

85. Match the following with respect to meiosis :

- |     |            |       |                 |
|-----|------------|-------|-----------------|
| (a) | Zygotene   | (i)   | Terminalization |
| (b) | Pachytene  | (ii)  | Chiasmata       |
| (c) | Diplojene  | (iii) | Crossing over   |
| (d) | Diakinesis | (iv)  | Synapsis        |

Select the **correct** option from the following :

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

86. According to Robert May, the global species diversity is about :

- (1) 20 million
- (2) 50 million
- (3) 7 million
- (4) 1.5 million

87. The ovary is half inferior in :

- (1) Mustard
- (2) Sunflower
- (3) Plum
- (4) Brinjal

88. Select the **correct** statement.

- (1) Glucagon is associated with hypoglycemia.
- (2) Insulin acts on pancreatic cells and adipocytes.
- (3) Insulin is associated with hyperglycemia.
- (4) Glucocorticoids stimulate gluconeogenesis.

89. The process responsible for facilitating loss of water in liquid form from the tip of grass blades at night and in early morning is :

- (1) Root pressure
- (2) Imbibition
- (3) Plasmolysis
- (4) Transpiration

90. Some dividing cells exit the cell cycle and enter vegetative inactive stage. This is called quiescent stage ( $G_0$ ). This process occurs at the end of :

- (1)  $G_1$  phase
- (2) S phase
- (3)  $G_2$  phase
- (4) M phase

91. The phase difference between displacement and acceleration of a particle in a simple harmonic motion is :

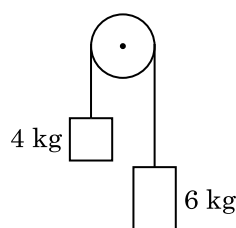
- (1)  $\frac{3\pi}{2}$  rad
- (2)  $\frac{\pi}{2}$  rad
- (3) zero
- (4)  $\pi$  rad

92. A long solenoid of 50 cm length having 100 turns carries a current of 2.5 A. The magnetic field at the centre of the solenoid is :

$$(\mu_0 = 4\pi \times 10^{-7} \text{ T m A}^{-1})$$

- (1)  $3.14 \times 10^{-4} \text{ T}$
- (2)  $6.28 \times 10^{-5} \text{ T}$
- (3)  $3.14 \times 10^{-5} \text{ T}$
- (4)  $6.28 \times 10^{-4} \text{ T}$

93. Two bodies of mass 4 kg and 6 kg are tied to the ends of a massless string. The string passes over a pulley which is frictionless (see figure). The acceleration of the system in terms of acceleration due to gravity (g) is :



- (1)  $g/2$
- (2)  $g/5$
- (3)  $g/10$
- (4)  $g$

94. The ratio of contributions made by the electric field and magnetic field components to the intensity of an electromagnetic wave is : (c = speed of electromagnetic waves)

