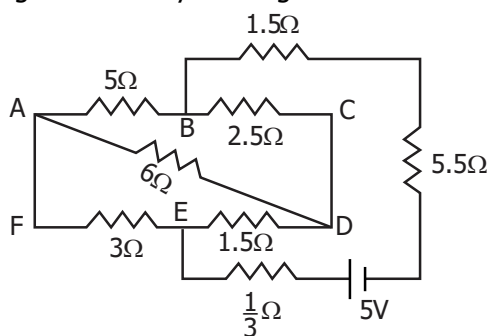# PHYSICS

(Question Paper with Answer & Solution)

Paper Code : 47   **Test Date :** 04.05.2025

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1. The current passing through the battery in the given circuit is :

(1) 1.5 A   (2) 2.0 A   (3) 0.5 A   (4) 2.5 A

Ans. **(3) 0.5 A**

Sol. 6Ω will remove by Balanced Wheatstone bridge

R_{eq} of bridge = $\dfrac{8 \times 4}{12} = \dfrac{8}{3}$

$R_{eq} = \dfrac{8}{3} + 7 + \dfrac{1}{3} = 10\Omega$

$i = \dfrac{5}{10} = .5\,Amp$

2. The electric field in a plane electromagnetic wave is given by $E_Z = 60 \cos (5x + 1.5 \times 10^9\, t)\,V/m$. Then expression for the corresponding magnetic field is (here subscripts denote the direction of the field)

(1) $B_y = 60 \sin (5x + 1.5 \times 10^9 t)\,T$ (2) $B_y = 2 \times 10^{-7} \cos (5x + 1.5 \times 10^9 t)\,T$

(3) $B_x = 2 \times 10^{-7} \cos (5x + 1.5 \times 10^9 t)\,T$ (4) $B_z = 60 \cos (5x + 1.5 \times 10^9 t)\,T$

Ans. **(2)**

Sol. $B = \dfrac{E}{C} = \dfrac{60}{3 \times 10^8} = 2 \times 10^{-7}\,T$ along y

3. A pipe open at both ends has a fundamental frequency f in air. The pipe is now dipped vertically in a water drum to half of its length. The fundamental frequency of the air column is now equal to :

(1) 2f   (2) $\dfrac{f}{2}$ (3) f   (4) $\dfrac{3f}{2}$

Ans. **(3) f**

Sol. $f_{open\,pipe} = \dfrac{V}{2l} = f$

$f_{closed\,pipe} = \dfrac{V}{4l'} = \dfrac{V}{4 \times \dfrac{l}{2}} = \dfrac{V}{2l} = f$

4. An electron (mass 9×10^{-31} kg and charge 1.6×10^{-19} C) moving with speed c/100 (c = speed of light) is injected into a magnetic field $\vec{B}$ of magnitude 9×10^{-4} T perpendicular to its direction of motion. We wish to apply an uniform electric field $\vec{E}$ together with the magnetic field so that the electron does not deflect from its path. Then : (speed of light c = 3×10^8 ms^{-1})

(1) $\vec{E}$ is parallel to $\vec{B}$ and its magnitude is 27×10^4 V m^{-1}

(2) $\vec{E}$ is perpendicular to $\vec{B}$ and its magnitude is 27×10^4 V m^{-1}

(3) $\vec{E}$ is perpendicular to $\vec{B}$ and its magnitude is 27×10^2 V m^{-1}

(4) $\vec{E}$ is parallel to $\vec{B}$ and its magnitude is 27×10^2 V m^{-1}

Ans. **(3)** $\vec{E}$ **is perpendicular to** $\vec{B}$ **and its magnitude is 27 × 10² V m⁻¹**

Sol. $V = \dfrac{E}{B}$

$E = \dfrac{C}{100} \cdot B = \dfrac{3 \times 10^8}{100} \times 9 \times 10^{-4}$

$= 27 \times 10^2$ V/m.

5. In a certain camera, a combination of four similar thin convex lenses are arranged axially in contact. Then the power of the combination and the total magnification in comparison to the power (p) and magnification (m) for each lens will be, respectively

(1) p^4 and m^4 (2) 4p and 4m   (3) p^4 and 4m   (4) 4p and m^4

Ans. **(4) 4p and m⁴**

Sol. $P_{eq} = P_1 + P_2 + P_3 + P_4 = 4P$
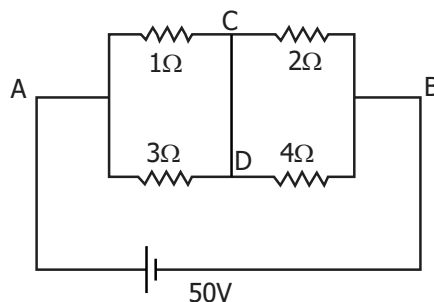
$m_{eq} = m_1 . m_2 . m_3 . m_4 = m^4$

6. A 2 amp current is flowing through two different small circular copper coils having radii ratio 1 : 2. The ratio of their respective magnetic moments will be :

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

Ans. **(2) 1 : 4**

Sol. $\mu = i\pi r^2$

$\dfrac{\mu_1}{\mu_2} = \dfrac{1}{4}$

7. A constant voltage of 50 V is maintained between the points A and B of the circuit shown in the figure. The current through the branch CD of the circuit is :
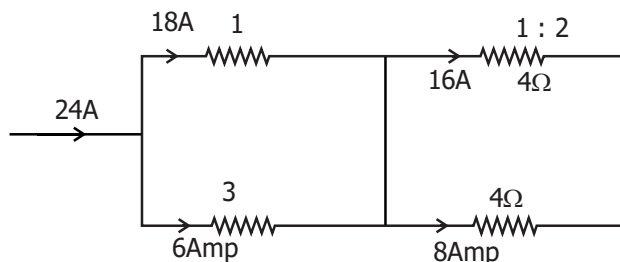

(1) 3.0 A   (2) 1.5 A   (3) 2.0 A   (4) 2.5 A

Ans. (3) 2.0 A

Sol. $R_{eq} = \dfrac{3}{4} + \dfrac{4}{3} = \dfrac{25}{12}$

$i = \dfrac{50}{25} \times 12 = 24\,\text{Amp}$

So, difference of current will flow from i = 2 Amp.

8. Two gases A and B are filled at the same pressure in separate cylinders with movable pistons of radius r_A and r_B, respectively. On supplying an equal amount of heat to both the systems reversibly under constant pressure, the pistons of gas A and B are displaced by 16 cm and 9 cm, respectively. If the change in their internal energy is the same, then the ratio r_A/r_B is equal to :

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

Ans. (3) $\dfrac{3}{4}$

Sol. $W_A = W_B$

$P.\pi r_A^2 .16 = P\pi r_B^2 .9$

$\dfrac{r_A^2}{r_B^2} = \dfrac{9}{16} \Rightarrow \dfrac{r_A}{r_B} = \dfrac{3}{4}$

9. A container has two chambers of volumes V_1 = 2 litres and V_2 = 3 litres separated by a partition made of a thermal insulator. The chambers contains n_1 = 5 and n_2 = 4 moles of ideal gas at pressures p_1 = 1 atm and p_2 = 2 atm, respectively. When the partition is removed, the mixture attains an equilibrium pressure of :

(1) 1.8 atm (2) 1.3 atm (3) 1.6 atm (4) 1.4 atm

Ans. (3) 1.6 atm

Sol. $n_{eq} = n_1 + n_2$

$P_{eq} \cdot V_{eq} = P_1 V_1 + P_2 V_2$

$P_{eq}. \times 5 = 1 \times 2 + 2 \times 3$

$P_{eq} = \dfrac{8}{5} = 1.6\,\text{atm}$

10. The radius of Martian orbit around the Sun is about 4 times the radius of the orbit of Mercury. The Martian year is 687 Earth days. Then which of the following is the length of 1 year on Mercury :

(1) 124 earth days   (2) 88 earth days   (3) 225 earth days   (4) 172 earth days

Ans. **(2) 88 earth days**

Sol.
$$\frac{T_{mass}}{T_B} = \left(\frac{r_M}{r_B}\right)^{3/2}$$

$$\frac{687}{T_B} = 8 \Rightarrow T_B = \frac{687}{8} = 88\,earth\,days$$

11. To an ac power supply of 220 V at 50 Hz, a resistor of 20 Ω, a capacitor of reactance 25Ω and an inductor of reactance 45 Ω are connected in series. The corresponding current in the circuit and the phase angle between the current and the voltage is, respectively ;

(1) 15.6 A and 45°   (2) 7.8 A and 30°   (3) 7.8 A and 45°   (4) 15.6 A and 30°

Ans. **(3) 7.8 A and 45°**

Sol.
$$Z = \sqrt{(X_L - X_C)^2 + R^2} = \sqrt{20^2 + (45 - 25)^2} = 20\sqrt{2}$$

$$i = \frac{220}{20\sqrt{2}} = \frac{11}{\sqrt{2}} = 7.8\,Amp$$

$$\tan\phi = \frac{X_L - X_C}{R} = \frac{20}{20} = 1$$

$\phi = 45°$

12. A wire of resistance R is cut into 8 equal pieces. From these pieces two equivalent resistances are made by adding four of these together in parallel. Then these two sets are added in series. The net effective resistance of the combination is :
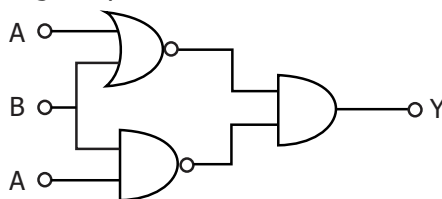
(1) $\dfrac{R}{8}$ (2) $\dfrac{R}{64}$ (3) $\dfrac{R}{32}$ (4) $\dfrac{R}{16}$

Ans. **(4) $\dfrac{R}{16}$**

Sol. Resistance of each wire = $\dfrac{R}{8}$

$$R_{eq} = \frac{R}{8 \times 4} + \frac{R}{8 \times 4} = \frac{R}{16}$$

13. The output (Y) of the given logic implementation is similar to the output of an/a .... gate :


(1) NOR   (2) AND   (3) NAND   (4) OR

Ans. **(1) NOR**

Sol. $y = \overline{\left(\overline{A+B}\right).\left(\overline{A.B}\right)}$

$= \left(\overline{A}.\overline{B}\right).\left(\overline{A}+\overline{B}\right) = \overline{A}.\overline{A}\overline{B} + \overline{A}.\overline{B}.\overline{B}$

$= \overline{A}.\overline{B}$ (NOR gate)

14. Two identical charged conducting spheres A and B have their centres separated by a certain distance. Charge on each sphere is q and the force of repulsion between them is F. A third identical uncharged conducting sphere is brought in contact with sphere A first and then with B and finally removed from both. New force of repulsion between spheres A and B (Radii of A and B are negligible compared to the distance of separation so that for calculating force between them they can be considered as point charges) is best given as :

(1) $\dfrac{3F}{8}$ (2) $\dfrac{3F}{5}$ (3) $\dfrac{2F}{3}$ (4) $\dfrac{F}{2}$

Ans. **(1) $\dfrac{3F}{8}$**

Sol.
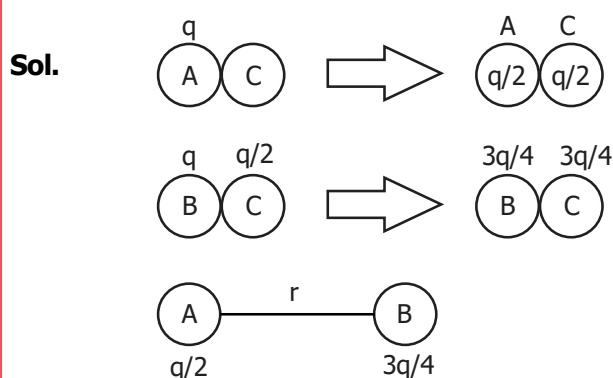
$F_{Pre} = \dfrac{kq^2}{r^2}$; $F' = \dfrac{K.\dfrac{q}{2}\times\dfrac{3q}{4}}{r^2}$ $\boxed{F' = \dfrac{3}{8}F}$

15. Consider the diameter of a spherical object being measured with the help of a Vernier callipers. Suppose its 10 Vernier Scale Divisions (V.S.D.) are equal to its 9 Main Scale Divisions (M.S.D.). The least division in the M.S. is 0.1 cm and the zero of V.S. is at x = 0.1 cm when the jaws of Vernier callipers are Closed. If the main scale reading for the diameter is M = 5 cm and the number of coinciding vernier division is 8, the measured diameter after zero error correction, is :

(1) 5.00 cm   (2) 5.18 cm   (3) 5.08 cm   (4) 4.98 cm

Ans. **(4) 4.98 cm**

Sol. 9 × MSD = 10 VSD

VSD = .9 × MSD

Least count = MSD − .9 MSD

= .01 cm

R = 5 + (8 × .01) − 1 [+ve zero error]

= 5.08 − 1 = 4.98 cm

16. In some appropriate units, time (t) and position (x) relation of a moving particle is given by $t = x^2 + x$. The acceleration of the particle is :

(1) $+\dfrac{2}{2x+1}$　　　(2) $-\dfrac{2}{(x+2)^3}$　　　(3) $-\dfrac{2}{(2x+1)^3}$　　　(4) $+\dfrac{2}{(x+1)^3}$

Ans. **(3)** $-\dfrac{2}{(2x+1)^3}$
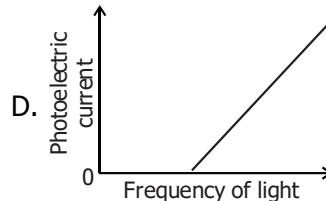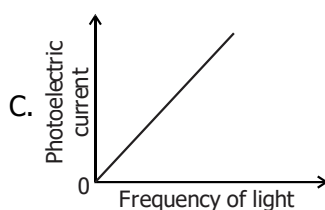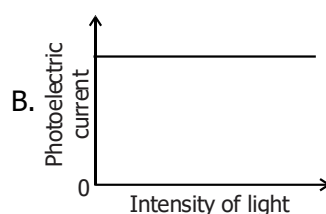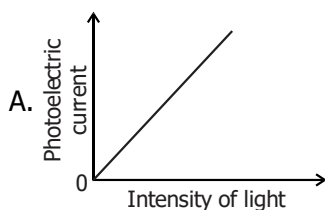
Sol. $t = x^2 + x$

$\dfrac{dt}{dx} = (2x+1)$

$\dfrac{dx}{dt} = v = (2x+1)^{-1}$

$\dfrac{dv}{dx} = -1(2x+1)^{-2} \times 2$

$a = v.\dfrac{dv}{dx} = -(2x+1)^{-1}_2 (2x+1)^{-2} = \dfrac{-2}{(2x+1)^3}$

17. Which of the following options represent the variation of photoelectric current with property of light shown on the x-axis :

A.

