MOCK TEST PAPER 4

General Instructions: **Same as Mock Test Paper 1**

PHYSICS

Section A

1. A motor cyclist going round in a circular track at constant speed has
(a) Constant linear velocity **(b)** Constant acceleration
(c) Constant angular velocity **(d)** Constant force

2. Forty electric bulbs are connected in series across 220 V supply. After one bulb is fused the remaining 39 are connected again in series across the same potential. The illumination will be:
(a) more with 40 bulbs than with 39 bulbs
(b) more with 39 bulbs than with 40 bulbs
(c) equal in both cases
(d) in ratio $40^2 : 39^2$

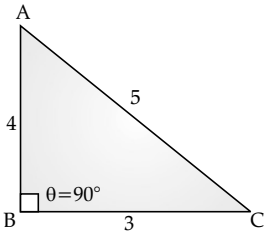
3. A balloon with mass 'm' is descending down with an acceleration 'a' where $a < g$. How much mass should be removed from it so that it starts moving up with an acceleration 'a'?
(a) $2ma/(g + a)$ **(b)** $2ma/(g - a)$ **(c)** $ma/(g + a)$ **(d)** $ma/(g - a)$

4. A ball is allowed to fall from a height of 10 m. If there is 40% loss of energy due to impact, then after one impact ball will go up to:
(a) 10 m **(b)** 8 m **(c)** 4 m **(d)** 6 m

5. A sound wave has frequency 500 Hz and velocity 360 m/s. What is the distance between two particles having phase difference of 60°?
(a) 0.7 cm **(b)** 12.0 cm **(c)** 70 cm **(d)** 120.0 cm

6. A plano convex lens (μ_1) fits exactly into a plano concave lens (μ_2). Their plane surfaces are parallel to each other. If R is the radius of curvature of the curved surface of the lenses, then the focal length of combination is:
(a) $\frac{2R}{(\mu_2 - \mu_1)}$ **(b)** $\frac{R}{2}(\mu_2 + \mu_1)$ **(c)** $\frac{R}{2}(\mu_1 - \mu_2)$ **(d)** $\frac{R}{\mu_1 - \mu_2}$

7. ABC is a triangular plate of uniform thickness. The sides are in the ratio as shown in the figure. I_{AB}, I_{BC} and I_{CA} are the moments of inertia of the plate about AB, BC and CA axes respectively. Which one of the following relations is correct?

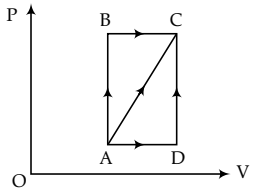


(a) $I_{AB} > I_{BC}$ **(b)** $I_{BC} > I_{AB}$
(c) $I_{AB} + I_{BC} = I_{CA}$ **(d)** I_{CA} is maximum

8. A bullet of mass 2 g is having a charge of 2 μC. Through what potential difference must it be accelerated, starting from rest, to acquire a speed of 10 m/s.
(a) 5 kV **(b)** 50 kV **(c)** 5 V **(d)** 50 V

9. Electrons of mass m with de Broglie wavelength λ fall on the target in an X-ray tube. The cutoff wavelength λ_0 of the emitted X-ray is:
(a) $\lambda_0 = 2mc\lambda^2/h$ **(b)** $\lambda_0 = 2h/mc$
(c) $\lambda_0 = 2m^2c^2\lambda^3/h^2$ **(d)** $\lambda_0 = \lambda$

10. A thermodynamic process is shown in the figure. The pressures and volumes corresponding to some points in the figure are:



$P_A = 3 \times 10^4$ Pa, $P_B = 8 \times 10^4$ Pa and $V_A = 2 \times 10^{-3}$ m^3, $V_D = 5 \times 10^{-3}$ m^3. In process AB, 600 J of heat is added to the system and in process BC, 200 J of heat is added to the system. The change in internal energy of the system in process AC would be:
(a) 560 J **(b)** 800 J **(c)** 600 J **(d)** 640 J

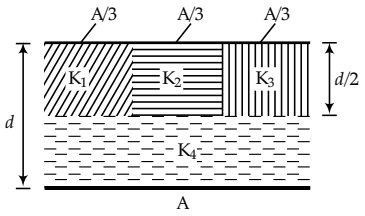
11. A man is sitting with folded hands on a revolving table. Suddenly, he stretches his arms. Angular speed of the table would:
(a) increase **(b)** decrease
(c) remain the same **(d)** nothing can be said

12. A man pushes a wall but fails to displace it, he does
(a) negative work **(b)** positive work
(c) no work at all **(d)** maximum positive work

13. When one electron is taken towards another electron, then the electric potential energy of the system
(a) Decreases **(b)** Increases
(c) Remains unchanged **(d)** Becomes zero

14. Two spherical nuclei have mass numbers 216 and 64 with their radii R_1 and R_2 respectively. The ratio, R_1/R_2 is equal to:
(a) 3 : 2 **(b)** 1 : 3 **(c)** 1 : 2 **(d)** 2 : 3

15. A parallel-plate capacitor of area A, plate separation d and capacitance C is filled with four dielectric materials having dielectric constants K_1, K_2, K_3 and K_4 as shown in the figure. If a single dielectric material is to be used to have the same capacitance C in this capacitor, then its dielectric constant K is given by:



(a) $K = K_1 + K_2 + K_3 + 3K_4$

(b) $K = \left(\frac{2}{3}\right)(K_1 + K_2 + K_3) + 2K_4$

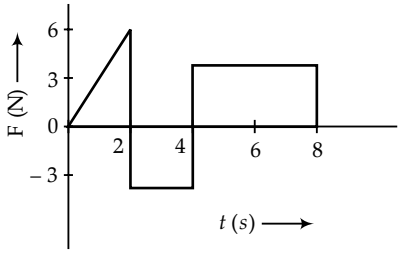
(c) $\frac{2}{K} = \frac{3}{K_1 + K_2 + K_3} + \frac{1}{K_4}$

(d) $\frac{1}{K} = \frac{1}{K_1 + 1K_2} + \frac{1}{K_3} + \frac{3}{2K_4}$

16. A body is displaced from (0, 0) to (1 m, 1 m) along the path $x = y$ by a force $F = x^2 j + yi$. The work done by this force will be:

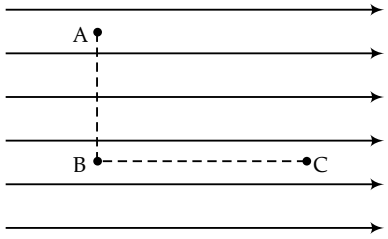
(a) $\frac{4}{3}$J **(b)** $\frac{5}{6}$J **(c)** $\frac{3}{2}$J **(d)** $\frac{7}{5}$J

17. The force 'F' acting on a particle of mass 'm' is indicated by the force-time graph shown below. The change in momentum of the particle over the time interval from zero to 8 s is:



(a) 12 Ns **(b)** 6 Ns **(c)** 24 Ns **(d)** 20 Ns

18. Figure shows three points A, B and C in a region of uniform electric field E. The line AB is perpendicular and BC is parallel to the field lines. Then which of the following holds good. Where V_A, V_B and V_C represent the electric potential at points A, B and C respectively:



(a) $V_A = V_B = V_C$ **(b)** $V_A = V_B > V_C$

(c) $V_A = V_B < V_C$ **(d)** $V_A > V_B = V_C$

19. The photoelectric threshold wavelength for potassium (work function being 2 eV) is:

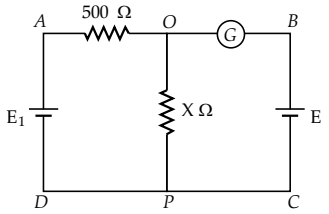
(a) 310 nm **(b)** 620 nm **(c)** 1200 nm **(d)** 2100 nm