- (1) 1 : 1
- (2) 1 : c
- (3) 1 :  $c^2$
- (4) c : 1

95. In a certain region of space with volume  $0.2 \text{ m}^3$ , the electric potential is found to be  $5 \text{ V}$  throughout. The magnitude of electric field in this region is :
- (1)  $0.5 \text{ N/C}$
  - (2)  $1 \text{ N/C}$
  - (3)  $5 \text{ N/C}$
  - (4) zero
96. The average thermal energy for a mono-atomic gas is : ( $k_B$  is Boltzmann constant and  $T$ , absolute temperature)
- (1)  $\frac{3}{2} k_B T$
  - (2)  $\frac{5}{2} k_B T$
  - (3)  $\frac{7}{2} k_B T$
  - (4)  $\frac{1}{2} k_B T$
97. Find the torque about the origin when a force of  $3\hat{j} \text{ N}$  acts on a particle whose position vector is  $2\hat{k} \text{ m}$ .
- (1)  $6\hat{j} \text{ N m}$
  - (2)  $-6\hat{i} \text{ N m}$
  - (3)  $6\hat{k} \text{ N m}$
  - (4)  $6\hat{i} \text{ N m}$
98. The mean free path for a gas, with molecular diameter  $d$  and number density  $n$  can be expressed as :
- (1)  $\frac{1}{\sqrt{2} n \pi d^2}$
  - (2)  $\frac{1}{\sqrt{2} n^2 \pi d^2}$
  - (3)  $\frac{1}{\sqrt{2} n^2 \pi^2 d^2}$
  - (4)  $\frac{1}{\sqrt{2} n \pi d}$
99. The energy equivalent of  $0.5 \text{ g}$  of a substance is :
- (1)  $4.5 \times 10^{13} \text{ J}$
  - (2)  $1.5 \times 10^{13} \text{ J}$
  - (3)  $0.5 \times 10^{13} \text{ J}$
  - (4)  $4.5 \times 10^{16} \text{ J}$
100. A screw gauge has least count of  $0.01 \text{ mm}$  and there are 50 divisions in its circular scale. The pitch of the screw gauge is :
- (1)  $0.25 \text{ mm}$
  - (2)  $0.5 \text{ mm}$
  - (3)  $1.0 \text{ mm}$
  - (4)  $0.01 \text{ mm}$
101. Two cylinders A and B of equal capacity are connected to each other via a stop cock. A contains an ideal gas at standard temperature and pressure. B is completely evacuated. The entire system is thermally insulated. The stop cock is suddenly opened. The process is :
- (1) adiabatic
  - (2) isochoric
  - (3) isobaric
  - (4) isothermal
102. A cylinder contains hydrogen gas at pressure of  $249 \text{ kPa}$  and temperature  $27^\circ\text{C}$ . Its density is : ( $R = 8.3 \text{ J mol}^{-1} \text{ K}^{-1}$ )
- (1)  $0.2 \text{ kg/m}^3$
  - (2)  $0.1 \text{ kg/m}^3$
  - (3)  $0.02 \text{ kg/m}^3$
  - (4)  $0.5 \text{ kg/m}^3$
103. When a uranium isotope  ${}^{235}_{92}\text{U}$  is bombarded with a neutron, it generates  ${}^{89}_{36}\text{Kr}$ , three neutrons and :
- (1)  ${}^{91}_{40}\text{Zr}$
  - (2)  ${}^{101}_{36}\text{Kr}$
  - (3)  ${}^{103}_{36}\text{Kr}$
  - (4)  ${}^{144}_{56}\text{Ba}$
104. A charged particle having drift velocity of  $7.5 \times 10^{-4} \text{ m s}^{-1}$  in an electric field of  $3 \times 10^{-10} \text{ Vm}^{-1}$ , has a mobility in  $\text{m}^2 \text{ V}^{-1} \text{ s}^{-1}$  of :
- (1)  $2.5 \times 10^6$
  - (2)  $2.5 \times 10^{-6}$
  - (3)  $2.25 \times 10^{-15}$
  - (4)  $2.25 \times 10^{15}$
105. Taking into account of the significant figures, what is the value of  $9.99 \text{ m} - 0.0099 \text{ m}$  ?
- (1)  $9.98 \text{ m}$
  - (2)  $9.980 \text{ m}$
  - (3)  $9.9 \text{ m}$
  - (4)  $9.9801 \text{ m}$

106. An iron rod of susceptibility 599 is subjected to a magnetising field of  $1200 \text{ A m}^{-1}$ . The permeability of the material of the rod is :

$$(\mu_0 = 4\pi \times 10^{-7} \text{ T m A}^{-1})$$

- (1)  $8.0 \times 10^{-5} \text{ T m A}^{-1}$   
 (2)  $2.4\pi \times 10^{-5} \text{ T m A}^{-1}$   
 (3)  $2.4\pi \times 10^{-7} \text{ T m A}^{-1}$   
 (4)  $2.4\pi \times 10^{-4} \text{ T m A}^{-1}$
107. A spherical conductor of radius 10 cm has a charge of  $3.2 \times 10^{-7} \text{ C}$  distributed uniformly. What is the magnitude of electric field at a point 15 cm from the centre of the sphere ?

$$\left( \frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N m}^2/\text{C}^2 \right)$$

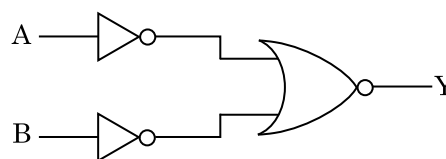
- (1)  $1.28 \times 10^5 \text{ N/C}$   
 (2)  $1.28 \times 10^6 \text{ N/C}$   
 (3)  $1.28 \times 10^7 \text{ N/C}$   
 (4)  $1.28 \times 10^4 \text{ N/C}$
108. A series LCR circuit is connected to an ac voltage source. When L is removed from the circuit, the phase difference between current and voltage is  $\frac{\pi}{3}$ . If instead C is removed from the circuit, the phase difference is again  $\frac{\pi}{3}$  between current and voltage. The power factor of the circuit is :