Photoelectric current vs Intensity of light

B.

Photoelectric current vs Intensity of light

C.

Photoelectric current vs Frequency of light

D.

Photoelectric current vs Frequency of light

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

Ans. **(2) A only**

Sol. Photocurrent $\propto$ Intensity
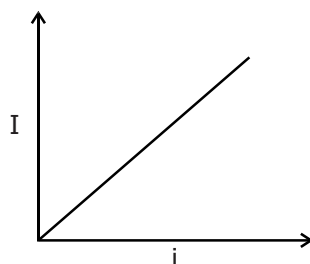
18. A particle of mass m is moving around the origin with a constant force F pulling it towards the origin. If Bohr model is used to describe its motion, the radius r of the nth orbit and the particle's speed v in the orbit depend on n as :

(1) $r \propto n^{4/3}$; $v \propto n^{-1/3}$ (2) $r \propto n^{1/3}$; $v \propto n^{1/3}$ (3) $r \propto n^{1/3}$; $v \propto n^{2/3}$ (4) $r \propto n^{2/3}$; $v \propto n^{1/3}$

Ans. **(4)** $\mathbf{r \propto n^{2/3}}$; $\mathbf{v \propto n^{1/3}}$

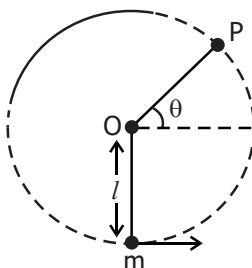**Sol.** $F = \dfrac{mv^2}{r}$; $mvr = \dfrac{nh}{2\pi}$

$v^2 \propto r$ .... (1)

$vr \propto n$

$v \propto \dfrac{n}{r}$; $\dfrac{n^2}{r^2} \propto r$

$r^3 \propto n^2$; $r \propto n^{2/3}$; $v \propto n^{1/3}$

19. A bob of heavy mass m is suspended by a light string of length l. The bob is given a horizontal velocity v_0 as shown in figure. If the string gets slack at some point P making an angle θ from the horizontal, the ratio of the speed v of the bob at point P to its initial speed v_0 is :

(1) $\left(\dfrac{\sin\theta}{2+3\sin\theta}\right)^{1/2}$ (2) $(\sin\theta)^{1/2}$ (3) $\left(\dfrac{1}{2+3\sin\theta}\right)^{1/2}$ (4) $\left(\dfrac{\cos\theta}{2+3\sin\theta}\right)^{1/2}$

Ans. **(1)** $\left(\dfrac{\sin\theta}{2+3\sin\theta}\right)^{1/2}$

Sol. $\dfrac{mv^2}{l} = mg\sin\theta$
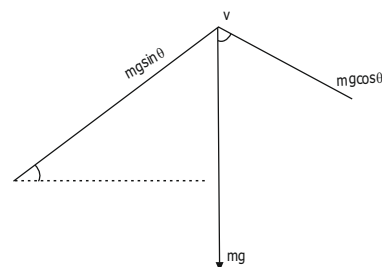
$v^2 = l\,g\sin\theta$

Now By energy conservation

$K_i + U_i = K_f + U_f$

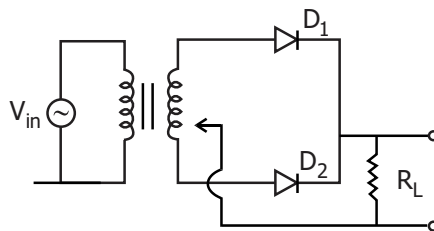$\dfrac{1}{2}mv_0^2 = \dfrac{1}{2}ml\,g\sin\theta + mg(l + l\sin\theta)$

$V_0^2 = l\,g\sin\theta + 2gl + 2gl\sin\theta$

$V_0^2 = 2gl + 3gl\sin\theta$

$\dfrac{V}{V_0} = \left(\dfrac{\sin\theta}{2 + 3\sin\theta}\right)^{1/2}$

"Gyan Tower" Near Shivbari Circle, Old Shivbari Road, Bikaner
(Mob. : 8003094891, 8003094892 web.www.synthesis.org.in)

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20. A full wave rectifier circuit with diodes (D_1) and (D_2) is shown in the figure. If input supply voltage V_{in} = 220sin (100 πt) volt, then at t = 15 msec :

(1) D_1 and D_2 both are reverse biased   (2) D_1 is forward biased, D_2 is reverse biased

(3) D_1 is reverse biased, D_2 is forward biased   (4) D_1 and D_2 both are forward biased

Ans. **(3) D_1 is reverse biased, D_2 is forward biased**

Sol. at t = 15 ms

$V = 220 \sin(100\pi \times 1.5 \times 10^{-3})$ (–ve)

So diode D_1 will be reverse and will be forward.

21. A balloon is made of a material of surface tension S and its inflation outlet (from where gas is filled in it) has small area A. It is filled with a gas of density ρ and takes a spherical shape of radius R. When the gas is allowed to flow freely out of it, its radius r changes from R to 0 (zero) in time T. If the speed v(r) of gas coming out of the balloon depends on r as r^a and $T \propto S^\alpha A^\beta \rho^\gamma R^\delta$ then :

(1) $a = \dfrac{1}{2}, \alpha = \dfrac{1}{2}, \beta = -\dfrac{1}{2}, \gamma = \dfrac{1}{2}, \delta = \dfrac{7}{2}$ (2) $a = \dfrac{1}{2}, \alpha = \dfrac{1}{2}, \beta = -1, \gamma = 1, \delta = \dfrac{3}{2}$

(3) $a = -\dfrac{1}{2}, \alpha = -\dfrac{1}{2}, \beta = -1, \gamma = -\dfrac{1}{2}, \delta = \dfrac{5}{2}$ (4) $a = -\dfrac{1}{2}, \alpha = -\dfrac{1}{2}, \beta = -1, \gamma = \dfrac{1}{2}, \delta = \dfrac{7}{2}$

Ans. **(4)** $a = -\dfrac{1}{2}, \alpha = -\dfrac{1}{2}, \beta = -1, \gamma = \dfrac{1}{2}, \delta = \dfrac{7}{2}$

Sol. $T \, a \, S \propto A^\beta \, \rho \propto R^\delta$

$(m^0 L^0 T^1) \propto (M^1 L^0 T^{-2})^\alpha (L2)^\beta (M'L^{-3})^r (L^1)^s$

$\alpha + r = 0 \qquad\qquad 2\alpha = 1$

$r = 1/2 \qquad\qquad \alpha = -1/2$

matches with only 4 option

22. A microscope has an objective of focal length 2 cm, eyepiece of focal length 4 cm and the tube length of 40 cm. If the distance of distinct vision of eye is 25 cm, the magnification in the microscope is :

(1) 250   (2) 100   (3) 125   (4) 150

Ans. **(3) 125**

Sol. $m = \dfrac{V_0}{u_0} \times \dfrac{D}{f_e}$

$= \dfrac{L}{f_0} \times \dfrac{D}{f_e} = \dfrac{40}{2} \times \dfrac{24}{4} = 125$

23. Two identical point masses P and Q, suspended from two separate massless springs of spring constants k_1 and k_2, respectively, oscillate vertically. If their maximum speeds are the same, the ratio (A_Q/A_P) of the amplitude of A_Q of mass Q to the amplitude A_P of mass P is :

(1) $\sqrt{\dfrac{k_1}{k_2}}$ 　　　　(2) $\dfrac{k_2}{k_1}$ 　　　　(3) $\dfrac{k_1}{k_2}$ 　　　　(4) $\sqrt{\dfrac{k_2}{k_1}}$

Ans. **(1)** $\sqrt{\dfrac{k_1}{k_2}}$

Sol. $\sqrt{\dfrac{k_1}{k_2}}$

$V_P = V_Q$

$A\omega = $ constant 　　　　$A \propto \dfrac{1}{\omega} \propto \sqrt{\dfrac{m}{k}}$

$\dfrac{A_Q}{A_P} = \sqrt{\dfrac{k_1}{k_2}}$

24. A parallel plate capacitor made of circular plates is being charged such that the surface charge density on its plates is increasing at a constant rate with time. The magnetic field arising due to displacement current is :

(1) zero between the plates and non-zero outside

(2) zero at all places

(3) constant between the plates and zero outside the plates

(4) non-zero everywhere with maximum at the imaginary cylindrical surface connecting peripheries of the plates

Ans. **(4) non-zero everywhere with maximum at the imaginary cylindrical surface connecting peripheries of the plates**

Sol. $i = \varepsilon_o \dfrac{d\sigma}{\varepsilon_o dt} A$ 　　　　i constant

i is constant But will be in cylindrical

so hypothetical cylindrical surface B is maximum
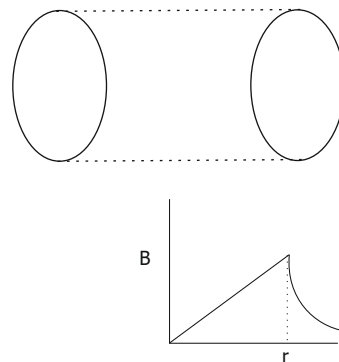
25. An electric dipole with dipole moment 5×10^{-6} Cm is aligned with the direction of a uniform electric field of magnitude 4×10^5 N/C. The dipole is then rotated through an angle of 60° with respect to the electric field. The change in the potential energy of the dipole is :

(1) 1.5 J   (2) 0.8 J   (3) 1.0 J   (4) 1.2 J

Ans.   **(3) 1.0 J**

Sol. $\Delta U = PE(\cos\theta_1 - \cos\theta_2)$

$= 5 \times 10^{-6} \times 4 \times 10^5 (1 - \frac{1}{2})$

$= 5 \times 10^{-6} \times 4 \times \frac{1}{2} \times 10^5$

= 1 Joule

26. There are two inclined surfaces of equal length (L) and same angle of inclination 45° with the horizontal. One of them is rough and the other is perfectly smooth. A given body takes 2 times as much time to slide down on rough surface than on the smooth surface. The coefficient of kinetic friction (μ_k) between the object and rough surface is close to :

(1) 0.75   (2) 0.25   (3) 0.40   (4) 0.5

Ans.   **(1) 0.75**

Sol. $t_1 = \sqrt{\dfrac{2h}{g\sin\theta}}$ $t_2 = \sqrt{\dfrac{2h}{(g\sin\theta - \mu g\cos\theta)}}$

$t_2 = 2t_1$

$\dfrac{1}{(\sin\theta - \mu\cos\theta)} = \dfrac{4}{\sin\theta}$

$\dfrac{1}{1-\mu} = 4$ $1 - \mu = \dfrac{1}{4}$

27. De-Broglie wavelength of an electron orbiting in the n = 2 state of hydrogen atom is close to :

(Given Bohr radius = 0.052 nm)

(1) 2.67 nm   (2) 0.067 nm   (3) 0.67 nm   (4) 1.67 nm

Ans.   **(3) 0.67 nm**

Sol. $2\pi r = n\lambda$
$2\pi r = 2\lambda$
$\lambda = \pi \times .052 \times 2^2 = .67$ nm.