20. The composition of two simple harmonic motions of equal periods at right angles to each other and with a phase difference of π results in the displacement of the particle along:

(a) circle **(b)** figure of eight

(c) straight line **(d)** ellipse

21. In the adjoining circuit, the battery E_1 has an emf of 12 volt and zero internal resistance, while the battery E has an emf of 2 volt. If the galvanometer reads zero, then the value of resistance X ohm is:



(a) 10 **(b)** 100 **(c)** 500 **(d)** 200

22. A radiation of energy E falls normally on a perfectly reflecting surface. The momentum transferred to the surface is:
[c = Velocity of light]

(a) $\frac{E}{c^2}$ **(b)** $\frac{E}{c}$ **(c)** $\frac{2E}{c}$ **(d)** $\frac{2E}{c^2}$

23. The energy equivalent of one atomic mass unit is:

(a) 1.6×10^{-19} J **(b)** 6.02×10^{23} J

(c) 931 MeV **(d)** 9.31 MeV

24. Three forces F_1, F_2 and F_3 acting on a particle of mass m keep it in equilibrium. Forces F_1 and F_2 are mutually perpendicular. Suddenly the force F_3 is removed. Then the acceleration of the particle is of magnitude:

(a) $\frac{F_1 + F_2}{m}$ **(b)** $\frac{F_1 - F_2}{m}$ **(c)** $\frac{F_1}{m}$ **(d)** $\frac{\sqrt{F_1^2 + F_2^2}}{m}$

25. A particle has initial velocity and acceleration $3\hat{i} + 4\hat{j}$ and $0.4\hat{i} + 0.3\hat{j}$ respectively. Its speed after 10 s is:

(a) 7 unit **(b)** $7\sqrt{2}$ unit **(c)** 8.5 unit **(d)** 10 unit

26. The ratio of wavelengths of the last line of Balmer series and the last line of Lyman series is:

(a) 1 **(b)** 4 **(c)** 0.5 **(d)** 2

27. A rain drop of radius 0.3 mm falls through air with a terminal velocity of 1 ms^{-1}. The viscosity of air is 18×10^{-5} poise. Find the viscous force on the rain drop.

(a) 1.018×10^{-2} dyne **(b)** 10.18×10^{-2} dyne

(c) 101.8×10^{-2} dyne **(d)** 1.018×10^{-6} dyne

28. At the surface of a certain planet acceleration due to gravity is one quarter of that on earth. If a brass ball is transported to this planet, then which one of the following statements is not correct?

(a) The mass of the brass ball on this planet is a quarter of its mass as measured on the earth.

(b) The weight of the brass ball on this planet is a quarter of the weight as measured on the earth.

(c) The brass ball has same mass on the another planet as on the earth.

(d) The brass ball has the same volume on the other planet as on earth.

29. The length of the string of a simple pendulum is measured with a meter scale, is found to be 92.0 cm, the radius of the bob plus the hook is measured with the help of vernier calliper to be 2.17 cm. Mark out the correct statement.

(a) Least count of meter scale is 0.1

(b) Least count of vernier calliper is 0.01 cm

(c) Effective length of simple pendulum is 94.2 cm

(d) All of the above

30. A transverse wave propagating along x-axis is represented by $y(x, t) = 8.0 \sin (0.5\pi x - 4\pi t - \pi/4)$,
where x is in metres and t is in seconds. The speed of the wave is:

(a) π/4 m/s **(b)** 4π m/s **(c)** 0.5π m/s **(d)** 8 m/s

31. The approximate depth of an ocean is 2700 m. The compressibility of water is 45.4×10^{-11}/Pa and density of water is 10^3 kg/m^3. What fractional compression of water will be obtained at the bottom of the ocean?
(a) 0.8×10^{-2} **(b)** 1.0×10^{-2} **(c)** 1.2×10^{-2} **(d)** 1.4×10^{-2}

32. When a body is projected at an angle with the horizontal in the uniform gravitational field of the Earth, the angular momentum of the body about the point of projection, as it proceeds along the path
(a) Remains constant
(b) Increases
(c) Decreases
(d) Initially decreases and after its highest point increases

33. An air bubble in a glass slab with refractive index 1.5 (near normal incidence) is 5 cm deep when viewed from one surface and 3 cm deep when viewed from the opposite face. The thickness (in cm) of the slabs:
(a) 8 **(b)** 10 **(c)** 12 **(d)** 16

34. The depletion layer in the *p-n* junction region is caused by:
(a) drift of holes
(b) diffusion of charge carriers
(c) migration of impurity ions
(d) driff of electrons

35. The period of oscillation of a bar magnet is 4 s. The period of oscillation of another bar magnet whose magnetic moment is 4 times that of the former is
(a) 4 s **(b)** 3 s **(c)** 2 s **(d)** 1 s

Section B

36. Two satellites of Earth, S_1 and S_2, are moving in the same orbit. The mass of S_1 is four times the mass of S_2. Which one of the following statements is true?
(a) The potential energies of Earth satellites in the two cases are equal.
(b) S_1 and S_2, are moving with the same speed.
(c) The kinetic energies of the two satellites are equal.
(d) The time period of S_1 is four times that of S_2.

37. The photoelectric threshold wavelength of silver is 3250×10^{-10} m. The velocity of the electron ejected from a silver surface by ultraviolet light of wavelength 2536×10^{-10} m is:
[Given $h = 4.14 \times 10^{-15}$ eV and $c = 3 \times 10^8$ m/s]
(a) 6.0×10^6 m/s **(b)** 61×10^3 m/s
(c) 0.3×10^6 m/s **(d)** 6×10^5 m/s

38. The radius of a satellite revolving in a circular orbit with a time period T is R. The radius of a satellite revolving in a circular orbit with time period 27T will be
(a) 3 R **(b)** 6 R **(c)** 9 R **(d)** 15 R

39. When a weight of 10 kg is suspended from a copper wire of length 3 m and diameter 0.4 mm. Its length increases by 2.4 cm. If the diameter of the wire is doubled, then the extension in its length will be:
(a) 7.6 cm **(b)** 4.8 cm **(c)** 1.2 cm **(d)** 0.6 cm

40. A straight wire of diameter 0.5 mm carrying a current of 1 A is replaced by another wire of 1 mm diameter carrying same current. The strength of magnetic field far away is:
(a) twice the earlier value.
(b) same as earlier value.
(c) one-half of the earlier value.
(d) one-quarter of the earlier value.

41. Two concentric loops of radius R_1 and R_2 lie in same plane ($R_2 > R_1$). The current in outer loop is clockwise and increasing with time. The induced current in inner loop is
(a) clockwise **(b)** anti-clockwise
(c) zero **(d)** none of these

42. A circular ring of diameter 20 cm has a resistance of 0.01 Ω. How much charge will flow through the ring if it is rotated from a position perpendicular to a uniform magnetic field of B = 2 T to a position parallel to field?
(a) 4 C **(b)** 6.28 C **(c)** 3.14 C **(d)** 2.5 C

43. L, C, R denote inductance, capacitance and resistance. Pick out the combination which does not have the dimension of frequency.
(a) $\frac{1}{RC}$ **(b)** $\frac{R}{L}$ **(c)** $\frac{1}{\sqrt{LC}}$ **(d)** $\frac{C}{L}$

44. An alternating EMF $E= 200\sqrt{2}$ sin $(100t)$ is connected to a 1 μF capacitor through an AC ammeter. The reading of ammeter is
(a) 10 mA **(b)** 20 mA **(c)** 40 mA **(d)** 80 mA

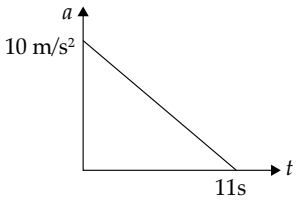
45. In double slit experiment, for which colour of light the fringe width will be minimum
(a) violet **(b)** red **(c)** green **(d)** yellow