- (1) 0.5  
 (2) 1.0  
 (3) -1.0  
 (4) zero
109. A capillary tube of radius  $r$  is immersed in water and water rises in it to a height  $h$ . The mass of the water in the capillary is 5 g. Another capillary tube of radius  $2r$  is immersed in water. The mass of water that will rise in this tube is :
- (1) 5.0 g  
 (2) 10.0 g  
 (3) 20.0 g  
 (4) 2.5 g

110. In Young's double slit experiment, if the separation between coherent sources is halved and the distance of the screen from the coherent sources is doubled, then the fringe width becomes :

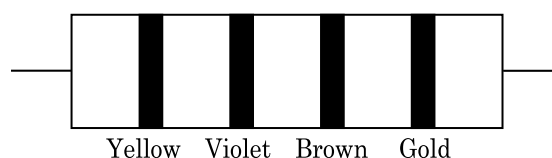
- (1) half  
 (2) four times  
 (3) one-fourth  
 (4) double

111. For the logic circuit shown, the truth table is :



(1)	A	B	Y
	0	0	0
	0	1	1
	1	0	1
	1	1	1
(2)	A	B	Y
	0	0	1
	0	1	1
	1	0	1
	1	1	0
(3)	A	B	Y
	0	0	1
	0	1	0
	1	0	0
	1	1	0
(4)	A	B	Y
	0	0	0
	0	1	0
	1	0	0
	1	1	1

112. The color code of a resistance is given below :



The values of resistance and tolerance, respectively, are :

- (1) 47 k $\Omega$ , 10%  
 (2) 4.7 k $\Omega$ , 5%  
 (3) 470  $\Omega$ , 5%  
 (4) 470 k $\Omega$ , 5%
113. The capacitance of a parallel plate capacitor with air as medium is 6  $\mu\text{F}$ . With the introduction of a dielectric medium, the capacitance becomes 30  $\mu\text{F}$ . The permittivity of the medium is :

- ( $\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$ )  
 (1)  $1.77 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$   
 (2)  $0.44 \times 10^{-10} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$   
 (3)  $5.00 \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$   
 (4)  $0.44 \times 10^{-13} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$

114. A ball is thrown vertically downward with a velocity of 20 m/s from the top of a tower. It hits the ground after some time with a velocity of 80 m/s. The height of the tower is : ( $g = 10 \text{ m/s}^2$ )
- (1) 340 m
  - (2) 320 m
  - (3) 300 m
  - (4) 360 m
115. A body weighs 72 N on the surface of the earth. What is the gravitational force on it, at a height equal to half the radius of the earth ?
- (1) 32 N
  - (2) 30 N
  - (3) 24 N
  - (4) 48 N
116. Two particles of mass 5 kg and 10 kg respectively are attached to the two ends of a rigid rod of length 1 m with negligible mass.  
The centre of mass of the system from the 5 kg particle is nearly at a distance of :
- (1) 50 cm
  - (2) 67 cm
  - (3) 80 cm
  - (4) 33 cm
117. The increase in the width of the depletion region in a p-n junction diode is due to :
- (1) reverse bias only
  - (2) both forward bias and reverse bias
  - (3) increase in forward current
  - (4) forward bias only
118. Light of frequency 1.5 times the threshold frequency is incident on a photosensitive material. What will be the photoelectric current if the frequency is halved and intensity is doubled ?
- (1) four times
  - (2) one-fourth
  - (3) zero
  - (4) doubled
119. Assume that light of wavelength 600 nm is coming from a star. The limit of resolution of telescope whose objective has a diameter of 2 m is :
- (1)  $1.83 \times 10^{-7} \text{ rad}$
  - (2)  $7.32 \times 10^{-7} \text{ rad}$
  - (3)  $6.00 \times 10^{-7} \text{ rad}$
  - (4)  $3.66 \times 10^{-7} \text{ rad}$
120. A resistance wire connected in the left gap of a metre bridge balances a  $10 \Omega$  resistance in the right gap at a point which divides the bridge wire in the ratio 3 : 2. If the length of the resistance wire is 1.5 m, then the length of  $1 \Omega$  of the resistance wire is :
- (1)  $1.0 \times 10^{-1} \text{ m}$
  - (2)  $1.5 \times 10^{-1} \text{ m}$
  - (3)  $1.5 \times 10^{-2} \text{ m}$
  - (4)  $1.0 \times 10^{-2} \text{ m}$
121. Light with an average flux of  $20 \text{ W/cm}^2$  falls on a non-reflecting surface at normal incidence having surface area  $20 \text{ cm}^2$ . The energy received by the surface during time span of 1 minute is :
- (1)  $12 \times 10^3 \text{ J}$
  - (2)  $24 \times 10^3 \text{ J}$
  - (3)  $48 \times 10^3 \text{ J}$
  - (4)  $10 \times 10^3 \text{ J}$
122. A ray is incident at an angle of incidence  $i$  on one surface of a small angle prism (with angle of prism  $A$ ) and emerges normally from the opposite surface. If the refractive index of the material of the prism is  $\mu$ , then the angle of incidence is nearly equal to :
- (1)  $\frac{2A}{\mu}$
  - (2)  $\mu A$
  - (3)  $\frac{\mu A}{2}$
  - (4)  $\frac{A}{2\mu}$
123. A  $40 \mu\text{F}$  capacitor is connected to a 200 V, 50 Hz ac supply. The rms value of the current in the circuit is, nearly :
- (1) 2.05 A
  - (2) 2.5 A
  - (3) 25.1 A
  - (4) 1.7 A
124. Dimensions of stress are :
- (1)  $[\text{ML}^2\text{T}^{-2}]$
  - (2)  $[\text{ML}^0\text{T}^{-2}]$
  - (3)  $[\text{ML}^{-1}\text{T}^{-2}]$
  - (4)  $[\text{MLT}^{-2}]$
125. The Brewsters angle  $i_b$  for an interface should be :
- (1)  $30^\circ < i_b < 45^\circ$
  - (2)  $45^\circ < i_b < 90^\circ$
  - (3)  $i_b = 90^\circ$
  - (4)  $0^\circ < i_b < 30^\circ$