28. The Sun rotates around its centre once in 27 days. What will be the period of revolution if the Sun were to expand to twice its present radius without any external influence. Assume the Sun to be a sphere of uniform density :

(1) 108 days   (2) 100 days   (3) 105 days   (4) 115 days

Ans.   **(1) 108 days**

Sol. $L = I\omega = $ constant

$MR^2 \dfrac{2\pi}{T_1} = M.4R^2 \dfrac{2\pi}{T_2}$

$T_2 = 4T_1 = 4 \times 27 = 108$ days

29. A physical quantity P is related to four observations a, b, c and d as follows : $P = a^3 b^2 / c\sqrt{d}$

The percentage errors of measurement in a, b, c and d are 1%, 3%, 2% and 4% respectively. The percentage error in the quantity P is :

(1) 15%   (2) 10%   (3) 2%   (4) 13%

Ans. **(4) 13%**

Sol. $\dfrac{\Delta P}{P} = 3\dfrac{\Delta a}{a} + 2\dfrac{\Delta b}{b} + \dfrac{\Delta c}{c} + \dfrac{1}{2} \times \dfrac{\Delta d}{d}$

$= 3 \times 1\% + 2 \times 3\% + 0 \times 2\% + \dfrac{1}{2} \times 4\%$

$3 + 6 + 2 + 2 = 13\%$

30. The plates of a parallel plate capacitor are separated by d. Two slabs of different dielectric constant K_1 and K_2 with thickness $\dfrac{3}{8}d$ and $\dfrac{d}{2}$, respectively are inserted in the capacitor. Due to this, the capacitance becomes two times larger than when there is nothing between the plates. If $K_1 = 1.25\, K_2$, the value of K_1 is :
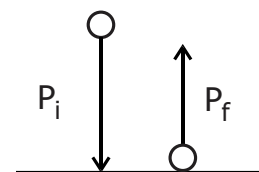
(1) 1.33   (2) 2.66   (3) 2.33   (4) 1.60

Ans. **(2) 2.66**

Sol. $C' = 2C_0$

$$\dfrac{A\varepsilon_0}{d - \left(\dfrac{3d}{8} + \dfrac{d}{2}\right) + \left(\dfrac{3d}{8K_1} + \dfrac{d \times 5}{2 \times 4K_1}\right)} = \dfrac{2A\varepsilon_0}{d}$$

$$\dfrac{1}{1 - \dfrac{7}{8} + \dfrac{1}{K_1}} = 2$$

$$\dfrac{1}{\dfrac{1}{8} - \dfrac{1}{K_1}} = 2 \Rightarrow 1 = \dfrac{1}{4} - \dfrac{2}{K_1}$$

$$K_1 = \dfrac{8}{3} = 2.66$$

31. A ball of mass 0.5 kg is dropped from a height of 40 m. The ball hits the ground and rises to a height of 10 m. The impulse imparted to the ball during its collision with the ground is : (Take g = 9.8 m/s^2)

(1) 84 NS   (2) 21 NS   (3) 7 NS   (4) 0

Ans. **(2) 21 NS**

Sol. Impulse $\Delta P = m\left[\sqrt{2gh_2} + \sqrt{2gh_1}\right]$

$= \dfrac{1}{2}\left[\sqrt{800} + \sqrt{2 \times 10 \times 10}\right]$

$= \dfrac{10}{2}\left[\sqrt{8} + \sqrt{2}\right] = 21\, NS$

32. Two cities X and Y are connected by a regular bus service with a bus leaving in either direction every T min. A girl is driving scooty with a speed of 60 km/h in the direction X to Y notices that a bus goes past her every 30 minutes in the direction of her motion, and every 10 minutes in the opposite period T of the bus service and the speed (assumed constant) of the buses :

(1) 15 min, 120 km/h (2) 9 min, 40 km/h (3) 25 min, 100 km/\ (4) 10 min, 90 km/h

Ans. **(1) 15 min, 120 km/h**

Sol. Distance between two buses

$$v_{girl} = \frac{60\,km}{60\,min}$$

= 1 km/min

$$30 = \frac{VT}{1-V} \quad .... (1)$$

$$10 = \frac{VT}{1+V} \quad .... (2)$$

30 − 3V = 10 + 10 V

20 = 40 V

V = 2 km/min or 120 km/h

$$30 = \frac{2T}{1-V}$$

$$10 = \frac{2T}{3}$$

T = 15 min

33. An oxygen cylinder of volume 30 litre has 18.20 moles of oxygen. After some oxygen is withdrawn from the cylinder, its gauge pressure drops to 11 atmospheric pressure at temperature 27°C. The mass of the oxygen withdrawn from the cylinder is nearly equal to :

[Given, $R = \frac{100}{12}$ Jmol^{-1}K^{-1}, and molecular mass of O_2 = 32, 1 atm pressure = 1.01 × 10^5 N/m]

(1) 0.156 kg (2) 0.125 kg (3) 0.144 kg (4) 0.116 kg

Ans. **(4) 0.116 kg**

Sol. Mass in container

m_1 = 18.20 mole × 32 gm = 582.4 gm
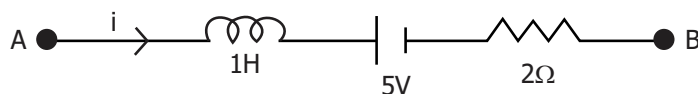
$$PV = \frac{m'}{M_0}RT$$

$$12 \times 1.01 \times 10^5 \times 30 \times 10^{-3} = \frac{m}{32} \cdot \frac{100}{12} \cdot 300$$

m' = 465.4 gm

$\Delta m = m_2 - m_1$ = 582.4 − 465.4 = 116 gm = .116 kg.

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34. AB is a part of an electrical circuit (see figure). The potential difference "$V_A - V_B$", at the instant when current i = 2A and is increasing at a rate of 1 amp/second is :

A •———$\xrightarrow{i}$———⟲⟲⟲———┤├———$\wedge\wedge\wedge$———• B
          1H   5V   2Ω

(1) 10 volt   (2) 5 volt   (3) 6 volt   (4) 9 volt
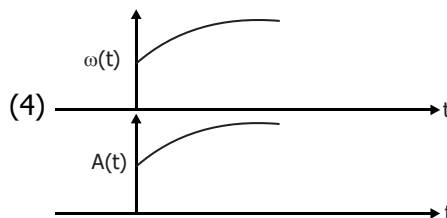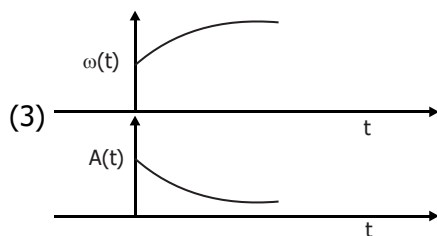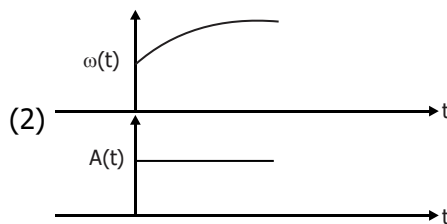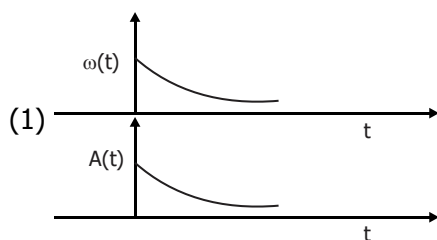
Ans.   **(1) 10 volt**

Sol. $V_A - L \times \dfrac{di}{dt} - 5 - ir - V_B = 0$

$V_A - 1 - 5 - 4 - V_B = 0$

$V_A - V_B = 10$ volt

35. In an oscillating spring mass system, a spring is connected to a box filled with sand. As the box oscillates, sand leaks slowly out of the box vertically so that the average frequency ω(t) and average amplitude A(t) of the system change with time t. Which one of the following options schematically depicts these changes correctly :

(1)
ω(t) — decreasing curve, t
A(t) — decreasing curve, t

(2)
ω(t) — increasing curve, t
A(t) — constant, t

(3)
ω(t) — increasing curve, t
A(t) — decreasing curve, t

(4)
ω(t) — increasing curve, t
A(t) — increasing curve, t

Ans.   **(2)**

Sol.   amp do not depends on mass.

$w = \sqrt{\dfrac{K}{m}}$

36. A model for quantized motion of an electron in a uniform magnetic field B states that the flux passing through the orbit of the electron is n(h/e) where n is an integer, h is Planck 's constant and e is the magnitude of electron's charge. According to the model, the magnetic moment of an electron in its lowest energy state will be : (m is the mass of the electron)

(1) $\dfrac{heB}{2\pi m}$ (2) $\dfrac{he}{\pi m}$ (3) $\dfrac{he}{2\pi m}$ (4) $\dfrac{heB}{\pi m}$

Ans.   **(3)** $\dfrac{he}{2\pi m}$

Sol. $B \cdot \pi r^2 = \dfrac{h}{e} \{ n = 1 \}$

$r = \sqrt{\dfrac{h}{eB\pi}}$ ..... (1)

$e \times B = \dfrac{mv}{r}$ $v = \dfrac{eBr}{m}$

$\mu = \dfrac{eVr}{2} = \dfrac{e}{2} \cdot \dfrac{eB}{m} \cdot r^2$

$e^2 \dfrac{B}{m} \cdot \dfrac{h}{eB\pi} = \dfrac{he}{2\pi m}$

37. A body weighs 48 N on the surface of the earth. The gravitational force experienced by the body due to the earth at a height equal to one-third the radius of the earth from its surface is :

(1) 36 N   (2) 16 N   (3) 27 N   (4) 32 N

Ans. **(3) 27 N**

Sol. $mg = 48 \Rightarrow m = \dfrac{48}{g}$

$w = \dfrac{48}{g} \times g_h = \dfrac{48}{g} \times \dfrac{gR^2}{(R+h)^2}$

$= 48 \times \dfrac{R^2}{\left(R^2 + \dfrac{R}{3}\right)^2} = 48 \times \dfrac{R^2 \times g}{16R^2} = 3 \times 9 = 27N$

38. Consider a waiter tank shown in the figure. It has one wall at $x = L$ and can be taken to be very wide in the z direction. When filled with a liquid of surface tension S and density ρ, the liquid surface makes angle $\theta_0 (\theta_0 << 1)$ with the x-axis at $x = L$. If $y(x)$ is the height of the surface then the equation for $y(x)$ is :
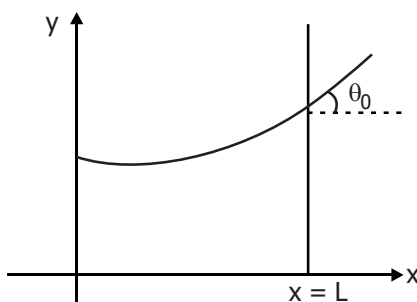
(take $\theta(x) = \sin\theta(x) = \tan\theta(x) = \dfrac{dy}{dx}$, g is the acceleration die to gravity)

(1) $\dfrac{dy}{dx} = \sqrt{\dfrac{\rho g}{S}}x$ (2) $\dfrac{d^2y}{dx^2} = \dfrac{\rho g}{S}x$ (3) $\dfrac{d^2y}{dx^2} = \dfrac{\rho g}{S}y$ (4) $\dfrac{d^2y}{dx^2} = \sqrt{\dfrac{\rho g}{S}}$

Ans. **(3)** $\dfrac{d^2y}{dx^2} = \dfrac{\rho g}{S}y$

Sol. radius of curvatre $r = \dfrac{d^2y\,/\,dx^2}{\left(1 + \dfrac{d^2y}{dx^2}\right)^{3/2}}$

By Using Laplace equation

$\rho gy = r.s$

$\dfrac{\rho g \cdot y}{S} = \dfrac{d^2y}{dx^2}$

II-method :

F = force due to surface tension

$F = S \times Z$ ....(1)

this force is balanced by weight of liq.

W = mg

$\boxed{W = \rho \times xyz \times g}$ .... (2)
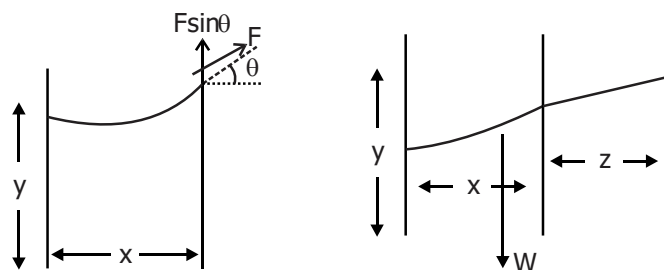
$\Delta \sin\theta = \rho xyz \times g$

$\boxed{\sin\theta = \tan\theta}$

$\delta \times \tan\theta = \rho xyg$

$\delta \times \dfrac{dy}{dx} = \rho xyg$

$\dfrac{dy}{dx} = \dfrac{\rho xyg}{s}$

$\dfrac{d^2y}{dx^2} = \dfrac{\rho g}{\delta} y$

39. The intensity of transmitted light when a polaroid sheet, placed between two crossed polaroids at 22.5° from the polarization axis of one of the Polaroid, is :

(I_0 is the intensity of polarised light after passing through the first polaroid)

(1) $\dfrac{I_0}{16}$ (2) $\dfrac{I_0}{2}$ (3) $\dfrac{I_0}{4}$ (4) $\dfrac{I_0}{8}$

Ans. **(4)** $\dfrac{I_0}{8}$

Sol. I from 1st polaroid is $- I_0$

I from 2 polaroid $= I_0 \cos^2.22.5°$

I from 3 polaroid $= I_0 \cos^2 (90° - 22.5°)$

$I = I_0 \sin^2 22.5° \cdot \cos^2 22.5°$

$= I_0 \dfrac{4}{4} \sin^2 22.5° \cos^2 22.5°$

$= \dfrac{I_0}{4} \times \sin^2 45°$ $= \dfrac{I_0}{8}$

40. A photon and an electron (mass m) have the same energy E. The ratio ($\lambda_{photon}/\lambda_{electron}$) of their de Broglie wavelengths is : (c is the speed of light)

(1) $\dfrac{1}{c}\sqrt{E/2m}$ (2) $\sqrt{E/2m}$ (3) $c\sqrt{2mE}$ (4) $c\sqrt{\dfrac{2m}{E}}$

Ans. **(4)** $c\sqrt{\dfrac{2m}{E}}$

Sol. $\lambda_{photon} = \dfrac{hc}{E}, \quad \lambda_{electron}\dfrac{h}{\sqrt{2mE}}$

$\dfrac{\lambda_{electron}}{\lambda_{electron}}\dfrac{hc\sqrt{2mE}}{E\cdot h} = C\cdot\sqrt{\dfrac{2m}{E}}$

41. An unpolarized light beam travelling in air is incident on a medium of refractive index 1.73 at Brewster's angle. Then :

(1) transmitted light is completely polarized with angle of refraction close to 30°

(2) reflected light is completely polarized and the angle of reflection is close to 60°

(3) reflected light is partially polarized and the angle of reflection is close to 30°

(4) both reflected and transmitted light are perfectly polarized with angles of reflection and refraction close to 60° and 30°, respectively

Ans. **(2) reflected light is completely polarized and the angle of reflection is close to 60°.**

Sol. μ = 1.75 so By Brewester law.