46. In YDSE setup, an interference pattern is obtained for λ = 6000 Å coming from two coherent source S_1 and S_2. At certain point on the screen third dark fringe is formed. The path difference $S_1P - S_2P$ is
(a) 1.5 μm **(b)** 0.75 μm **(c)** 3.0 μm **(d)** 4.5 μm

47. The angle of polarisation for a medium is 60°, find the critical angle for this medium?
(a) $\sin^{-1}\sqrt{3}$ **(b)** $\tan^{-1}\sqrt{3}$
(c) $\cos^{-1}\sqrt{3}$ **(d)** $\sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$

48. A 2 μF capacitor is charged to 100 V and then its two plates are connected by a conduting wire. The heat produced in the wire is
(a) 0.001 J **(b)** 0.1 J **(c)** 1 J **(d)** 0.01 J

49. A particle starts from rest. Its acceleration versus time graph is shown in figure.



The maximum speed of the particle is
(a) 110 m/s **(b)** 55 m/s **(c)** 550 m/s **(d)** 660 m/s

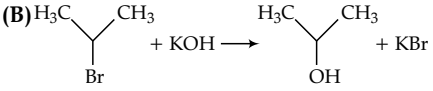
50. Water rises to a height of 20 mm in a capillary. If the radius of capillary is made one fourth, then the new value of height will be
(a) 10 mm **(b)** 40 mm **(c)** 5 mm **(d)** 80 mm

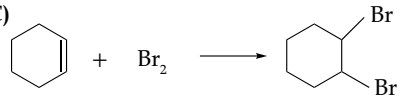
CHEMISTRY

Section A

51. The orbital angular momentum for an electron revolving in an orbit is given by $\sqrt{l(l+1)}.\frac{h}{2\pi}$. This momentum for an s-electron will be given by
(a) zero **(b)** $\frac{h}{2\pi}$ **(c)** $\sqrt{2}.\frac{h}{2\pi}$ **(d)** $+\frac{1}{2}.\frac{h}{2\pi}$

52. For the following reactions:
(A) $CH_3CH_2CH_2Br + KOH \rightarrow CH_3CH = CH_2 + KBr + H_2O$

(B) 

(C) 

Which of the following statements is correct?
(a) **(A)** is elimination, **(B)** and **(C)** are substitution reactions.
(b) **(A)** is substitution, **(B)** and **(C)** are addition reactions.
(c) **(A)** and **(B)** are elimination reactions and **(c)** is addition reaction.
(d) **(A)** is elimination, **(B)** is substitution and **(C)** is addition reaction.

53. In which pair of ions both the species contain S-S bond?
(a) $S_2O_7^{2-}$, $S_2O_2^{2-}$ **(b)** $S_4O_6^{2-}$, $S_2O_3^{2-}$
(c) $S_2O_7^{2-}$, $S_2O_8^{2-}$ **(d)** $S_4O_6^{2-}$, $S_2O_7^{2-}$

54. A mixture of 2.3 g formic acid and 4.5 g oxalic acid is treated with conc. H_2SO_4. The evolved gaseous mixture is passed through KOH pellets. Weight (in g) of the remaining product at STP will be:
(a) 1.4 **(b)** 3.0 **(c)** 2.8 **(d)** 4.4

55. With respect to the conformers of ethane, which of the following statements is true?
(a) Bond angles remains same but bond length changes.
(b) Bond angle changes but bond length remains same.
(c) Both bond angle and bond length change.
(d) Both bond angle and bond length remain same.

56. Which one of the following statements is correct when SO_2 is passed through acidified $K_2Cr_2O_7$ solution?
(a) SO_2 is reduced.
(b) Green $Cr_2(SO_4)_3$ is formed.
(c) The solution turns blue.
(d) The solution is decolourized.

57. Two electrons occupying the same orbital are distinguished by:
(a) azimuthal quantum number
(b) spin quantum number
(c) principal quantum number
(d) magnetic quantum number

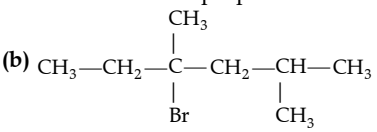
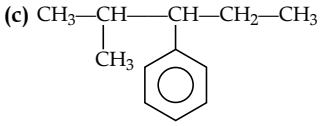
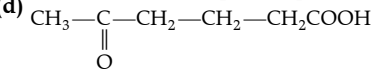
58. Clemmensen reduction of ketone is carried out in the presence of ...
(1) H_2 and Pt as catalyst **(2)** Glycol with KOH
(3) Zn-Hg with HCl **(4)** LiAlH

59. Maximum bond angle at nitrogen is present in which of the following?
(a) NO_2^+ **(b)** NO_3^- **(c)** NO_2 **(d)** NO_2^-

60. The increasing order of atomic radii of the following group 13 elements is:
(a) Al < Ga < In < Tl **(b)** Ga < Al < In < Tl
(c) Al < In < Ga < Tl **(d)** Al < Ga < Tl < In

61. When copper is heated with conc. HNO_3 it produces :
(a) $Cu(NO_3)_2$, NO and NO_2 **(b)** $Cu(NO_3)_2$ and N_2O
(c) $Cu(NO_3)_2$ and NO_2 **(d)** $Cu(NO_3)_2$ and NO

62. For a sample of perfect gas when its pressure is changed isothermally from p_i to p_f, the entropy change is given by:
(a) $\Delta S = nR \ln\left(\frac{P_f}{P_i}\right)$ **(b)** $\Delta S = nR \ln\left(\frac{P_i}{P_f}\right)$
(c) $\Delta S = nRT \ln\left(\frac{P_f}{P_i}\right)$ **(d)** $\Delta S = RT \ln\left(\frac{P_i}{P_f}\right)$

63. Which nomenclature is not according to IUPAC system?
(a) $Br - CH_2 - CH = CH_2$
1-bromo prop 2-ene
(b) 
4-bromo 2, 4 dimethyl hexane
(c) 
2-methyl-3-phenyl pentane
(d) 
5-oxohexanoic acid

64. Which among the following is the most reactive?
(a) Cl_2 **(b)** Br_2 **(c)** I_2 **(d)** ICl

65. (I) $H_2O_2 + O_3 \rightarrow H_2O + 2O_2$
(II) $H_2O_2 + Ag_2O \rightarrow 2Ag + H_2O + O_2$
Role of hydrogen peroxide in the above reaction is respectively:
(a) Oxidizing in **(I)** and reducing in (II)
(b) Reducing in **(I)** and oxidizing in (II)
(c) Reducing in **(I)** and (II)
(d) Oxidizing in **(I)** and (II)

66. P_A and P_B are the vapour pressure of pure liquid components A and B, respectively of an ideal binary solution. If χ_A represents the mole fraction of component A, the total vapour pressure of the solution will be:
(a) $p_A + \chi_A (p_B - p_A)$ **(b)** $p_A + \chi_A (p_A - p_B)$
(c) $p_B + \chi_A (p_B - p_A)$ **(d)** $p_B + \chi_A (p_A - p_B)$

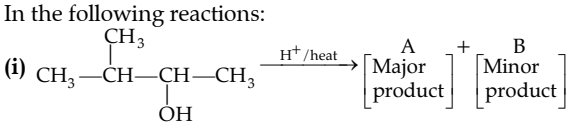
67. Nitrobenzene on reaction with conc. HNO_3/H_2SO_4 at 80–100°C forms which one of the following products ?
(a) 1, 2-dinitrobenzene **(b)** 1, 3-dinitrobenzene
(c) 1, 4-dinitrobenzene **(d)** 1, 2, 4-trinitrobenzene

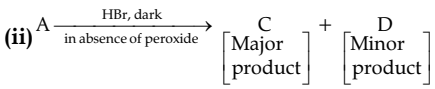
68. The K_{sp} of Ag_2CrO_4, AgCl, AgBr and AgI are respectively, 1.1×10^{-12}, 1.8×10^{-10}, 5.0×10^{-13}, 8.3×10^{-17}. Which one of the following salts will precipitate last if $AgNO_3$ solution is added to the solution containing equal moles of NaCl, NaBr NaI and Na_2CrO_4?
(a) AgBr **(b)** Ag_2CrO_4 **(c)** AgI **(d)** AgCl

69. Which of the following statement is incorrect about the reaction of ammonia derivatives with carbonyl compounds?
(a) pH of solution is maintained between 3 to 4.
(b) Addition of ammonia derivatives occurs followed by elimination of H_2O.
(c) At very low pH (less than 3) ammonia derivatives are protonated and do not act as nucleophile.
(d) At very high pH reaction becomes explosive.