126. A wire of length  $L$ , area of cross section  $A$  is hanging from a fixed support. The length of the wire changes to  $L_1$  when mass  $M$  is suspended from its free end. The expression for Young's modulus is :

- (1)  $\frac{Mg(L_1 - L)}{AL}$   
 (2)  $\frac{MgL}{AL_1}$   
 (3)  $\frac{MgL}{A(L_1 - L)}$   
 (4)  $\frac{MgL_1}{AL}$

127. A short electric dipole has a dipole moment of  $16 \times 10^{-9} \text{ C m}$ . The electric potential due to the dipole at a point at a distance of 0.6 m from the centre of the dipole, situated on a line making an angle of  $60^\circ$  with the dipole axis is :

$$\left( \frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N m}^2/\text{C}^2 \right)$$

- (1) 200 V  
 (2) 400 V  
 (3) zero  
 (4) 50 V

128. In a guitar, two strings A and B made of same material are slightly out of tune and produce beats of frequency 6 Hz. When tension in B is slightly decreased, the beat frequency increases to 7 Hz. If the frequency of A is 530 Hz, the original frequency of B will be :

- (1) 524 Hz  
 (2) 536 Hz  
 (3) 537 Hz  
 (4) 523 Hz

129. An electron is accelerated from rest through a potential difference of  $V$  volt. If the de Broglie wavelength of the electron is  $1.227 \times 10^{-2} \text{ nm}$ , the potential difference is :

- (1)  $10^2 \text{ V}$   
 (2)  $10^3 \text{ V}$   
 (3)  $10^4 \text{ V}$   
 (4) 10 V

130. The solids which have the negative temperature coefficient of resistance are :

- (1) insulators only  
 (2) semiconductors only  
 (3) insulators and semiconductors  
 (4) metals

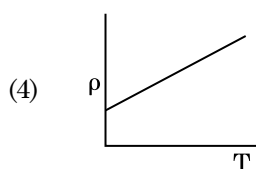
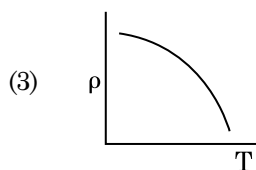
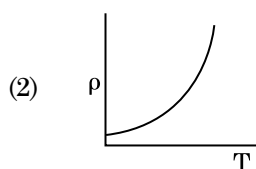
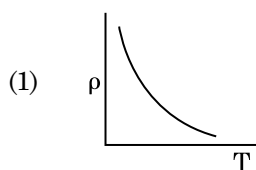
131. The energy required to break one bond in DNA is  $10^{-20} \text{ J}$ . This value in eV is nearly :