μ = tan θ_p

$\sqrt{3} = \tan\theta_p$

$\theta_p = 60°$

Reflected Ray will prefectly polarized.

$\dfrac{\sin i}{\sin r} = \mu$

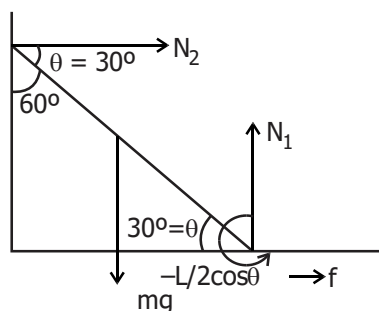$\dfrac{\sin 60°}{\sin r} = \sqrt{3}$ $\sin r = \dfrac{1}{2}$ $\boxed{r = 30°}$

42. An uniform rod of mass 20 kg and length 5 m leans against a smooth vertical wall making an angle of 60° with it. The other end rests on a rough horizontal floor. The friction force that the floor exerts on the rod is : (take g = 10 m/s²)

(1) $200\sqrt{3}$ N   (2) 100 N   (3) $100\sqrt{3}$ N   (4) 200 N

Ans. **(3)** $100\sqrt{3}$ N

Sol. Torque Balancing

$mg \times \dfrac{L}{2}\cos\theta = N_2 \times L\sin\theta$

$$N_2 = \frac{mg}{\cot 60}L_2 = 200 \times \frac{1}{2} \times \sqrt{3}$$

43. Three identical heat conducting rods are connected in series as shown in the figure. The rods on the sides have thermal conductivity 2K while that in the middle has thermal conductivity K. The left end of the combination is maintained at temperature 3T and the right end at T. The rods are thermally insulated from outside. In steady state, temperature at the left junction is T_1 and that at the right-junction is T_2. The ratio T_1/T_2 is :
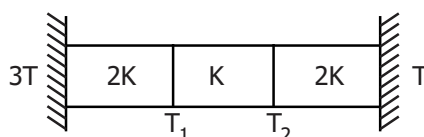
(1) $\dfrac{5}{4}$　　　　(2) $\dfrac{3}{2}$　　　　(3) $\dfrac{4}{3}$　　　　(4) $\dfrac{5}{3}$

Ans. **(4)** $\dfrac{5}{3}$
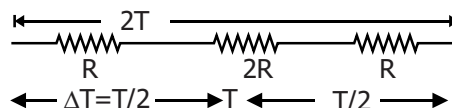
Sol. Consider resistance

$\Delta T_1 : \Delta T_2 : \Delta T_3$
$\ \ 1 \ : \ \ 2 \ \ : \ 1$

$T_A = 3T - T/2 = 5T/2 \ ..... (1)$

$T_B = \dfrac{5T}{2} - T = \dfrac{3T}{2}$

$\dfrac{T_A}{T_B} = \dfrac{5}{3}$

$\Delta T_1 : \Delta T_2 : \Delta T_3$
$\ 1 : 2 : 1$

44. The kinetic energies of two similar cars A and B are 100 J and 225 J respectively. On applying breaks, car A stops after 1000 m and car B stops after 1500 m. If F_A and F_B are the forces applied by the breaks on cars A and B, respectively, then the ratio F_A/F_B is :

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

Ans. **(3)** $\dfrac{2}{3}$

Sol. Work done by $F = \Delta K$

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$100 = F_A \cdot 1000$ .... (1)

$225 = F_B \cdot 1500$ ... (2)

$$\frac{100}{225} = \frac{F_A}{F_B} \times \frac{2}{3}$$

$$\frac{F_A}{F_B} = \frac{2}{3}$$

45. A sphere of radius R is cut from a larger solid sphere of radius 2R as shown in the figure. The ratio of the moment of inertia of the smaller sphere to that of the rest part of the sphere about the Y-axis is :
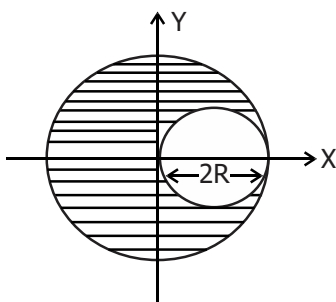
(1) $\dfrac{7}{64}$

(2) $\dfrac{7}{8}$

(3) $\dfrac{7}{40}$

(4) $\dfrac{7}{57}$

Ans. **(4)** $\dfrac{7}{57}$

Sol. $M_{cut\,part} = \dfrac{M}{\frac{4}{3}\pi(2R)^3} \times \dfrac{4}{3}\pi R^3 = \dfrac{M}{8}$

$I_{small} = \dfrac{7}{5} \times \dfrac{M}{8} \times R^2 = \dfrac{7}{40}MR^2 \ldots\ldots(1)$

$I_{remain} = \dfrac{2}{5}M \times 4R^2 - \dfrac{7}{40}MR^2$

$\dfrac{I_{small}}{I_{remain}} = \dfrac{7/40}{\left(\dfrac{8}{5} - \dfrac{7}{40}\right)} = \dfrac{7/40}{\dfrac{64-7}{40}} = \dfrac{7}{57}$

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46. If the molar conductivity (Λ_m) of a 0.050 mol L^{-1} solution of a monobasic weak acid is 90 S cm^2 mol^{-1}, its extent (degree) of dissociation will be :

[Assume Λ_+^0 = 349.6 S cm^2 mol^{-1} and Λ_-^0 = 50.4 S cm^2 mol^{-1})

(1) 0.215   (2) 0.115   (3) 0.125   (4) 0.225

Ans. **(4) 0.225**

Sol. Λ_m = 90 S Cm^2 mol^{-1}

$\Lambda_m^0 = \Lambda^0 + \Lambda_-^0$ (According Kohlrausch law)

Λ_m^0 = 349.6 + 50.4 = 400 S cm^2 mol^{-1}

Degree of dissociation $(\alpha) = \dfrac{\Lambda_m}{\Lambda_m} = \dfrac{90}{400} = 0.225$

47. Given below are two statement :

Statement I : A hypothetical diatomic molecule with bond order zero is quite stable.

Statement II : As bond order increases, the bond length increases.

In the light of the above statement, choose the most appropriate answer from the options given below:

(1) Statement I is false but Statement II is true

(2) Both Statement I and Statement II are true

(3) Both Statement I and Statement II are false

(4) Statement I is ture but Statement II is false

Ans. **(3) Both Statement I and Statement II are false**

Sol. If the bond order between two atoms in zero it means the molecule will not form and it is unstable. So statement–I is false.

B. L $\propto \dfrac{1}{B.O.}$ (Bond order inversly proportional to bond length)

So statement–II is also false.

48. The ratio of the wavelengths of the light absorbed by a Hydrogen atom when it undergoes n = 2 $\rightarrow$ n=3 and n = 4 $\rightarrow$ n = 6 transition, respectively, is

(1) $\dfrac{1}{4}$ (2) $\dfrac{1}{36}$ (3) $\dfrac{1}{16}$ (4) $\dfrac{1}{9}$

Ans. **(1) $\dfrac{1}{4}$**

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Sol. Wavelength during transmition of electron

$$\lambda = \frac{1}{R_H Z^2}\left(\frac{n_1^2 n_2^2}{n_1^2 - n_1^2}\right)$$

$$(\lambda_1)_{2-3} = \frac{1}{R_H}\left(\frac{4 \times 9}{9-4}\right)$$

$$(\lambda_2)_{4-6} = \frac{1}{R_H}\left(\frac{16 \times 36}{36-16}\right)$$

$$\frac{(\lambda_1)_{2-3}}{(\lambda_2)_{4-6}} = \frac{36}{5} \times \frac{20}{16 \times 36} = \frac{1}{4}$$

49. The correct order of wavelength of light absorbed by the following complexes is :
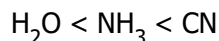
A. $\left[Co(NH_3)_6\right]^{3+}$ B. $\left[Co(CN)_6\right]^{3-}$ C. $\left[Cu(H_2O)_4\right]^{2+}$ D. $\left[Ti(H_2O)_6\right]^{3+}$

Choose the correct answer from the options given belwo :

(1) C < A < D < B   (2) B < D < A < C   (3) B < A < D < C   (4) C < D < A < B
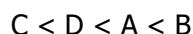
Ans.   **(3) B < A < D < C**

Sol.   A stronger ligand will cause a greater splitting of the d-orbitals.

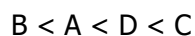Increasing order of of strength of ligand

$H_2O < NH_3 < CN$

Octahderal (C.N = 6) splitting of d-orbitals is more as compared to zetrohedral (C.N. = 4) $\left(\Delta_0 = \frac{9}{4}\Delta_t\right)$

then increasing order of splitting energy

C < D < A < B

increasing order of wavelength of light absorbed $\left(\lambda \propto \frac{1}{E}\right)$
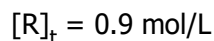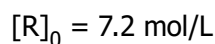
B < A < D < C

50. If the rate constant of a reaction is $0.03\ s^{-1}$, how much time does it take for $7.2\ mol\ L^{-1}$ concentration of the reactant to get reduced to $0.9\ mol\ L^{-1}$?

(Given : log 2 = 0.301)

(1) 21.0 s   (2) 69.3 s   (3) 23.1 s   (4) 210 s

Ans.   **(2) 69.3 s**

Sol. $K = 0.03\ S^{-1}$

$[R]_0 = 7.2\ mol/L$

$[R]_t = 0.9\ mol/L$

for first order

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$$t = \frac{2.303}{K} \log \frac{[R]_0}{[R]_t}$$

$$t = \frac{2.303}{0.03} \log \left(\frac{7.2}{0.9} \right)$$

$$t = \frac{2.303}{0.03} \log (8)$$

$$t = \frac{2.303}{0.03} \log (2)^3$$

$$t = \frac{2.303}{0.03} \times 3 \times \log 2 = 69.3 \text{ sec}$$

51. Match List I with List II

List-I	**List-II**
(Mixture)	**(Method of Separation)**
A. $CHCl_3$ + $C_6H_5NH_2$	I. Distillation under reduced
B. Crude oil in petroleum industry	II. Steam distillation
C. Glycerol from spent-lye	III. Fractional distillation
D. Aniline - water	IV. Simple distillation

Choose the correct answer from the options given below :

(1) A–III, B–IV, C–II, D–I

(2) A–IV, B–III, C–I, D–II

(3) A–IV, B–III, C–II, D–I

(4) A–III, B–IV, C–I, D–II

Ans. **(2) A–IV, B–III, C–I, D–II**

Sol.

Mixture	**Method of Separation**
A. $CHCl_3$ + $C_6H_5NH_2$	I. Simple distillation
B. Crude oil in petroleum industry	II. By Fractional distillation
C. Glycerol from spent-lye	III. Distillation under reduced
D. Aniline - water	IV. Steam distillation

52. The major product of the following reaction is :

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(3)

(4)

Ans. **(3)**
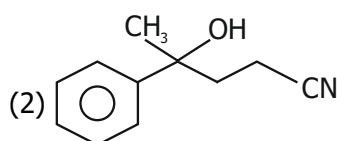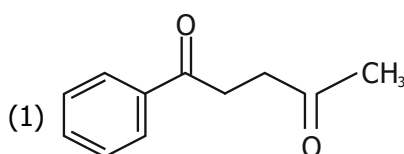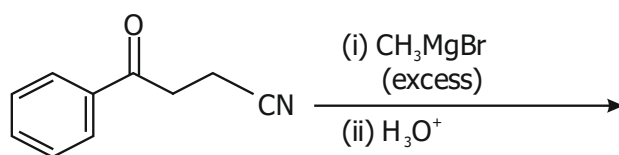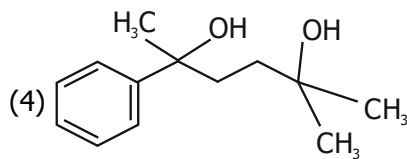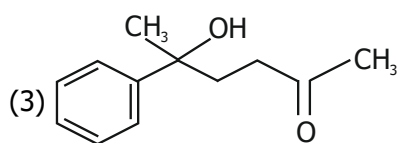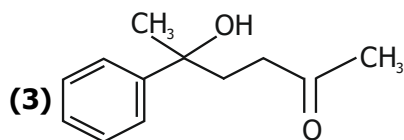
Sol.