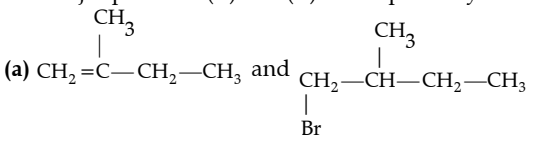
70. The activation energy for a simple chemical reaction, A → B is E_a, in forward direction.
The activation energy for reverse reaction:
(a) can be less than or more than E_a.
(b) is always double of E_a.
(c) is negative of E_a.
(d) is always less than E_a.

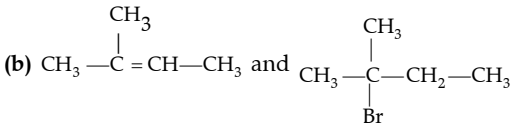
71. In the following reactions:

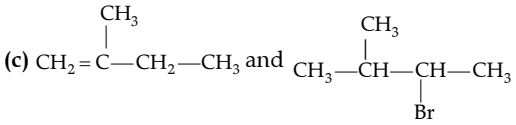
(i) 

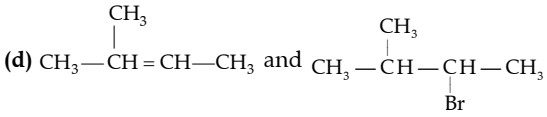
(ii) 

The major products (A) and (C) are respectively:

(a) 

(b) 

(c) 

(d) 

72. The values of K_{P1} and K_{P2} for the gaseous reactions

$$X \rightleftharpoons Y + Z \quad \ldots(i)$$

and $$A \rightleftharpoons 2B \quad \ldots(ii)$$

are in the ratio of 9 : 1. If degree of dissociation of X and A be equal, then total pressure at equilibrium (i) and (ii) are in the ratio:
(a) 3 : 1 **(b)** 1 : 9 **(c)** 36 : 1 **(d)** 1 : 1

73. The correct thermodynamic conditions for the spontaneous reaction at all temperatures is:
(a) $\Delta H < 0$ and $\Delta S > 0$ **(b)** $\Delta H < 0$ and $\Delta S < 0$
(c) $\Delta H > 0$ and $\Delta S > 0$ **(d)** $\Delta H > 0$ and $\Delta S < 0$

74. A solution of sucrose (molar mass = 342 g mol^{-1}) has been prepared by dissolving 68.5 g of sucrose in 1000 g of water. The freezing point of the solution obtained will be:
(K_f for water = 1.86 K kg mol^{-1})
(a) –0.372°C **(b)** –0.520°C **(c)** +0.372°C **(d)** –0.570°C

75. When a biochemical reaction is carried out in laboratory from outside of human body in the absence of enzyme, the rate of reaction obtained is 10^{-6} times, then activation energy of the reaction in the presence of enzyme is:
(a) $\frac{6}{RT}$
(b) P is required
(c) different from E_a obtained in laboratory
(d) cannot say anything

76. Zinc can be coated on iron to produce galvanized iron but the reverse is not possible. It is because:
(a) Zinc is lighter than iron.
(b) Zinc has lower melting point than iron.
(c) Zinc has lower negative electrode potential than iron.
(d) Zinc has higher negative electrode potential than iron.

77. In DNA, the complimentary bases are:
(a) adenine and guanine; thymine and cytosine.
(b) uracil and adenine; cytosine and guanine.
(c) adenine and thymine; guanine and cytosine.
(d) adenine and thymine; guanine and uracil.

78. Products of the following reaction:

$$CH_3C{\equiv}CCH_2CH_3 \xrightarrow[\text{(ii) Hydrolysis}]{\text{(i) } O_3} \ldots. \text{ are}$$

(a) $CH_3CHO + CH_3CH_2CHO$
(b) $CH_3COOH + CH_3COCH_3$
(c) $CH_3COOH + HOOC.CH_2CH_3$
(d) $CH_3COOH + CO_2$

79. Number of moles of MnO_4^- required to oxidize one mole of ferrous oxalate completely in acidic medium will be:
(a) 7.5 moles **(b)** 0.2 moles **(c)** 0.6 moles **(d)** 0.4 moles

80. Kohlrausch's law states that at:
(a) infinite dilution, each ion makes definite electrolyte, whatever be the nature of the other ion of the electrolyte.
(b) infinite dilution each, ion makes definite contribution to equivalent conductance of an electrolyte depending on the nature of the other ion of the electrolyte.
(c) infinite dilution, each ion makes definite contribution to conductance of an electrolyte, whatever be the nature of the other ion of the electrolyte.
(d) infinite dilution, each ion makes definite contribution to equivalent conductance of an electrolyte, whatever be the nature of the other ion of the electrolyte.

81. During osmosis, flow of water through a semipermeable membrane is:
(a) from solution having higher concentration only.
(b) from both sides of semipermeable membrane with equal flow rates.
(c) from both sides of semipermeable membrane with unequal flow rates.
(d) from solution having lower concentration only.

82. The ions O^{2-}, F^-, Na^+, Mg^{2+} and Al^{3+} are isoelectronic. Their ionic radii show:
(a) an increase from O^{2-} to F^- and then decrease from Na^+ to Al^{3+}.
(b) a decrease from O^{2-} to F^- and then increase from Na^+ to Al^{3+}.
(c) a significant increase from O^{2-} to Al^{3+}.
(d) a significant decrease from O^{2-} to Al^{3+}.

83. Which of the following reactions will not result in the formation of carbon-carbon bonds?
(a) Friedel-Craft's acylation
(b) Reimer-Tiemann reaction
(c) Cannizzaro reaction
(d) Wurtz reaction

84. A buffer solution is prepared in which the concentration of NH_3 is 0.30 M and the concentration of NH_4^+ is 0.20 M. If the equilibrium constant, K_b for NH_3 equals 1.8×10^{-5}, what is the pH of this solution? (log 2.7 = 0.43)
(a) 9.43 **(b)** 11.72 **(c)** 8.73 **(d)** 9.08

85. The product formed by the reaction of an aldehyde with a primary amine is:
(a) carboxylic acid **(b)** aromatic acid
(c) Schiff's base **(d)** ketone

Section B

86. "Metals are usually not found as nitrates in their ores." Out of the following two (I and II) reasons which is/are true for the above observation?

I. Metal nitrates are highly unstable

II. Metal nitrates are highly soluble in water.

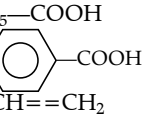
(a) I and II are true **(b)** I and II are false

(c) I is false but II is true **(d)** I is true but II is false

87. Which one of the following sets forms the biodegradable polymer?

(a) $CH_2{=}{=}CH{-}CN$ and $CH_2{=}{=}CH{-}CH{=}{=}CH_2$

(b) $H_2N{-}CH_2{-}COOH$ and $H_2N{-}(CH_2)_5{-}COOH$

(c) $HO{-}CH_2{-}CH_2{-}OH$ and 

(d)  and $CH_2{=}{=}CH{-}CH{=}{=}CH_2$

88. Acetic acid exist in dimer state in benzene due to:

(a) Condensation reaction

(b) Hydrogen bonding

(c) Presence of carbonyl group

(d) Strong polar nature

89. Choose the incorrect statement from the options given below.

(a) Specific conductance of an electrolytic solution decreases with dilution.

