) measurement of biomass in terms of fresh weight is more accurate
(4) in an aquatic ecosystem, GFC is the major conduit for energy flow

164. In India, varieties of mango are
(1) 10000
(2) 1000
(3) 100000
(4) 50000

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. *Opuntia* shows adjustment to desert conditions by having
(1) flattened stems
(2) CAM pathway
(3) leaves reduced to spines
(4) all the above

167. Scientifically sound estimate made by Robert May places the global species diversity at about
(1) 7 million
(2) 17 million
(3) 3 million
(4) 12 million

168. In any growing population, the most of the contribution is of
(1) post-reproduction members
(2) reproductive members
(3) pre-reproductive members
(4) all of the above

169. **Statement-I** : Keoladeo National park is located in Bharatpur.

Statement-II : Homeostasis is mantainence of constant internal environment despite varying external 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

170. 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 only

(4) both (1) & (2)

171. Tropics support greater biodiversity because

(1) of moist and dry environment

(2) they have less seasonal and relatively more constant environment

(3) they provide long evolutionary time for species diversification

(4) both 2 and 3

172. Catalytic converters are fitted into automobiles to reduce emission of harmful gases. Catalytic converters change unburnt hydrocarbons into

(1) CO_2 and water

(2) CO

(3) methane

(4) CO and methane

173. Net primary productivity can be defined as

(1) total assimilatory energy

(2) productivity at producer level

(3) gross primary productivity – energy lost in respiration

(4) gross primary productivity + energy produced in respiration

174. Which is incorrect w.r.t species-area relationships?

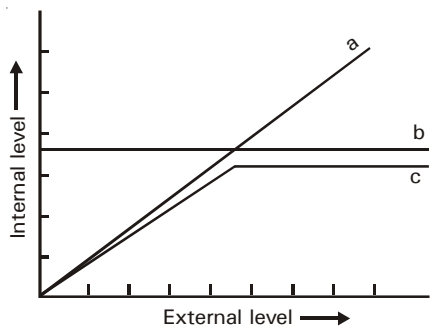
(1) Species richness increased with increasing area but upto a certain limit

(2) Regression cofficient is generally 0.1-2.0 regardless to taxonomic group or region

(3) $S = CA^z$

(4) For a very large area e.g. whole continent, slope of the line becomes steeper

175. Identify a, b & c in the given fibure



(1) a–conformers,b–partial regulators,c–regulators

(2) a–conformers,b–regulators,c–partial regulators

(3) a–regulators,b–partial regulators,c–conformers

(4) a–partial regulators,b–conformers,c–regulators

176. Which statement is correct?

(1) Decomposers donot contribute to phosphorus cycle

(2) Soil obtained from lake or ocean bed is good source of phosphorous

(3) The natural reservoir of phosphorus is ocean which contains phosphorus in the form of phosphates

(4) Lot of atmospheric inputs of phosphorus occur through rainfall.

177. In which year was the air (prevention and control of pollution) act amended to include noise as an air pollutant?

(1) 1980

(2) 1987

(3) 1990

(4) 1992

178. In the rivet popper hypothesis, rivet are compared with

(1) ecosystem

(2) species

(3) flight

(4) ecosystem functions

179. **Assertion** : In regions of high latitude or altitude, complete decomposition of detritus may require several years or decades.

Reason : Low temperature i.e. $< 10^{\circ}C$ sharply reduces the decomposition rate even if moisture is in plenty.

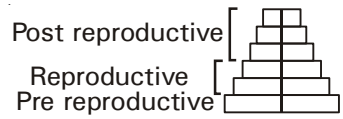
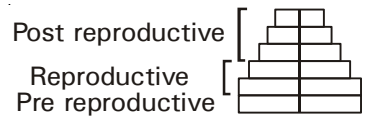
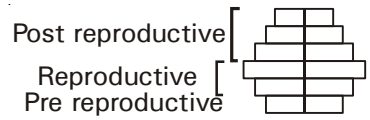
(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion

(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

180. Match representation of age pyramids for human population in column-I with their growth status in colmun-II.

Column I	Column II
a. 	p.expanding
b. 	q. declining
c. 	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