- (1) 0.6  
 (2) 0.06  
 (3) 0.006  
 (4) 6

132. The quantities of heat required to raise the temperature of two solid copper spheres of radii  $r_1$  and  $r_2$  ( $r_1 = 1.5 r_2$ ) through 1 K are in the ratio :

- (1)  $\frac{9}{4}$   
 (2)  $\frac{3}{2}$   
 (3)  $\frac{5}{3}$   
 (4)  $\frac{27}{8}$

133. Which of the following graph represents the variation of resistivity ( $\rho$ ) with temperature ( $T$ ) for copper ?



- 134.** For transistor action, which of the following statements is **correct** ?
- (1) Base, emitter and collector regions should have same size.
  - (2) Both emitter junction as well as the collector junction are forward biased.
  - (3) The base region must be very thin and lightly doped.
  - (4) Base, emitter and collector regions should have same doping concentrations.
- 135.** For which one of the following, Bohr model is **not** valid ?
- (1) Singly ionised helium atom ( $\text{He}^+$ )
  - (2) Deuteron atom
  - (3) Singly ionised neon atom ( $\text{Ne}^+$ )
  - (4) Hydrogen atom
- 136.** What is the change in oxidation number of carbon in the following reaction ?
- $$\text{CH}_4(\text{g}) + 4\text{Cl}_2(\text{g}) \rightarrow \text{CCl}_4(\text{l}) + 4\text{HCl}(\text{g})$$
- (1) 0 to +4
  - (2) -4 to +4
  - (3) 0 to -4
  - (4) +4 to +4
- 137.** On electrolysis of dil. sulphuric acid using Platinum (Pt) electrode, the product obtained at anode will be :
- (1) Oxygen gas
  - (2)  $\text{H}_2\text{S}$  gas
  - (3)  $\text{SO}_2$  gas
  - (4) Hydrogen gas
- 138.** An increase in the concentration of the reactants of a reaction leads to change in :
- (1) heat of reaction
  - (2) threshold energy
  - (3) collision frequency
  - (4) activation energy
- 139.** Reaction between benzaldehyde and acetophenone in presence of dilute NaOH is known as :
- (1) Cannizzaro's reaction
  - (2) Cross Cannizzaro's reaction
  - (3) Cross Aldol condensation
  - (4) Aldol condensation
- 140.** Which of the following alkane cannot be made in good yield by Wurtz reaction ?
- (1) 2,3-Dimethylbutane
  - (2) n-Heptane
  - (3) n-Butane
  - (4) n-Hexane
- 141.** Which of the following is a natural polymer ?
- (1) poly (Butadiene-styrene)
  - (2) polybutadiene
  - (3) poly (Butadiene-acrylonitrile)
  - (4) *cis*-1,4-polyisoprene
- 142.** A mixture of  $\text{N}_2$  and Ar gases in a cylinder contains 7 g of  $\text{N}_2$  and 8 g of Ar. If the total pressure of the mixture of the gases in the cylinder is 27 bar, the partial pressure of  $\text{N}_2$  is :
- [Use atomic masses (in  $\text{g mol}^{-1}$ ) : N = 14, Ar = 40]
- (1) 12 bar
  - (2) 15 bar
  - (3) 18 bar
  - (4) 9 bar
- 143.** Match the following and identify the **correct** option.
- |  |   |
|--|---|
| (a) $\text{CO}(\text{g}) + \text{H}_2(\text{g})$ | (i) $\text{Mg}(\text{HCO}_3)_2 + \text{Ca}(\text{HCO}_3)_2$ |
| (b) Temporary hardness of water                  | (ii) An electron deficient hydride                          |
| (c) $\text{B}_2\text{H}_6$                       | (iii) Synthesis gas   |
| (d) $\text{H}_2\text{O}_2$                       | (iv) Non-planar structure                                   |
- |     | (a)   | (b)   | (c)  | (d)  |
|-----|-------|-------|------|------|
| (1) | (iii) | (ii)  | (i)  | (iv) |
| (2) | (iii) | (iv)  | (ii) | (i)  |
| (3) | (i)   | (iii) | (ii) | (iv) |
| (4) | (iii) | (i)   | (ii) | (iv) |