(b) Conductance of an electrolytic solution increases with dilution.

(c) Equivalent conductance of an electrolytic solution increases with dilution.

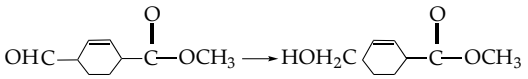
(d) Conductance of an electrolytic solution decreases with dilution.

90. When HCOOH acid is heated with conc. H_2SO_4, the gas evolved is:

(a) Only CO_2 **(b)** $CO + CO_2$

(c) $SO_2 + CO_2$ **(d)** CO

91. Which of the following reagent can be used in the given reaction?



(a) $LiAlH_4$ **(b)** $NaBH_4$ **(c)** DIBAL **(d)** H_2/Pt

92. Choose the incorrect statements from the given options below.

(a) Transition metals and their compounds are known for their catalytic activity because of their ability to adopt multiple oxidation states and to form complexes.

(b) Transition elements exhibit lower enthalpies of atomisation.

(c) Transition metals have low volatility.

(d) Transition metals because of similar radii and other characteristics, readily form alloys.

93. An alcohol A produces an alkene B on dehydration. Alkene B on ozonolysis produces two molecules of acetaldehyde. Identify alcohol A.

(a) butanol **(b)** ethanol

(c) 2-methyl propanol **(d)** butan-2-ol

94. Given below are two statements –

Statement I: Complexes of type MA_5B and MA_6 do not show geometrical isomerism.

Statement II: Coordination compounds having coordination number 6 do not exhibit geometrical isomerism.

Choose the correct answer from the options given below:

(a) Statement I is incorrect but statement II is true.

(b) Both statement I and statement II are true.

(c) Both statement I and statement II are false.

(d) Statement I is correct but statement II is false.

95. **Statement I:** Ethoxyethane on treatment with concentrated HI gives iodomethane and ethanol.

Statement II: The above reaction is carried by S_N2 mechanism.

Choose the correct answer from the options given below

(a) Statement I is incorrect but statement II is true.

(b) Both statement I and statement II are true.

(c) Both statement I and statement II are false.

(d) Statement I is correct but statement II is false.

96. Which of the following process has

$$\Delta S = \frac{\Delta H}{T}$$

(a) An adiabatic process.

(b) An isobaric process.

(c) An isothermal reversible process.

(d) A process for which $\Delta c_p = 0$.

97. Carboxylic acids have higher boiling points than aldehydes, ketones and even alcohols of comparable molecular mass. It is due to their:

(a) Formation of intramolecular H-bonding.

(b) Formation of carboxylate ion.

(c) Formation of intermolecular H-bonding.

(d) More extensive association of carboxylic acid via van der Waals force of attraction.

98. Choose the correct statement from the given options.

(a) The crystal field splitting Δ_o, depends upon the field produced by the ligand and charge on the metal ion.

(b) The crystal field theory is a model which considers the metal- ligand bond to be covalent in nature.

(c) CFT consider ligands as line charges in case of cations or dipoles in case of neutral molecules.

(d) Ligands are arranged in a series in the order of increasing field strength. Such series is termed as electrochemical series.

99. Which of the following complex species is not expected to exhibits optical isomerism?

(a) $[Co(en)(NH_3)_2Cl_2]$

(b) $[Co(en)_3]^{3+}$

(c) $[Co(en)_2Cl_2]$

(d) $[Co(NH_3)_3Cl_3]$

100. Match **List I** with **List II**

List I	List II
(a) Pathfunction	**(i)** At constant volume
(b) State function	**(ii)** Work
(c) $\Delta U = q$	**(iii)** Enthalpy
(d) $\Delta H = q$	**(iv)** At constant pressure

Choose the correct answer from the given options.

(a) **(a)**-(iii), **(b)**-(ii), **(c)**-**(i)**, **(d)**-(iv)

(b) **(a)**-(iv), **(b)**-**(i)**, **(c)**-(iii), **(d)**-(ii)

(c) **(a)**-(ii), **(b)**-(iii), **(c)**-**(i)**, **(d)**-(iv)

(d) **(a)**-**(i)**, **(b)**-(ii), **(c)**-(iii), **(d)**-(iv)

BOTANY

Section A

101. Which among the following is not a prokaryote ?
(a) *Nostoc* **(b)** *Mycobacterium*
(c) *Saccharomyces* **(d)** *Oscillatoria*

102. Arrange the following events of meiosis in correct sequence:
A. Crossing over
B. Synapsis
C. Terminalisation of chiasmata
D. Disappearance of nucleolus
(a) B, C, D, A **(b)** B, A, D, C
(c) B, A, C, D **(d)** A, B, C, D

103. In *Antirrhinum* (Snapdragon), a red flower was crossed with a white flower and in F_1 generation, pink flowers were obtained. When pink flowers were selfed, the F_2 generation showed white, red and pink flowers. Choose the incorrect statement from the following:
(a) Pink color in F_1 is due to incomplete dominance.
(b) Ratio of F_2 is 1/4 (Red) : 2/4 (Pink) : 1/4 (White)
(c) Law of Segregation does not apply in this experiment.
(d) This experiment does not following the Principle of Dominance.

104. Viruses have:
(a) DNA enclosed in a protein coat
(b) Prokaryotic nucleus
(c) Single chromosome
(d) Both DNA and RNA

105. A vascular cryptogam is:
(a) *Equisetum* **(b)** *Cedrus* **(c)** *Marchantia* **(d)** *Ginkgo*

106. The unequivocal proof of DNA as the genetic material came from studies on a:
(a) Viroid **(b)** Bacterial virus
(c) Bacterium **(d)** Fungus

107. Which of the given is medicinal plant of family *Liliaceae*?
(a) Aloe **(b)** Belladonna
(c) Ashwagandha **(d)** Mulaithi

108. Which of the given pair of hormones shows their synergistic effect on cell division?
(a) IAA and Cytokinin
(b) Ethylene and ABA
(c) IAA and GA_3
(d) Ethylene and Cytokinin

109. The motile bacteria are able to move by:
(a) Fimbriae **(b)** Flagella **(c)** Cilia **(d)** Pili

110. Aerobic respiratory pathway is approximately called:
(a) Anabolic **(b)** Catabolic
(c) Amphibolic **(d)** Parabolic

111. Match the following columns and select the correct option regarding placentation.

a. Marginal	**(i)** Lemon
b. Free central	**(ii)** Mustard
c. Axile	**(iii)** Pea
d. Parietal	**(iv)** Primrose

(a) a-(iii), b-**(i)**, c-(iv), d-(ii)
(b) a-(iv), b-(iii), c-**(i)**, d-(ii)
(c) a-(iii), b-(iv), c-(ii), d-**(i)**
(d) a-(iii), b-(iv), c-**(i)**, d-(ii)

112. The smallest living organisms which lack cell wall are:
(a) Methanogens **(b)** *Mycoplasma*
(c) Halophiles **(d)** Eubacteria

113. Choose the incorrect statement regarding gel electrophoresis.
(a) DNA fragments separate according to their size through sieving effect.
(b) Smaller fragments move farther from anode.
(c) DNA samples are loaded in the wells, close to cathode.
(d) Separated fragments can be visualized only after staining with EtBr under UV light.