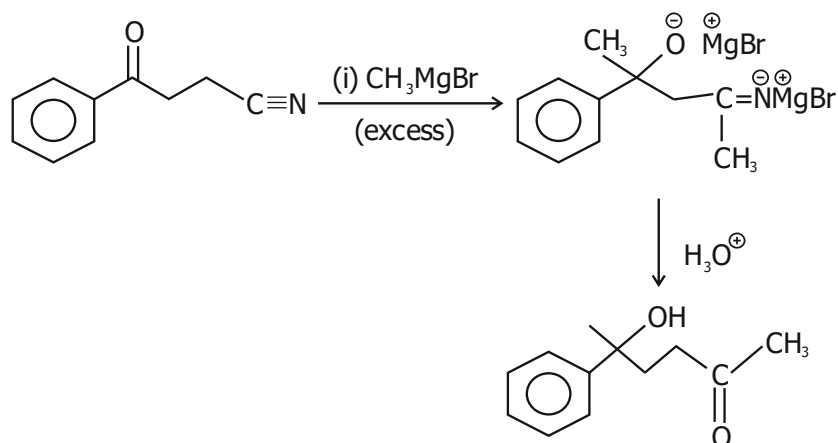**53.** Which one of the following compounds can exist as cis-trans isomers ?
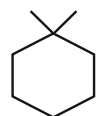
(1) 1,2-Dimethylcyclohexane

(2) Pent-1-ene

(3) 2-Methylhex-2-ene

(4) 1, 1-Dimethylcyclopropane
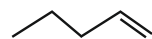
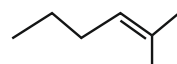**Ans.** **(1) 1,2-Dimethylcyclohexane**

Sol.

cis   trans

 No G.I.

 No G.I.

 No G.I.

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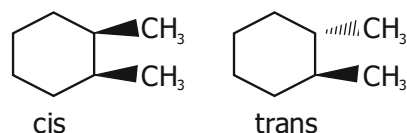
54. Among the following, choose the ones with equal number of atoms .

A. 212 g of Na_2CO_3 (s) [molar mass = 106 g]

B. 248 g of Na_2O (s) [molar mass = 62 g]

C. 240 g of NaOH (s) [molar mass = 40 g]

D. 12 g of H_2 (g) [molar mass = 2 g]

E. 220 g of CO_2 (g) [molar mass = 44 g]

Choose the correct answer from the options given below :

(1) B, D and E only   (2) A, B and C only   (3) A, B and D only   (4) B, C and D only

Ans. **(3) A, B and D only**

Sol. Option A 212 g Na_2CO_3

$$n = \frac{m}{Mw} = \frac{212}{106} = 2$$

no. of atoms = $2 \times 6 = 12\ N_A$

Option B 248 g Na_2O

$$n = \frac{248}{62} = 4$$

no. of atoms = $4 \times 3 = 12\ N_A$

option C 240 g NaOH

$$n = \frac{240}{40} = 6$$

no. of atoms = $6 \times 3 = 18\ N_A$

Option D 12 g H_2

$$n = \frac{12}{2} = 6$$

no. of atoms = $6 \times 2 = 12\ N_A$

Option E 220 g CO_2

$$n = \frac{220}{44} = 5$$

no. of atoms = $5 \times 3 = 15\ N_A$

A, B and D have same no. of atoms.

55. Among the given compounds I-III, the correct order of bond dissociation energy of C–H bond marked with * is :
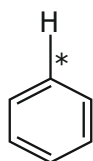
(1) II > III > I   (2) II > I > III   (3) I > II > III   (4) III > II > I

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Ans. **(2) II > I > III**

Sol. C – H Bond energy α overlapping between orbitals

$C_{sp} - H > Csp^2 - H > Csp^3 - H$

Bond energy
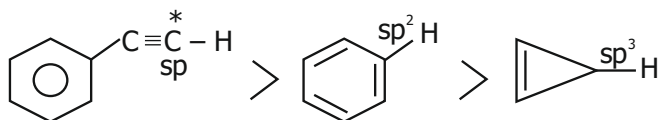
56. The standard heat of formation, in kcal/ mol of Ba^{2+} is :

[Given : standard heat of formation of SO_4^{2-} ion (aq) = – 216 kcal/mol,

$BaSO_4$(s) = –4.5 kcal/mol, standard heat of formation of $BaSO_4$(s) =–349 kcal/mol]

(1) + 220.5   (2) –128.5   (3) –133.0   (4) +133.0

Ans. **(2) –128.5**

Sol. Crystallisation of $BaSO_{4(s)}$

$Ba^{+2}_{(aq)} + SO^{-2}_{4(aq)} \longrightarrow BaSO_{4(s)}$
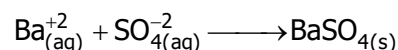
$\Delta_r H$ = –4.5 kcal /mol

$\Delta_r H = (\Delta_f H)_P - (\Delta_f H)_R$
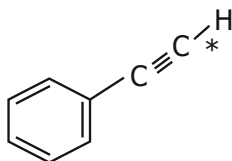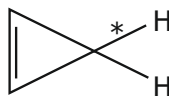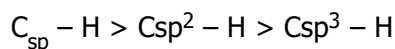
$-4.5 = -349 - (\Delta_f H_{(Ba^{+2})} + (-216))$

$-4.5 = -349 - \Delta_f H_{(Ba^{+2})} + (-216)$

$\Delta_f H_{(Ba^{+2})}$ = –349 + 216 + 4.5 = –128.5 kcal/mol

57. Consider the following compounds :

$\underline{K}O_2$, $H_2\underline{O}_2$ and $H_2\underline{S}O_4$
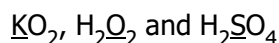
The oxidation states of the underlined elements in them are, respectively,

(1) +4, -4, and +6   (2) +1,-1, and +6   (3) +2,-2; and +6   (4) +1,-2, and +4

Ans. **(2) +1,-1, and +6**

Sol. KO_2 (Super oxide)

Alkali metal show only one oxidation state which is +1

O.S. of K is +1

H_2O_2 (Peroxide)

(2x + 1) + 2x = 0

2x = –2

x = –1

O.S. of O is –1

$H_2\underline{S}O_4$

(2x + 1) + x + (4x – 2) = 0

+2 + x – 8 = 0

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$x = +6$

58. Out of the following cofnplex compounds, which of the compound will be having the minimum conductance in solution?

(1) $[Co(NH_3)_5Cl]Cl$ (2) $[Co(NH_3)_3Cl_3]$ (3) $[Co(NH_3)_4Cl_2]$ (4) $[Co(NH_3)_6Cl]Cl_3$

Ans. **(2) $[Co(NH_3)_3Cl_3]$, (3) $[Co(NH_3)_4Cl_2]$**

59. Which one of the following reactions does NOT give benzene as the product ?

(1) $\xrightarrow[\text{warm}]{H_2O}$

(2) $\xrightarrow[\Delta]{\text{sodalime}}$

(3) n-hexane $\xrightarrow[\text{773 K, 10 - 20 atm.}]{Mo_2O_3}$

(4) $H - C \equiv C - H \xrightarrow[\text{at 873 K}]{\text{red hot Iron Tube}}$

Ans. **(1)** $\xrightarrow[\text{warm}]{H_2O}$

Sol. $\xrightarrow[\text{warm}]{H_2O}$ phenol

 $\xrightarrow{\text{sodalime}}$

 $\xrightarrow[\substack{\text{773K 10-20} \\ \text{atm}}]{MO_2O_3}$

$HC \equiv CH \xrightarrow[\text{tube}]{\text{Red HOT Fe}}$
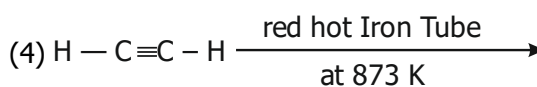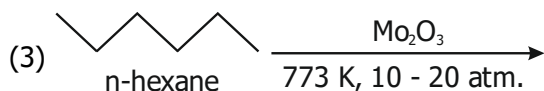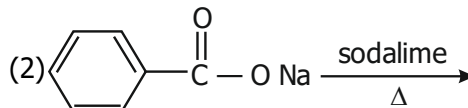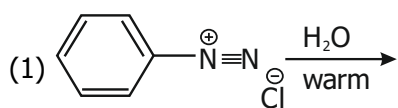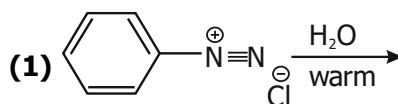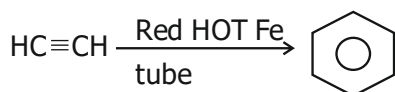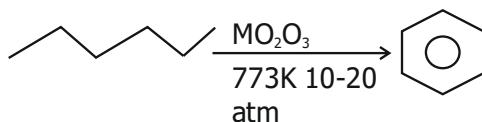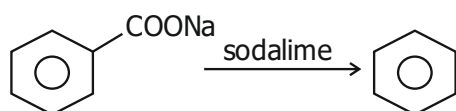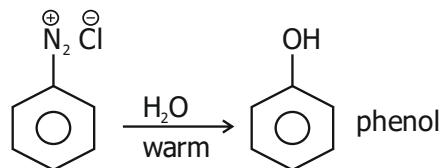
60. Which of the following are paramagnetic ?

A. $[NiCl_4]^{2-}$ B. $Ni(CO)_4$ C. $[Ni(CN)_4]^{2-}$

D. $[Ni(H_2O)_6]^{2+}$ E. $Ni(PPh_3)_4$

Choose the correct ans|ver from the options given below:

(1) A, D and E only   (2) A and C only   (3) B and E only   (4) A and D only

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Ans. **(4) A and D only**

Sol. A. $[NiCl_4]^{2-}$

Oxidation state of Ni is +2

tetrahedral complex

Electronic configuration $e^4 t_2^4$

unpaired electrons – 2 soparamagnetic

B. $Ni(CO)_4$
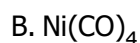
Oxidation state of Ni is O

tetrahedral complex

electronic configuration $e^4 t_2^6$

unpaired electrons $\rightarrow$ O so diamagnetic

C. $[Ni(CN)_4]^{2-}$

Oxidation state of NI is +2

Square planar

Electronic configuration (d^8)

unpaired electrons $\rightarrow$ O so diamagnetic

D. $[Ni(H_2O)_6]^{2+}$
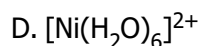
Oxidation state of NI is +2

Oxtahedral

Electronic configuration $t_{2g}^6 e_g^2$

unpaired electrons $\rightarrow$ 2 so paramagnetic

E. $[(PPh_3)_4]$

Oxidation state of NI is O

tetrahedral Electronic configuration d^{10}

unpaired electrons $\rightarrow$ O so diamagnetic

61. Which one of the following compounds **does not** decolourize bromine water ?

(1) ⬡—NH₂   (2) ⬡   (3) ⬡—OH   (4) ⬡—CH = CH₂

Ans. **(2)** ⬡

Sol.

Aniline + Bromine water → 2,4,6-tribromoaniline

Phenol + Bromine water → 2,4,6-tribromophenol

Styrene + Br_2/H_2O → product + product

Cyclohexane + Bromine water → No rxn
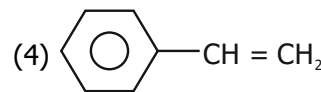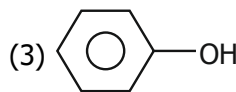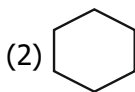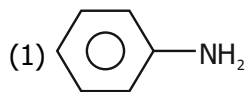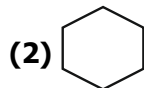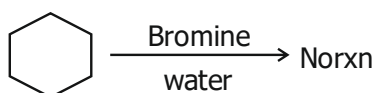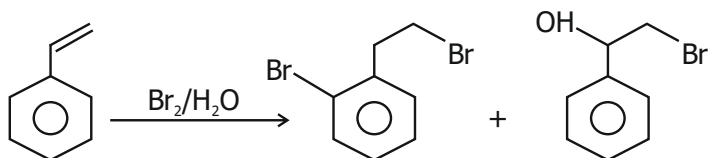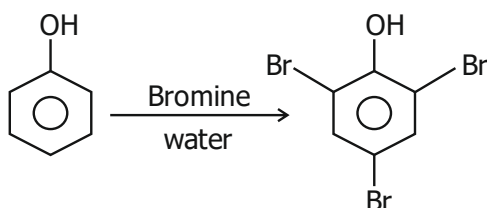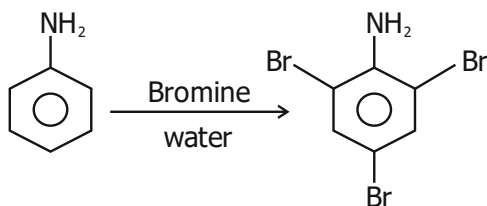
62. Match List - I with List - II

List–I	List–II
A. Haber process	I. Fe catalyst
B. Wacker oxidation	II. $PdCl_2$
C. Wilkinson catalyst	III. $[(PPh_3)_3RHCl]$
D. Ziegler catayst	IV. $TiCl_4$ with $Al(CH_3)_3$

Choose the **correct** answer from the options given below :

(1) A-I, B-IV, C-III, D-II

(2) A-I, B-II, C-IV, D-III

(3) A-II, B-III, C-I, D-IV

(4) A-I, B-II, C-III, D-IV

Ans. **(4) A-I, B-II, C-III, D-IV**

63. Match List-I with List-II

List-I (Name of Vitamin)	List-II (Deficiency disease)
A. Vitamin B_{12}	I. Cheilosis
B. Vitamin D	II. Convulsions
C. Vitamin B_2	III. Rickets
D. Vitamin B_6	IV. Pernicious anaemia

Choose the correct answer from the options given below :

(1) A-IV, B–III, C–II, D–I

(2) A-I, B–III, C–II, D–IV

(3) A-IV, B–III, C–I, D–II

(4) A–II, B–III, C–I, D–IV

Ans. **(3) A-IV, B–III, C–I, D–II**

Sol.