181. National Forest Policy (1988) of India has recommended forest cover for the plains and hills respectively

(1) 67% and 33%

(2) 30% and 70%

(3) 33% and 67%

(4) 70% and 30%

182. Homeostasis is

(1) tendency of biological systems to change with change in environment

(2) tendency of biological systems to resist change

(3) disturbance of self regulatory system and natural controls

(4) biotic materials used in homeopathic medicines

183. Select the incorrect statement w.r.t. "Terror of Bengal".

(1) They are world's most problematic aquatic weed

(2) Grow abundantly in eutrophic water bodies

(3) Helps in maintaining ecosystem dynamics

(4) These were introduced into India for beautiful flowers and shape of leaves

184. Snow blindness occurs when eye absorbs

(1) UV-B radiation

(2) bright sun light

(3) dust particles

(4) Smog

185. Which of the following set includes the organisms at same trophic level?

(1) sparrow, lion,wolf

(2) zooplanktons,grasshopper and cow

(3) birds , man and fishes

(4) trees, zooplanktons and grasses

BOTANY : SECTION-B

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

186. In the following food chain, energy available to lion is _____ if energy available at level of cow is 10 kJ.

Grass $\rightarrow$ Cow $\rightarrow$ Lion

(1) 1000 J

(2) 100 J

(3) 10 J

(4) 10000 J

187. Joint Forest Management (JFM) was introduced by goverment of India, in 1980, it involves

(1) participation of local communities for protection and management of forests

(2) establishment of a commitee of officials

(3) joining all forest management organisations

(4) all of these

188. 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

189. The wasp pollinates the fig inflorescence while searching for suitable egg-laying sites. In return for the favour of pollination the fig offers the wasp some of its developing seeds, as food for the developing wasp larvae. Such population interaction belong to_____

(1) Commensalism
(2) Mutualism
(3) Amensalism
(4) Parasitism

190. Bioprospecting is study of diversity of economically important organisms at

(1) molecular level
(2) genetic level
(3) species level
(4) all of these

191. Which one is not the limitation of an ecological pyramid?

(1) providing place to saprophytes
(2) accomodation of a food web
(3) considering that same species may belong to two or more trophic levels
(4) explaining energy relationship between organisms

192. Without green house effect the average temperature at surface of earth would have been

(1) $-28^{\circ}C$
(2) $-8^{\circ}C$
(3) $-18^{\circ}C$
(4) $-12^{\circ}C$

193. Series of changes on previously barren area where no living organism ever existed is

(1) Sere
(2) Climatic climax
(3) Primary succession
(4) Secondary succession

194. **Statement-I** : Many freshwater animals cannot live for long in sea water.

Statement-II : It is because of the osmotic problems faced by these organisms.

(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

195. Who have recently tried to put price tags on nature's life support services?

(1) Herbert Boyer and his colleagues
(2) Nile Perch and his colleagues
(3) Ram Deo Misra and his colleagues
(4) Robert Constanza and his colleagues

196. Ozone hole over Antarctica develops each year between

(1) Late August and early October
(2) Late September and early December
(3) Early March and late July
(4) Late July and early August

197. **Assertion** : Alien species invasion is one of the important causes of biodiversity loss.

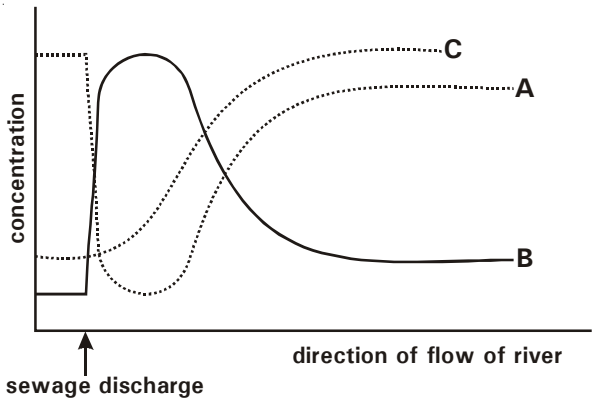
Reason : Introduction of African Catfish in the aquatic ecosystems has threatened indigenous catfishes in rivers.

(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

198. What parameters are used for tiger census in our country's national parks and sanctuaries?

(1) Pug marks only
(2) Pug marks and faecal pellets
(3) Faecal pellets only
(4) Actual head counts

199.



Which of the curves in the graph above 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

200. Which of the following is incorrect ?

(1) Montreal protocol was signed in 1987

(2) Interaction between *Calotropis* and its herbivore is commensalism

(3) Crop –field is a man–made ecosystem

(4) Sacred groves are found in bastar area of Madhya pradesh

Space for rough work

Space for rough work