114. Persistent nucellus in some seeds is called:
(a) Endosperm **(b)** Pericarp
(c) Perisperm **(d)** Epiblast

115. The collective study of genotypic, chemotaxonomic, and phenotypic method is _____:
(a) Polyphasic approach **(b)** Numerical taxonomy
(c) Bacterial taxonomy **(d)** Phylogenetic approach

116. In chloroplast, chlorophyll is present in:
(a) Inner membrane **(b)** Thylakoid membrane
(c) Outer membrane **(d)** Stroma

117. If number of chromosomes in a gametophytic structure of fern is 8 then find the number of chromosomes in rhizoid, oosphere, leaf cell, megaspore respectively.
(a) 8, 8, 16, 8 **(b)** 16, 16, 8, 8 **(c)** 8, 16, 16, 8 **(d)** 16, 8, 8, 16

118. Asexual spores formed exogenously during favourable conditions, is a feature of:
(a) Egg fungi **(b)** Sac fungi
(c) Conjugation fungi **(d)** Club fungi

119. The essential components of many coenzymes are:
(a) Carbohydrates **(b)** Proteins
(c) Nucleic acid **(d)** Vitamins

120. Nomenclature is governed by certain universal rules. Which of the following is contrary to the rules of nomenclature ?
(a) The first word in a biological name represents the genus name and the second is a specific epithet.
(b) The names are written in Latin and are italicized.
(c) When written by hand, the names are to be underlined.
(d) Biological names can be written in any language.

121. When the cell has started DNA replication, which check point should be predominantly activated?
(a) G_1/S **(b)** G_2/M and M
(c) G_2/M **(d)** M

122. Cyclic photophosphorylation results in the formation of:
(a) NADPH **(b)** ATP
(c) ATP and NADPH **(d)** NADPH and O_2

123. Ecological Niche is:
(a) Surface area of the ocean.
(b) An ecologically adapted zone.
(c) Physical position and functional role of a species within the community.
(d) Formed of all plants and animals living at the bottom of a lake.

124. Which type of restriction nuclease is used in genetic engineering?
(a) Type I **(b)** Type II **(c)** Type III **(d)** Type IV

125. What is true about ribosomes?
(a) These are found only in eukaryotic cells.
(b) These are self-splicing introns of same RNAs.
(c) The prokaryotic ribosomes are 80 S, where S stands for sedimentation coefficient.
(d) These are composed of ribonucleic acid and proteins.

126. Which of the following statements is not true of two genes that show 50% recombination frequency?
(a) The genes may be on different chromosomes.
(b) The genes are tightly linked.
(c) The genes show independent assortment.
(d) If the genes are present on the same chromosomes, they undergo more than one crossovers in every meiosis.

127. Identify the wrong statement about meiosis:
(a) Pairing of homologous chromosomes.
(b) Four haploid cells are formed.
(c) At the end of meiosis the number of chromosomes are reduced to half.
(d) Two cycles of DNA replication occur.

128. As we go from species to kingdom in a taxonomic hierarchy, the number of common characteristics:
(a) Decreases **(b)** Increases
(c) Remains same **(d)** May increase or decrease

129. Some of the characteristics of *Bt* cotton are:
(a) Long fibre and resistance to aphids.
(b) Medium yield, long fibre and resistance to beetle pests.
(c) High yield and production of toxic protein crystals which kill dipteran pests.
(d) High yield and resistance to bollworms.

130. Microtubules are constituents of:
(a) Centrosome, nucleosome and centrioles
(b) Cilia, flagella and peroxisomes
(c) Spindle fibres, centrioles and cilia
(d) Centrioles, spindle fibres and chromatin

131. Which of the following is incorrect about fibrous protein?
(a) Keratin and collagen are the best examples.
(b) It is in rod or wire like shape.
(c) It provides structural support for cells and tissues.
(d) Hemoglobin is the best example.

132. One nucleus of the pollen tube and secondary nucleus of the ovum grow into:
(a) Stigma **(b)** Endosperm
(c) Anther **(d)** Stamen

133. Which of the following features are correct for Basidiomycetes?
(a) These are also known as sac fungi.
(b) Their mycelium is branched and aseptate.
(c) They show special septal structure known as Dolipore Septum.
(d) *Albugo* and *Rhizopus* are the examples.

134. Select the mismatched pair:
(a) Mendel's hybridisation- 1858 to 1865 experiments
(b) Mendel's work published- 1866
(c) Rediscovery of Mendel's- 1900 work
(d) Chromosomal Theory of- 1902 Inheritance

135. Function of filiform apparatus is to:
(a) recognise the suitable pollen at stigma.
(b) stimulate division of generative cell.
(c) produce nectar.
(d) guide the entry of pollen tube.

Section B

136. Which one of the following structures between two adjacent cells is an effective transport pathway?
(a) Plasmalemma **(b)** Plasmodesmata
(c) Plastoquinone **(d)** Endoplasmic reticulum

137. Which of the following is the possible cause for greater biodiversity in the tropics?
(a) Higher productivity due to more solar energy.
(b) Lesser technological development.
(c) Traditional and religious practices for conservation of nature.
(d) Lesser natural calamities.

138. Of the total incident solar radiation the proportion of PAR is:
(a) More than 80% **(b)** About 70%
(c) About 60% **(d)** Less than 50%

139. Sclerenchyma differs from collenchyma in being:
(a) Mechanical in nature **(b)** Thick walled
(c) Simple tissue **(d)** Dead at maturity

140. Which one of the following is the internal source of CO_2 in CAM plants?
(a) Oxaloacetic acid **(b)** Malic acid
(c) RuBP **(d)** PEPA

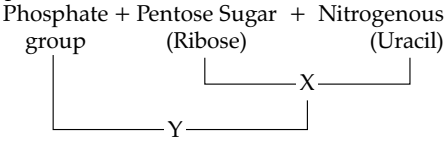
141. What shall be the total number of phosphates in the DNA segment which has 75 cytosine and 40 thymine nucleotides?
(a) 115 **(b)** 230 **(c)** 75 **(d)** 220

142. The second stage of hydrosere is occupied by plants like:
(a) *Azolla* **(b)** *Salix* **(c)** *Typha* **(d)** *Vallisneria*

143. Which one of the following is correctly matched?
(a) *Chlamydomonas* – Conidia **(b)** Yeast – Zoospores
(c) Onion – Bulb **(d)** Ginger – Sucker

144. Two pea plants having the genotype of Aabb is crossed. What is the probability of getting the gamete Ab from this cross?
(a) 30% **(b)** 50% **(c)** 80% **(d)** 100%

145. What does X and Y represent in the below given representation?



(a) X - Ribonucleoside, Y - Nucleotide
(b) X - Ribonucleotide, Y - Nucleotide
(c) X - Nucleotide, Y - Nucleoside
(d) X - Ribonucleoside, Y - Ribonucleotide

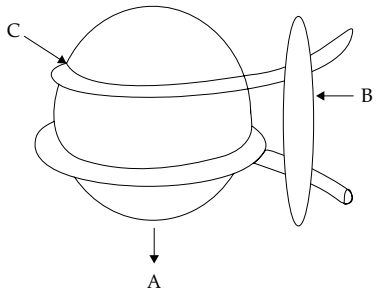
146. An example of edible underground stem is:
(a) Carrot **(b)** Groundnut
(c) Sweet potato **(d)** Potato

147. In the evolutionary history of plant forms, ferns and conifers are most related to _____.
(a) chlorophyte **(b)** tracheophyte
(c) psilophyton **(d)** seed ferns

148. Refer to the given sequence of nucleotides in *m*RNA and choose the correct amino acid sequence coded by the following.
UAU CAC AUA AGA GCG UCU
(a) Tyr-His-Ile-Ser-Ala-Ser
(b) Tyr-His-Ile-Arg-Ala-Ser
(c) Arg-Leu-Asn-Asp-Phe-Cys
(d) Pro-Ser-Ile-Asp-Ser-Arg

149. Read the following characteristics properly:
(i) Fibrous root system
(ii) Absence of Cambium
(iii) Root is devoid of pith
(iv) Dumb-bell shaped stomata
(v) Secondary growth present
How many of the above characteristics are correct for monocotyledonous plants?
(a) Three **(b)** One **(c)** Four **(d)** Two

150. This is a diagrammatic representation of nucleosome. What do A, B, C represent respectively.



(a) A - Core histone octamer, B - H1 histone, C – DNA
(b) A - Core histone heptamer, B - H1 histone, C- RNA
(c) A - Core histone pentamer, B - H_2A histone, C - DNA
(d) A - Core histone octamer, B - H_2B histone, C - RNA

ZOOLOGY

Section A

151. The most widely distributed connective tissue in the body of animals is:
(a) Areolar **(b)** Adipose
(c) Cartilage **(d)** Dense irregular

152. Identify the hormone with its correct matching of source and function.
(a) Oxytocin – posterior pituitary, growth and maintenance of mammary glands.
(b) Melatonin – pineal gland, regulates the normal rhythm of sleep-wake cycle.
(c) Progesterone – corpus luteum, stimulation of growth and activities of female secondary sex organs.
(d) Atrial natriuretic factor – ventricular wall, increases the blood pressure.