(Name of Vitamin)	(Deficiency disease)
A. Vitamin B_{12}	I. Pernicious anaemia
B. Vitamin D	II. Rickets
C. Vitamin B_2	III. Cheilosis
D. Vitamin B_6	IV. Convulsions

64. Given below are two statements :

Statement I : Ferromagnetism is considered as an extreme form of paramagnetism.

Statement II : The number of unpaired electrons in a Cr^{2+} ion (Z = 24) is the same as that of a Nd^{3+} ion (Z = 60)

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

(1) Statement I is false but Statement II is true

(2) Both Statement I and Statement II are true

(3) Both Statement I and Statement II are false

(4) Statement I it true but Statement II is false

Ans. **(4) Statement I it true but Statement II is false**

Sol. Ferromagnetism is cosidered as an extreme from of paramagnetism.

Cr^{+3} = [Ar]$3d^4 4s^0$ (4 unpaired electron)

Nd^{+3} = [Xe] $4f^3 6s^0$ (3 unpaired electron)

65. If the half-life ($t_{1/2}$ for a first order reaction is 1 minute, then the time required for 99.9% completion of the reaction is closest to :

(1) 10 minutes   (2) 2 minutes   (3) 4 minutes   (4) 5 minutes

Ans. **(1) 10 minutes**

$$t_{1/2} = 1 \, min$$

$$K = \frac{0.693}{t_{1/2}} = 0.693 \, min^{-1}$$

$$t = \frac{2.303}{K} \log\left(\frac{[R]_0}{[R]_t}\right)$$

$$t_{(99.9\%)} = \frac{2.303}{0.693} \log\left(\frac{100}{0.1}\right)$$

$$t_{(99.9\%)} = 10 \, min$$

66. The correct order of decreasing basic strength of the given amines is :

(1) benzenamine > ethanamine > N-methylaniline > N-ethylethanamine

(2) N-methylaniline > benzenamine > ethanamine > N-ethylethanamine

(3) N-ethylethanamine > ethanamine > benzenamine > N-methylaniline

(4) N-ethylethanamine > ethanamine > N-methylaniline > benzenamine

Ans. **(3) N-ethylethanamine > ethanamine > benzenamine > N-methylaniline**

Sol. Basic strength order

$(C_2H_5)_2\ddot{N}$ > $C_2H_5\ddot{N}H_2$ > (structure: benzene ring with $NH-CH_3$) > (structure: benzene ring with $\ddot{N}H_2$)
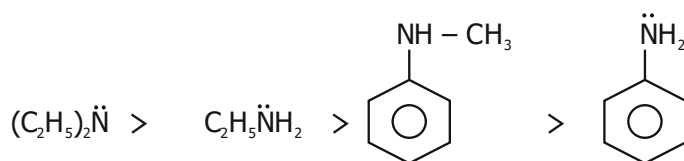
67. Match List I with List II

List–I	List-II
(Ion)	**(Group number in Cation Anylysis)**
A. CO^{2+}	I. Group–I
B. Mg^{2+}	II. Group–III
C. Pb^{2+}	III. Group–IV
D. Al^{3+}	IV. Group–VI

Choose the **correct** answer from the options given below :

(1) A-III, B-II, C-I; D-IV

(2) A-III, B-IV, C-II, D-I

(3) A-III, B-IV, C-I, D-II

(4) A-III, B-II, C-IV, D-I

Ans. **(3) A-III, B-IV, C-I, D-II**

68. Phosphoric acid ionizes in three steps with their ionization constant values

K_{a_1}, K_{a_2} and K_{a_3} respectively,

while K is the overall ionization constant. Which of the following statements are true?

A. $\log K = \log K_{a_1} + \log K_{a_2} + \log K_{a_3}$

B. H_3PO_4 is stronger acid than $H_2PO_4^-$ and HPO_4^{2-}.

C. $K_{a_1} > K_{a_2} > K_{a_3}$

D. $K_{a_1} = \dfrac{K_{a_2} + K_{a_2}}{2}$

Choose the **correct** answer from the options given below:

(1) A, B and C only   (2) A and B only   (3) A and C only   (4) B, C and D only

Ans. **(1) A, B and C only**

Sol. Polyprotic weak acid

$H_3PO_4 \rightleftharpoons H^+ + H_2PO_4^- \quad K_{a_1}$

$H_2PO_4^- \rightleftharpoons H^+ + HPO_4^{-2} \quad K_{a_2}$

$H_2PO_4^{-2} \rightleftharpoons H^+ + PO_4^{-3} \quad K_{a_3}$

$H_3PO_4 \rightleftharpoons H^+ + PO_4^{-3} \quad K = K_{a_1} \times K_{a_2} \times K_{a_3}$
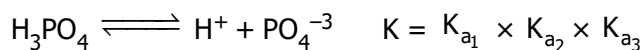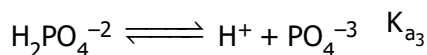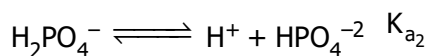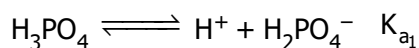
$\log K = \log K_{a_1} + \log K_{a_2} + \log K_{a_3}$

$K_{a_1} > K_{a_2} > K_{a_3}$

69. Which of the following statements are true?

A. Unlike Ga that has a very high melting point, Cs has a very low melting point.

B. On Pauling scale, the electronegativity values of N and Cl are not the same.

C. Ar, K^+, Cl^-, Ca^{2+}, and S^{2-} are all isoelectronic species

D. The correct order of the first ionization enthalpies of Na, Mg, Al, and Si is Si > Al > Mg > Na.

E. The atomic radius of Cs is greater than that of Li and Rb

Choose the correct answer from the options given below :

(1) A, C and E only   (2) A, B and E only   (3) C and E only   (4) C and D only

Ans. **(3) C and E only**

Sol. Ga has low melting point

E.N of Cl is graterthan nitrogen

Ar, K^+, Cl^-, Ca^{2+}, S^{2-} all have 18 electrons

Order of first ionization enthalpies

Si > Mg > Al > Na

Order of atomic radius

Cs > Rb > Li

70. Given below are two statements :

Statement I : Like nitrogen that can form ammonia, arsenic can form arsine.

Statement II: Antimony cannot form antimony pentoxide.

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

(1) Statement I is incorrect but Statement II is correct

(2) Both Statement 1 and Statement II are correct

(3) Both Statement 1 and Statement II are incorrect

(4) Statement I is correct but Statement II is incorrect

Ans. **(4) Statement I is correct but Statement II is incorrect**

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71. Which of the following aqueous solution will exhibit highest boiling point?

(1) 0.015 M $C_6H_{12}O_6$ (2) 0.01 M Urea   (3) 0.01 M KNO_3 (4) 0.01 M Na_2SO_4

Ans. **(4) 0.01 M Na_2SO_4**

Sol. No. of particals (im) $\propto$ colligative properties

(im) $\propto$ boiling point

0.015 M $(C_6H_{12}O_6)$ im = 0.015

0.01 M (Urea) im = 0.01

0.01 M (KNO_3) im = 0.02

0.01 M (Na_2SO_4) im = 0.03

So 0.01 M (Na_2SO_4) has highest bailing point

72. Give below are two statement :

Statement I : Benzenediazonium salt is prepared by the reaction of aniline with nitrous acid at 273 - 278 K. It decomposes easily in the dry state.

Statement II : Insertion of iodine into the benzene ring is difficult and hence iodobenzene is prepared through the reaction of benzenediazonium salt with KI.

In the light of the above statement, choose the most appropriate answer from the options given below :

(1) Statement I is incorrect but Statement II is correct

(2) Both Statement I and Statement II are correct

(3) Both Statement I and Statement II are incorrect

(4) Statement I is correct but Statement II is incorrect

Ans. **(2) Both Statement I and Statement II are correct**

Sol. Statement I & II Both are correct

73. Identify the suitable reagent for the following conversion.
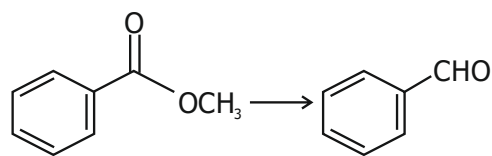
(1) H_2 / Pd-$BaSO_4$

(2) (i) $LiAlH_4$, (ii) H^+/H_2O

(3) (i) $AlH(iBu)_2$, (ii) H_2O

(4) (i) $NaBH_4$, (ii) H^+/H_2O

Ans. **(3) (i) $AlH(iBu)_2$, (ii) H_2O**

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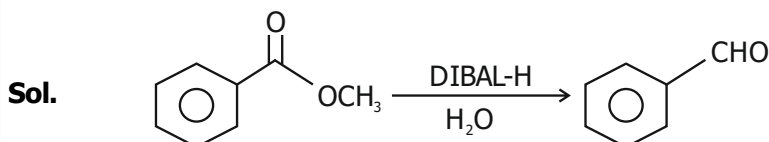
74. Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A) : ∕∖∕∖ I undergoes S_N2 reaction faster than ∕∖∕∖ Cl.

Reason (R) : Iodine is a better leaving group because of its large size.

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

(1) A is false but R is true

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

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

(4) A is true but R is false

Ans. **(2) Both A and R are true and R is the correct explanation of A**

Sol. Both statements are correct

75. The correct order of decreasing acidity of the following aliphatic acids is :

(1) $HCOOH > (CH_3)_3 CCOOH > (CH_3)_2 CHCOOH > CH_3COOH$

(2) $(CH_3)_3 CCOOH > (CH_3)_2 CHCOOH > CH_3COOH > HCOOH$

(3) $CH_3COOH > (CH_3)_2 CHCOOH > (CH_3)_3 CCOOH > HCOOH$

(4) $HCOOH > CH_3COOH > (CH_3)_2CHCOOH > (CH_3)_3 CCOOH$

Ans. **(4) $HCOOH > CH_3COOH > (CH_3)_2CHCOOH > (CH_3)_3 CCOOH$**

Sol. Acidic strength order

$HCOOH > CH_3COOH > (CH_3)_2 CHCOOH > (CH_3)_3 CCOOH$
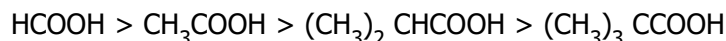
76. Which one of the following reactions does **NOT** belong to "Lassaigne's test" ?

(1) $2CuO + \xrightarrow{\Delta} 2Cu + CO_2$

(2) $Na + C + N \xrightarrow{\Delta} NaCN$

(3) $2Na + S \xrightarrow{\Delta} Na_2S$

(4) $Na + X \xrightarrow{\Delta} + NaX$

Ans. **(1) $2CuO + \xrightarrow{\Delta} 2Cu + CO_2$**

Sol. $2CuO + C \xrightarrow{\Delta} 2Cu + CO_2$

This reaction is not related with lassaingne test.

77. How many products (including stereoisomers) are expected from monochlorination of the following compound ?

$$H_3C$$
$$\diagdown$$
$$CH - CH_2 - CH_3$$
$$\diagup$$
$$H_3C$$

(1) 6   (2) 2   (3) 3   (4) 5

Ans. **(1) 6**

Sol.

optically active
so mirror image also
include in steroisomer
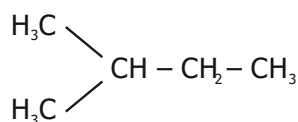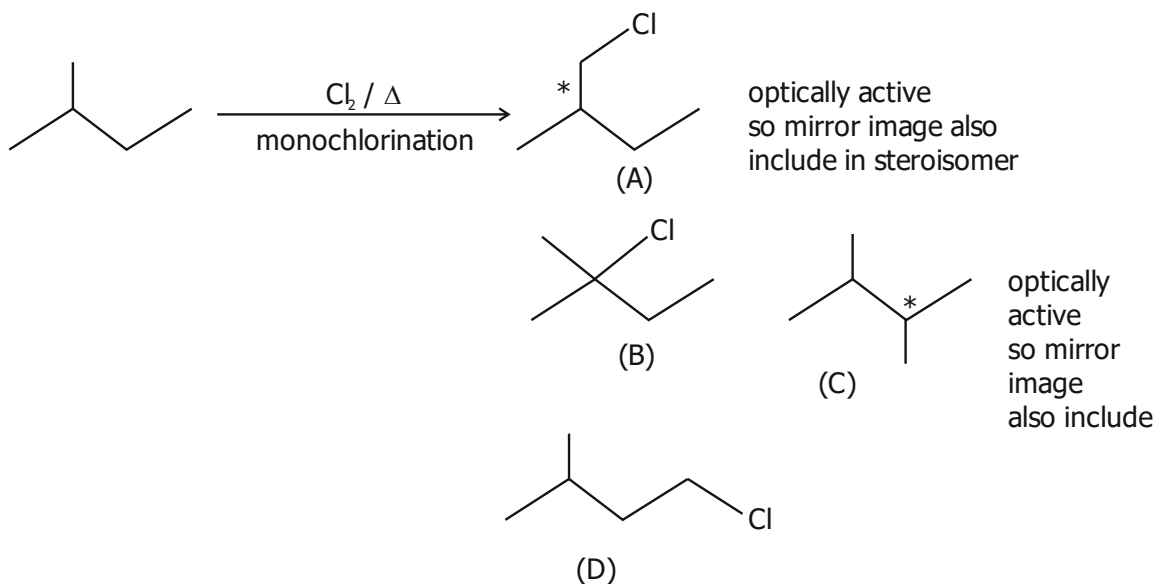
Total 6 isomers obtain including stereoisomerism.