153. Which one of the following is not a property of cancerous cells?
(a) They divide in an uncontrolled manner.
(b) They show contact inhibition.
(c) They compete with normal cells for vital nutrients.
(d) They do not remain confined in the area of formation.

154. Which is least likely to be involved in stabilising the three dimensional folding of most proteins?
(a) Ester bonds
(b) Hydrogen bonds
(c) Electrostatic interactions
(d) Hydrophobic interactions

155. Cells that secrete histamine, serotonin and heparin, are:
(a) Neutrophils **(b)** Basophils
(c) Monocytes **(d)** Eosinophils

156. Motile zygote of *Plasmodium* occurs in:
(a) Human RBCs
(b) Human liver
(c) Gut of female *Anopheles*
(d) Salivary gland of *Anopheles*

157. The matrix of all the following connective tissues is fibrous except:
(a) Blood **(b)** Cartilage
(c) Adipose tissue **(d)** Areolar tissue

158. *Toxoplasma*, a parasite responsible for causing opportunistic infection in AIDS, is a:
(a) Bacterium **(b)** Fungus
(c) Virus **(d)** Protozoan

159. One example of animals having a single opening to the outside that serves both as mouth as well as anus is:
(a) *Fasciola* **(b)** *Octopus*
(c) *Asterias* **(d)** *Ascidia*

160. Select the incorrect statement among following.
(a) Brain stem does not include hypothalamus.
(b) Breathing centre is not located in medulla oblongata.
(c) Cerebral cortex has motor areas to regulate movement of voluntary muscles.
(d) Cerebral aqueduct occurs as a narrow passage in midbrain.

161. Given below are components of mammary gland. Arrange them from proximal to distal.
(1) Mammary duct **(2)** Lactiferous duct
(3) Alveoli **(4)** Mammary ampulla
(5) Mammary tubules
Choose the most appropriate answer from the options:
(a) (5) → (3) → (4) → (2) → (1)
(b) (3) → (1) → (4) → (5) → (2)
(c) (2) → (3) → (5) → (4) → (1)
(d) (3) → (5) → (1) → (4) → (2)

162. The part of nephron involved in active reabsorption of sodium is:
(a) Distal convoluted tubule
(b) Proximal convoluted tubule
(c) Bowman's capsule
(d) Descending limb of Henle's loop

163. Incorrect match is:

(a)	Tracy	First transgenic sheep
(b)	ANDi	First transgenic monkey
(c)	Dolly	First cloned sheep
(d)	Rosie	Transgenic cow

164. Marriages between close relatives should be avoided as it causes more:
(a) Abnormalities in child birth
(b) Mutations
(c) Recessive alleles to come together
(d) Multiple births

165. Match the column I and column II.

	Column I		Column II
(A)	Protonephridia	**(i)**	Prawn
(B)	Nephridia	**(ii)**	Planaria
(C)	Malpighian tubules	**(iii)**	Cockroach
(D)	Antennal glands	**(iv)**	Earthworm

Choose the correct option.
(a) A-(iv), B-(iii), C-**(i)**, D-(ii)
(b) A-(iii), B-(iv), C-(i), D-(ii)
(c) A-(iv), B-**(i)**, C-(iii), D-(ii)
(d) A-(ii), B-(iv), C-(iii), D-(i)

166. The principal nitrogenous excretory compounds in humans is synthesized:
(a) In kidneys but eliminated mostly through liver.
(b) In kidneys as well as eliminated by kidneys.
(c) In liver and also eliminated by the same through bile.
(d) In the liver, but eliminated mostly through kidneys.

167. Which one of the following statements is false in respect of viability of mammalian sperm?
(a) Viability of sperm is determined by its molality.
(b) Sperms must be concentrated in a thick suspension.
(c) Sperms are viable for only 24 hours.
(d) Survival of sperm depends on the pH of the medium and is more active in alkaline medium.

168. In gobar gas, the maximum amount is that of:
(a) Propane **(b)** Methane
(c) Butane **(d)** Carbon dioxide

169. Vital capacity is:
(a) TV + IRV **(b)** ERV + IRV
(c) ERV + TV + IRV **(d)** ERV +TV + IRV + TV

170. All the following events occur during gastrulation except:
(a) Open cavity blastula replaced by close archenteron.
(b) Morphogenetic movement occurs.
(c) Cleavage division stops.
(d) Size of embryo starts increasing.

171. Which of the following is a hormone releasing intra uterine device:
(a) Multiload 375 **(b)** LNG 20
(c) Cervical cap **(d)** Vault

172. Gause's principle of competitive exclusion states that:
(a) More abundant species will exclude the less abundant species through competition.
(b) Competition for the same resources excludes species having food preferences.
(c) No two species can occupy the same niche indefinitely for the same limiting resources.
(d) Larger organisms exclude smaller ones through competition.

173. Which of the following animals is not viviparous?
(a) Whale **(b)** Flying fox (Bat)
(c) Elephant **(d)** *Platypus*

174. Changes in GnRH pulse frequency in females is controlled by circulating levels of:
(a) Estrogen and inhibin
(b) Progesterone only
(c) Progesterone and inhibin
(d) Estrogen and progesterone

175. A person likely to develop tetanus is immunized by administering:
(a) Weakened germs
(b) Dead germs
(c) Preformed antibiotics
(d) Wide spectrum antibiotics

176. Which of the following disorders is caused by hypersecretion of parathormone?
(a) Gout **(b)** Rheumatoid arthritis
(c) Osteoporosis **(d)** Gull's disease

177. Expression of emotional reactions are under control of:
(a) Limbic system **(b)** Cerebrum
(c) Cerebellum **(d)** Corpora quadrigemina

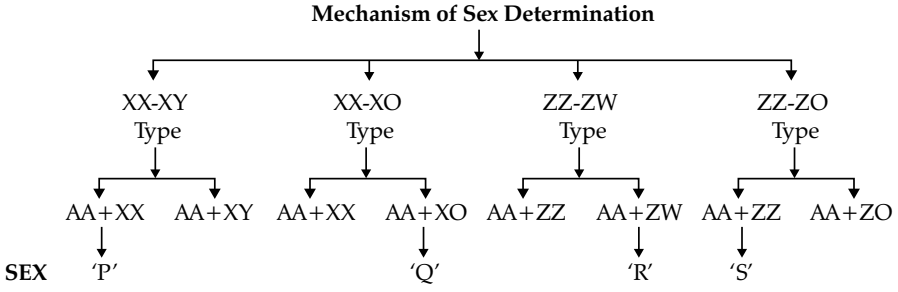
178. How many ribs are present in human body?
(a) 14 **(b)** 16 **(c)** 12 **(d)** 24

179. _____ depend on the activity of antithrombin and in all mammals it is produced by _____ and _____ .
(a) Serotonin; Nervous cells; Blood cells
(b) Heparin; Basophils; Mast cells
(c) Epinephrin; Liver cells; Kidney
(d) Thrombocytopenia; Alveolar Cells; Goblet cells.