78. Sugar 'X'

A. is found in honey.

B. is a keto sugar.

C. exists in α and β - anomeric forms.

D. is laevorotatory.

'X' is :

(1) Sucrose   (2) D-Glucose   (3) D-Fructose   (4) Maltose

Ans. **(3) D-Fructose**

Sol. Sugar (x)

is fructose →
- present in Honey
- Keto sugar
- present in α & β form
- Laevorotatory

79. Dalton's Atomic theory could not explain which of the following?

(1) Law of gaseous volume   (2) Law of conservation of mass

(3) Law of constant proportion   (4) Law of multiple proportion

Ans. **(1) Law of gaseous volume**

Sol. Dalton's atomic theory not explain law of gaseous volume.

80. Higher yield of NO in

$N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$ can be obtained at

[ΔH of the reaction = + 180.7 kJ mol^{-1}]

A. higher temperaturg

B. lower temperature

C. higher concentration of N_2

D. higher concentration of O_2

Choose the **correct** answer from the options given below :

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

Ans. **(1) A, C, D only**

Sol. $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$ $\Delta H = +180.7$ KJ mol

$\rightarrow$ endothermic reaction

(1) Higher temperaturg

(2) Higher concentration of N_2

(3) Higher concentration of O_2

81. Match List-I with List-II

List-I	**List-II**
A. XeO_3	I. sp^3d; linear
B. XeF_2	II. sp^3; pyramidal
C. $XeOF_4$	III. sp^3d^3; distorted octahedral
D. XeF_6	IV. sp^3d^2; square pyramidal

Choose the **correct** answer from the options given below :

(1) A-IV, B-II, C-I, D-III   (2) A-II B-I, C-IV, D-III

(3) A-II B-I, C-III, D-IV   (4) A-IV, B-II, C-III, D-I

Ans. **(2) A-II B-I, C-IV, D-III**

Sol. $XeO_3 \rightarrow sp^3d$ lenear   [36 + 1 LP)

$XeF_2 \rightarrow sp^3d$ lenear   [26 + 3 LP)

$XeOF_4 \rightarrow sp^3d^2$ – square pyramidal [5 + 1 LP)

$XeF_6 \rightarrow sp^3d^3$ – Distorted octahedral

82. Match List - I with List - II

List-I (Example)	**List-II (Type of solution)**
A. Humidity	I. Solid in solid
B. Alloys	II. Liquids in gas
C. Amalgams	III. Solid in gas
D. Smoke	III. Liquid in solid

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Choose the **correct** answer from the options given below :

(1) A-III, B-II, C-I, D-IV

(2) A-II, B-IV, C-I, D-III

(3) A-II, B-I, C-IV, D-III

(4) A-III, B-I, C-IV, D-II

Ans. **(3) A-II, B-I, C-IV, D-III**

Sol. Humidity – Liquid in gas

Alloys – Solid in solid

Amalgams – Liquid in solid

Smoke – Solid in gas

83. Enery and radius of first Bohr orbit of He^+ and Li^{2+} are

[Given $R_H = 2.18 \times 10^{-18}$ J, $a_0 = 52.9$ pm]

(1) $E_n (Li^{2+}) = -8.72 \times 10^{-16}$ J;

$r_n (Li^{2+}) = 17.6$ pm

$E_n (He^+) = -19.62 \times 10^{-16}$ J;

$r_n (He^+) = 17.6$ pm

(2) $E_n (Li^{2+}) = -19.62 \times 10^{-18}$ J;

$r_n (Li^{2+}) = 17.6$ pm

$E_n (He^+) = -8.72 \times 10^{-18}$ J;

$r_n (He^+) = 26.4$ pm

(3) $E_n (Li^{2+}) = -8.72 \times 10^{-18}$ J;

$r_n (Li^{2+}) = 26.4$ pm

$E_n (He^+) = -19.62 \times 10^{-18}$ J;

$r_n (He^+) = 17.6$ pm

(4) $E_n (Li^{2+}) = -19.62 \times 10^{-16}$ J;

$r_n (Li^{2+}) = 17.6$ pm

$E_n (He^+) = -8.72 \times 10^{-16}$ J;

$r_n (He^+) = 26.4$ pm

Ans. **(2) $E_n (Li^{2+}) = -19.62 \times 10^{-18}$ J;**

$r_n (Li^{2+}) = 17.6$ pm

$E_n (He^+) = -8.72 \times 10^{-18}$ J;

$r_n (He^+) = 26.4$ pm

Sol. $r = .529 \times \dfrac{n^2}{Z} A^0 \qquad E = -2.18 \times 10^{-18} \times \dfrac{z^2}{n^2}$ Joule

$n = 1$

$E_{He^+} = .529 \times \dfrac{1}{2} A^0 \quad E_{He^+} = -2.18 \times 10^{-18} \times \dfrac{(2)^2}{(1)^2}$

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$= .264 \, S \, A^0$ $\qquad E_{He^+} = -8.72 \times 10^{-18} \, S$

$= 26.4 \, PM$

$n = 1$

$r_{Li^{+2}} = .529 \times \dfrac{1}{3} A^0$ $\qquad E_{Li^{+2}} = -2.18 \times 10^{-18} \times \dfrac{(3)^2}{(1)^2}$

$= 17.6 \, pm$ $\qquad E_{Li^{+2}} = -19.62 \times 10^{-18} \, J$

84. Which among the following electronic configurations belong to main group elements :

A. $[Ne]3s^1$ $\qquad$ B. $[Ar]3d^34s^2$ $\qquad$ C. $[Kr]4d^{10}5s^25p^5$

D. $[Ar]3d^{10}4s^1$ $\qquad$ E. $[Rn]5f^0 \, 6d^27s^2$
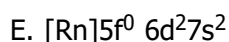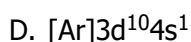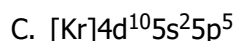
Choose the **correct** answer form the option given below :

(1) A, C and D only $\qquad$ (2) B and E only $\qquad$ (3) A and C only $\qquad$ (4) D and E only

Ans. **(3) A and C only**

Sol. s & p block element are main group element

(A) $[Ne]3s^1 \rightarrow$ s-block element

(B) $[Ar]3d^34s^2 \rightarrow$ d-block element

(C) $[Kr]4d^{10}5s^25p^5 \rightarrow$ p-block element

(D) $[Ar]3d^{10}4s^1 \rightarrow$ d-block element

(E) $[Rn]5f^0 \, 6d^27s^2 \rightarrow$ f-block element

85. $C(s) + 2H_2(g) \rightarrow CH_4(g); \Delta H = -74.8 \, kJ \, mol^{-1}$

Which of the following diagrams gives an accurate representation of the above reaction ?

$[R \rightarrow$ reactants; $P \rightarrow$ prducts]

Ans. **(2)**
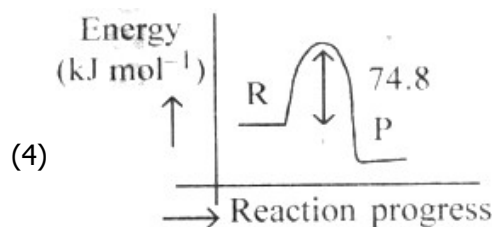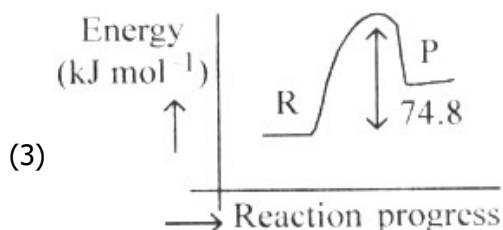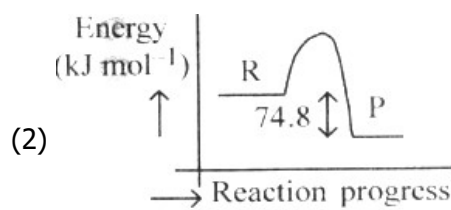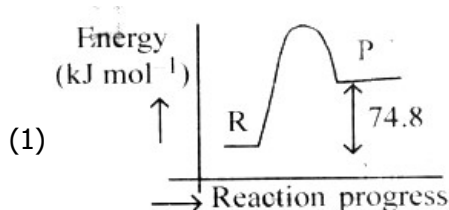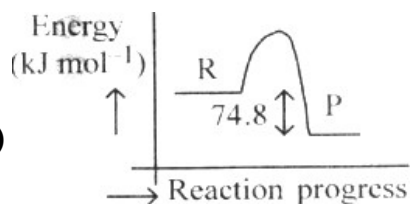
Sol. $C_{(s)} + 2H_{2(g)} \rightarrow CH_{4(g)}$ $\Delta H = -74.8$ kJ/mol
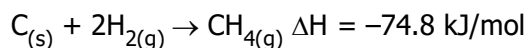
$\rightarrow$ Exothermic reaction

$E_P < E_R$
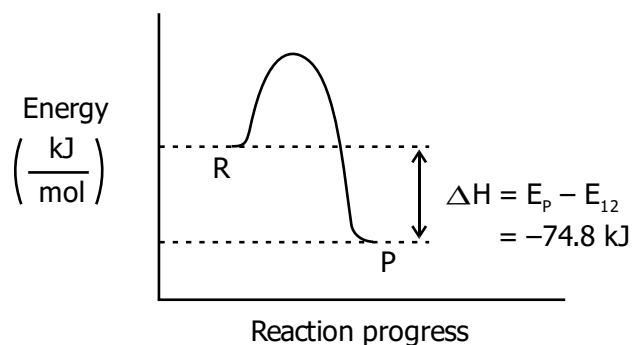
86. Predict the major product 'P' in the following sequence of reactions –

Ans. **(2)**

Sol.

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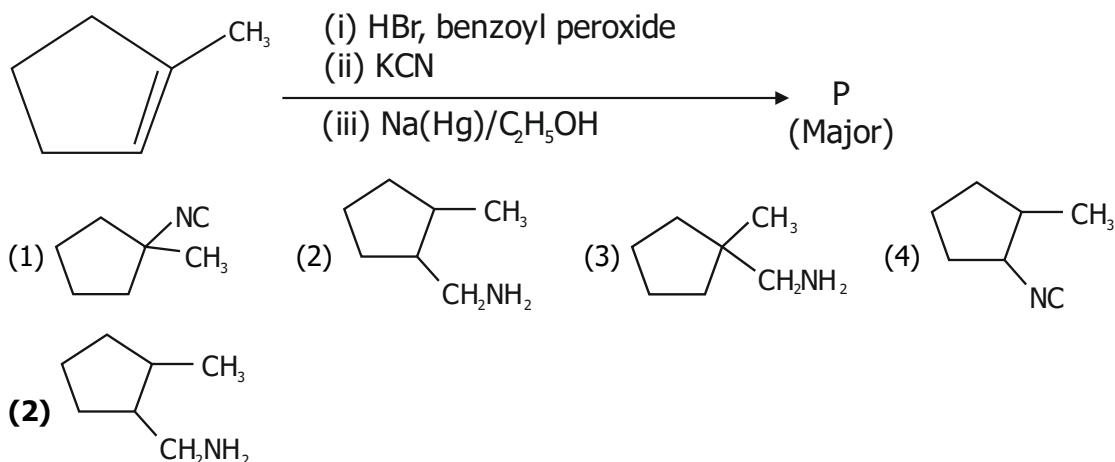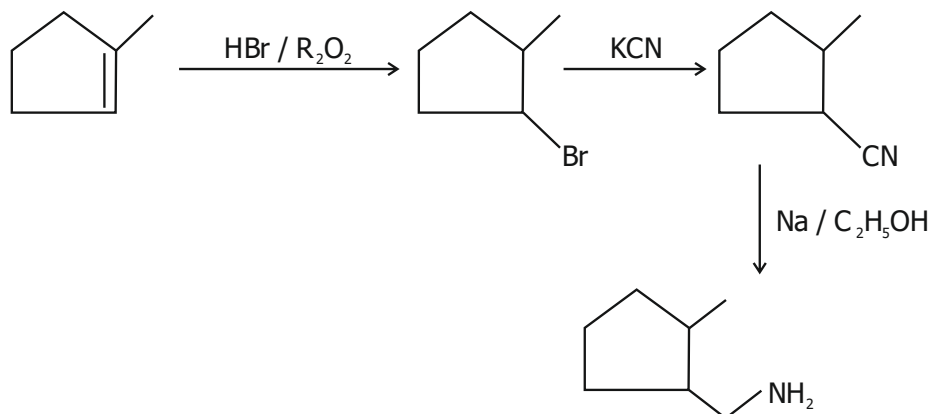
87. Identify the correct orders against the property mentioned

A. $H_2O > NH_3 > CHCl_3$ – dipole moment

B. $XeF_4 > XeO_3 > XeF_2$ – number of lone pairs on central atom

C. O–H > C–H > N–O – bond length

D. $N_2 > O_2 > H_2$ – bond enthalpy

Choose the **correct** answer from the options given below :

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

Ans. **(2) A, D only**

Sol. (A) $H_2O > NH_3 > CHCl_3$ – dipole moment

(B) $\underset{3\ell.p.}{XeF_2} > \underset{2\ell.p.}{XeF_4} > \underset{1\ell.p.}{XeO_3}$ – number of lone pairs on central atom

(D) $\underset{(N\equiv N)}{N_2} > \underset{(O=O)}{O_2} > \underset{(H-H)}{H_2}$ – bond enthalpy

88. Total number of possible isomers (both structural as well as stereoisomers) of cyclic ethers of molecular formula C_4H_8O is :

(1) 11   (2) 6   (3) 8   (4) 10

Ans. **(4) 10**

Sol. MF $\xrightarrow{\quad C_4H_8O \quad}$ cyclic ether isomers.
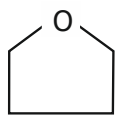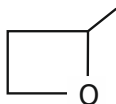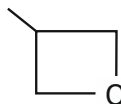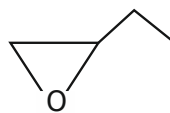
(A)   (B)   (C)   (D)
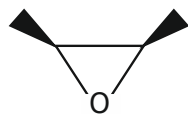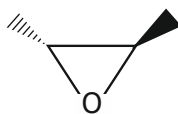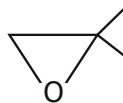
(E)   (F)   (G)

structure (B), (D), (F) are optically active so mirror images also included in stereoisomerism. so total stereoisomers are.