180. Prolonged exposure to CO may be lethal because it:
(a) Increases CO_2 transport
(b) Reduces CO_2 transport
(c) Reduces O_2 transport
(d) Denatures haemoglobin

181. Which of the following can be excreted by foetus, pregnant and lactating women?
(a) Xanthine **(b)** Hippuric acid
(c) Guanine **(d)** Creatine

182. Refer to the given chart representing the types of sex determination mechanism.



Select the correct option regarding the sex of the organism.
(a) 'P' - Female; 'Q' - Male; 'R' - Female; 'S' - Male
(b) 'P' - Female; 'Q' - Female; 'R'- Male; 'S' - Male
(c) 'P' - Male; 'Q' - Female; 'R'- Male; 'S' - Female
(d) 'P' - Male; 'Q' - Male; 'R' - Female; 'S' - Female

183. Read the names of the tissues given in the box.

Hair-follicle, Skin, Bone, Saliva, Sperms, Blood

How many of the above are used in DNA profiling technique?
(a) 3 **(b)** 4 **(c)** 5 **(d)** 6

184. Which of the following is not an example of autoimmune disorder ?
(a) Hashimoto's disease
(b) Adam's Stokes syndrome
(c) Myasthenia gravis
(d) Rheumatoid arthritis

185. Out of 'X' pairs of ribs in humans only 'Y' pairs are true ribs. Select the option that correctly represent values of X and Y and provides their explanation.
(a) X = 12, Y = 7 **True** ribs are attached dorsally to vertebral column and ventrally to the sternum.
(b) X = 12, Y = 5 **True** ribs are attached dorsally to vertebral column and sternum on the two end.
(c) X = 24, Y = 7 **True** ribs are dorsal attached to vertebral column but are free on ventral side.
(d) X = 24, Y = 12 **True** ribs are dorsal attached to vertebral column but are free on ventral side.

Section B

186. Which of the following statements are correct for agarose-gel electrophoresis?
(1) Agarose is a natural polymer obtained from sea-weed.
(2) The separation of DNA molecules in agarose-gel electrophoresis depends on the size of DNA.
(3) The DNA migrates from negatively-charged electrode to the positively-charged electrode
(4) The DNA migrates from positively-charged electrode to the negatively-charged electrode.
Choose the most appropriate answer from the options given below:
(a) (2), (3) and (4) only **(b)** (1) and (2) only
(c) (1), (2) and (3) only **(d)** (1), (2) and (4) only

187. Choose correct option to complete the analogy between placental mammals and Australian marsupials
Anteater : Numbat : : Lemur : _____
(a) Bobcat **(b)** Marsupial mole
(c) Flying phalanger **(d)** Spotted cuscus

188. What does the latitudinal gradient in the pattern of biodiversity shows?
(a) Species diversity decreases as one moves away from the equator towards the poles.
(b) Species diversity increases as we move away from the equator towards the poles.
(c) Species diversity decreases as we move away from the poles towards the equator.
(d) Species diversity remains constant as we move away from the poles towards the equator.

189. Disturbance in Hardy-Weinberg equilibrium would be interpreted as:
(a) Resulting in stable population
(b) Resulting in no natural selection
(c) Resulting in evolution
(d) Evolution cannot be interpreted

190. Which one of the following is most commonly used to feel pulse?
(a) Radial vein **(b)** Brachial artery
(c) Brachial vein **(d)** Radial artery

191. Which of these is not a characteristic feature of adaptive immunity?
(a) Antigen non-specific
(b) Immunogenic memory
(c) Self/non-self recognition
(d) Diversity

192. Match the following columns.

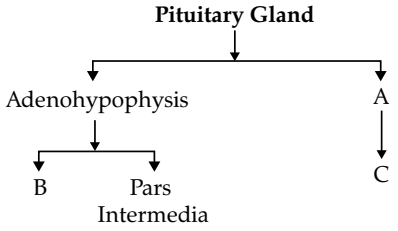
Column I	Column II
A. Ciliary movement	1. Macrophages and Leucocytes
B. Flagellar movement	2. Human sperm
C. Pseudopodial movement	3. Jaws, limbs and tongue
	4. Respiratory tract
	5. Oviducts

Codes

	A	B	C
(a)	1	3, 4	2, 5
(b)	4, 5	2	1
(c)	4, 3	1	2, 5
(d)	1	2, 3	4, 5

193. Which cells of the neural system performs the following given functions?
(1) Biochemically support the endothelial cells and regulates cerebral blood flow.
(2) Glial cells that forms myelin sheath.
(3) Phagocytic glial cells that engulf microbes and cellular debris.
(a) (1) - Astrocytes, (2) - Oligodendrocytes, (3) - Microglia
(b) (1) - Somatocytes, (2) - Neurons, (3) - Schwann cells
(c) (1) - Microglial, (2) - Ependymal, (3) - Astrocytes
(d) (1) - Neuroglia, (2) - Glial, (3) - Oligodendrocytes

194. Complete the following chart by choosing correct option for A, B and C.



A	B	C
(a) Endohypophysis	Pars Distalis	Pars Adenosis
(b) Prohypophysis	Pars Serosa	Pars Nervosa
(c) Epihypophysis	Pars Serosa	Pars Adenosis
(d) Neurohypophysis	Pars Distalis	Pars Nervosa

195. Which one of the following is correctly matched?

(a)	Ontogeny recapitulates phylogeny	–	Von Baer
(b)	Taxonomy without phylogeny is similar to bones without flesh	–	Ernst Haeckel
(c)	Survival of the fittest	–	Alfred Wallace
(d)	Single step large mutation	–	Hugo de Vries

196. A pregnant human female goes to a doctor for regular check-up and ultrasound. After diagnosis, doctor told her that she is going to deliver an abnormal child. The foetus that she is carrying developed from a zygote formed by an XX-egg fertilised by Y-carrying sperm. Select the correct name for this genetic abnormality?
(a) Down's Syndrome **(b)** Turner's Syndrome
(c) Klinefelter's Syndrome **(d)** Patau's Syndrome

197. Identify the incorrect equation:

(a) $Hb + O_2 \underset{\text{In tissues}}{\overset{\text{In lungs}}{\rightleftharpoons}} HbO_2$

(b) $HbO_2 \underset{\text{In tissues}}{\overset{\text{In lungs}}{\rightleftharpoons}} Hb + O_2$

(c) $CO_2 + H_2O \underset{\text{anhydrase}}{\overset{\text{Carbonic}}{\rightleftharpoons}} H_2CO_3$

(d) $HbO_2 + CO_2 \rightleftharpoons HbCO_2 + H^+ + O_2$

198. The vital capacity can be used to help differentiate causes of lung disease. Which of the following statements are correct with respect to vital capacity?

(1) It includes ERV, TV and IRV.
(2) Total volume of air a person can inspire after a normal expiration.
(3) The maximum volume of air a person can breathe in after forced expiration.
(4) It includes ERV, RV and IRV.
(5) The maximum volume of air a person can breathe out after a forced inspiration.

Choose the most appropriate answer from the options given below:

(a) (1) and (5) **(b)** (2), (4) and (5)
(c) (1), (3) and (4) **(d)** (1), (3) and (5)

199. Choose incorrect option regarding sex determination in *Drosophila* according to genic balance theory:

	Chromosome complement	$\frac{X}{A}$ ratio	Sexual morphology
(a)	XX + 2A	1.0	Female
(b)	XO + 2A	0.5	Sterile male
(c)	XXX + 3A	1.0	Female
(d)	XX + 3A	0.75	Intersex, fertile

200. Correct match is:

(a) *Australopithecus* — The first ape man
(b) *Homo neanderthalensis* — Cranial capacity 650–800 cc
(c) *Homo habilis* — Java man
(d) *Homo erectus* — Handy man