89. For the reaction A (g) $\rightleftharpoons$ 2B(g), the backward reaction rate constant is higher than the forward reaction rate constant by a factor of 2500, at 1000 K.

[Given : R = 0.0831 L atm mol^{-1} K^{-1}]

K_P for the reaction at 1000 K is :

(1) 0.021   (2) 83.1   (3) 2.077×10^5 (4) 0.033

Ans. **(4) 0.033**

Sol. $A(g) \rightleftharpoons 2B(g)$ $\Delta ng = +1$

$K_b = 2500 \, K_F$ $K_p = K_c (RT)^{\Delta ng}$

$K_c = \dfrac{K_f}{K_b}$
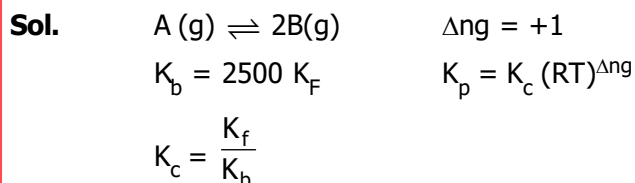
$K_c = \dfrac{K_f}{2500 K_f}$ $K_P = 4 \times 10^{-4} (.0831 \times 1000)^1$

$K_c = 4 \times 10^{-4}$ $K_p = .033$

90. 5 moles of liquid X and 10 moles of liquid Y make a solution having a vapour pressures of pure X and Y are 63 torr and 78 torr respectively. Whic of the following is true regarding the described solution :

(1) The solution has volume greater than the sum of individual volumes.

(2) The solution shows positive deviation

(3) The solution shows negative deviation

(4) The solution is ideal

Ans. **(3) The solution shows negative deviation**

Sol. $P_S = P_A + P_B \rightarrow$ Rault's law

$P_S = P_X + P_Y$

$P_x = X_x \, P_x^0$ $P_x = \dfrac{5}{15} \times 63$ $P_x = 21$

$P_y = X_y \, P_y^0$ $P_y = \dfrac{10}{15} \times 78$ $P_y = 52$

$P_s = 21 + 52$

$P_s = 73$

$\boxed{P_{Practical} < P_{Theortical}}$

$\rightarrow$ Show Negative deviation

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NEET(UG)–2025 EXAMINATION

(Held On Sunday 4th May, 2025)

BIOLOGY

(Question Paper with Answer & Solution)

Paper Code : **47**

Test Date : **04.05.2025**

91. Which of the following is the unit of productivity of an Ecosystem ?

(1) $(KCal \ m^{-2}) \ y$ (2) gm^{-2} (3) $KCal \ m^{-2}$ (4) $KCal \ m^{-3}$

Ans. (1). $(KCal \ m^{-2}) \ y$

92. The First menstruation is called :

(1) Ovulation   (2) Menopause   (3) Menarche   (4) Diapause

Ans. (3) **Menarche**

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

Assertion (A) : All vertebrates are chorates but all chorates are not vertebrate.

Reason (R) : The members of subphylum vertebrata possess notochord during the embryonic period, the notochord is replaced by a cartilaginous or bony vertebral column in adults.

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

(1) A is false but R is true

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

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

(4) A is true but R is false

Ans. (2) **Both A and R are true and R is the correct explanation of A**

94. Genes R and Y follow independent assortment. If RRYY produce round yellow seeds and rryy produce wrinkled green seeds, what will be the phenotypic ratio of the F2 generation?

(1) Phenotypic ratio - 9 : 7   (2) Phenotypic ratio - 1 : 2 : 1

(3) Phenotypic ratio - 3 : 1   (4) Phenotypfc ratio - 9 : 3 : 3 : 1

Ans. (4) **Phenotypfc ratio - 9 : 3 : 3 : 1**

95. Given below are two statements :

Statement I : The DNA fragments extracted from gel electrophoresis can be used in construction of recombinant DNA.

Statement II: Smaller size DNA fragments are observed near hnbde while larger fragments are found near the wells in an agarose gel.

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

(1) Statement I is incorrect but statement II is correct

(2) Both statement I and statement II are correct

(3) Both statement I and statement II are incorrect

(4) Statement is correct but statement II is incorrect

Ans. (2) **Both statement I and statement II are correct**

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96. What is the main function of the spindle fibers during mitosis ?

(1) To regulatecell growth

(2) To separate the chromosomes

(3) To synthesize new DNA

(4) To rgpair damaged DNA

Ans. (2) **To separate the chromosomes**

97. How many meiotic and mitotic divisions need to occur for the development of a mature female gametophyte from the megaspore mother cell in an angioserm plants ?

(1) No meiosis and 2 Mitosis

(2) 2 Meiosis and 3 Mitosis

(3) 1 Meiosis and 2 Mitosis

(4) 1 Meiois and 3 Mitosis

Ans. (4) **1 Meiois and 3 Mitosis**

98. Identify the statement that is **NOT** correct.

(1) Constant region of heavy and light chains are located at C-terminus of antibody

(2) Each molecules antibody has two light and two heavy chains.

(3) The heavy and light chains are held togetherby disulfide bonds.

(4) Antigen binding site is located at C-terminal region of antibody molecules.

Ans. (4)

99. Consider the following :

A. The reductive division for the human female gametogenesis starts earlier than that of the male gametogenesis.

B. The gap between the first meiotic division and the secbnd meiotic division is much shorter for males compared to females.

C. The first polar body is associated with the formation of the primary oocyte.

D. Luteinizing Hormone (LH) surge leads to disintegration of the endometrium and onset of menstrual bleeding.

Choose the correct answer from the options given below :

(1) B and C are true

(2) A and B are true

(3) A and C are true

(4) B and D are true

Ans. (2) **A and B are true**

100. Given below are two statements : One is labelled as **Assertion (A)** and the other is labelled as **Reason (R).**

Assertion (A): Cells of the tapetum possess dense cytoplasm and generally have more than one nucleus.

Reason (R) : Presence of more than one nucleus in the tapetum .increases the efficiency of nourishing the developing microspore mother cells.

In light of the above statements, choose the **most appropriate** answer from the options given below:

(1) A is false but R is true

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

(3) Both A and R are true but R is NOT the correct explanation of A

(4) A is true but R is false

Ans. (2) **Both A and R are true and R is the correct explanation of A**

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101. The blue and white selectable markers have been developed which differentiate recombinant colonies from non-recombinant colonies on the basis of their ability to produce colour in the presence of a chromogenic substrate. Given below are two statements about this method:

Statement I : The blue coloured colonies have DNA insert in the plasmid and they are identified as recombinant colonies.

Statement II : The colonies without blue colour have DNA insert in the plasmid and are identified as recombinant colonies.

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

(1) Statement I is incorrect but Statement II is correct

(2) Both Statement I and Statement II are correct

(3) Both Statement I and Statement II incorrect.

(4) Statement I is correct but Statement II is incorrect

Ans. (1) Statement I is incorrect but Statement II is correct

102. In bryophytes the gemmae help in which one of the following ?

(1) Gaseous exchange   (2) Sexual reproduction

(3) Asexual reproduction   (4) Nutrient absorption

Ans. (3) Asexual reproduction

103. Match List I with List II

List-I	List-II
A. Adenosine	I. Nitrogen base
B. Adenylic acid	II. Nucleotide
C. Adenine	III. Nucleoside
D. Alanine	IV. Amino acid

Choose the option with all correct matches.

(1) A-II, B-III, C-I, D-IV

(2) A-III, B-IV, 6-II, D-I

(3) A-III, B-II, C-lV, D-I

(4) A-III, B-II, C-I, D-IV

Ans. (4). A-III, B-II, C-I, D-IV

104. With the help of given pedigree, find out the probability for the birth of a child having no disease and being a carrier (has the disease mutation in one allele of the gene) in F_3 generation.

F_0

F_1

F_2

F_3 [?] (?) (?) [?]
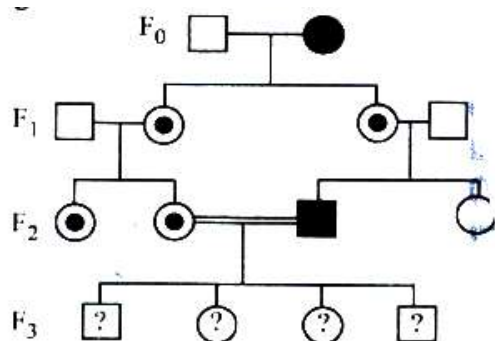
☐ Unaffected male

■ Affected male

⦿ Carrier female

◯ Unaffected female

● Affected female

(1) Zero   (2) 1/4   (3) 1/2   (4) 1/8

Ans. (2) 1/4

105. Consider the following statements regarding function of adrenal medullary hormones :

A. It causes pupilary constriction

B. It is a hyperglycemic hormone

C. It causes piloerection

D. It increases strength of heart contraction

Choose the **correct** answer from the options given below :

(1) D Only   (2) C and D Only   (3) B, C and D Only   (4) A, C and D Only

Ans. (3) B, C and D Only

106. Which of the following is an example of a zygomorphic flower ?

(1) Chilli   (3) Datura

(2) Petunia   (4) Pea

Ans. (4) Pea

107. Who proposed that the genetic code for amino acids should be made up of three nucleotides?

(1) Franklin Stahl   (2) George Gamow

(3) Francis Crick   (4) Jacque Monod

Ans. (2) George Gamow

108. Given below are two statements :

Statement I : In ecosystdfo, there is unidirectional flow of energy of sun from roducers to consumers.

Statement II : Ecosystems are exempted from 2nd law of thermodynamics.

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

(1) Statement I is incorrect but statement II is correct

(2) Both statement I and statement II are correct

(3) Both statement I and statement II are incorrect

(4) Statement I is correct but statement II is incorrect

Ans. (4) **Statement I is correct but statement II is incorrect**

109. Sweet potato and potato represent a certain type of evolution. Select the correct combination of terms to explain the evolution.

(1) Analogy, divergent

(2) Analpgy, convergent

(3) HofhPlogy, divergent

(4) Homology, convergent

Ans. (2) **Analpgy, convergent**

110. All living members of the class Cyclostomata are:

(1) Ectoparasite   (2) Free living   (3) Endpparasite   (4) Symbiotic

Ans. (1) **Ectoparasite**

111. Histones are enriched with -

(1) Phenylalanine & Arginine

(2) Lysine & Arginine

(3) Leucine & Lysine

(4) Phenylalanine & Leucine

Ans. (2) **Lysine & Arginine**

112. Which one of the following equations represents the Verhulst-Pearl Logistic Growth of population?

(1) $\dfrac{dN}{dt} = N\left(\dfrac{r-K}{K}\right)$ (2) $\dfrac{dN}{dt} = r\left(\dfrac{K-N}{K}\right)$ (3) $\dfrac{dN}{dt} = rN\left(\dfrac{K-N}{K}\right)$ (4) $\dfrac{dN}{dt} = rN\left(\dfrac{N-K}{N}\right)$

Ans. (3) $\dfrac{dN}{dt} = rN\left(\dfrac{K-N}{K}\right)$

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

Assertion (A) : The primary function of the Golgi apparatus is to package the materials made by the endoplasmic reticulum and deliver it to intracellular targets and outside the cell.

Reason (R) : Vesicles containing materials made by the endoplasmic reticulum fuse with the cis face of the Golgi apparatus, and they are modified and released from the trans face of the Golgi apparatus.

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

(1) A is false but R is true

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

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

(4) A is true but R is false

Ans. (2) **Both A and R are true and R is the correct explanation of A**

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114. Which of the following statements about RuBisCO is true?

(1) It catalyzes the carboxylation of RuBP

(2) It is active only in the dark.

(3) It has higher affinity for oxygen than carbondioxide.

(4) It is an enzyme involved in the photolysis of water.

Ans. (1)   It catalyzes the carboxylation of RuBP

115. Match List- I with List-II.

List - I	List-II
A. Progesterone	I. Pars intermedia
B. Relaxin	II. Ovary
C. Melanocyte stimulating hormone	III. Adrenal Medulla
D. Catecholamines	IV. Corpus Luteum

Choose the **correct** answer from the options givenb below :

(1) A–III, B–II, C–IV, D–I

(2) A–IV, B–II, C–I, D–III

(3) A–IV, B–II, C–III, D–I

(4) A–II, B–IV, C–I, D–III

Ans. (2)   A–IV, B–II, C–I, D–III

116. The protein portion of an enzyme is called :

(1) Prosthetic group

(2) Cofactor

(3) Coenzyme

(4) Apoenzyme

Ans. (4)   Apoenzyme

117. Which of the following enzyme(s) are **NOT** essential for gene cloning?

A. Restriction enzymes

B. DNA ligase

C. DNA mutase

D. DNA recombinase

E. DNA polymerase

Choose the **correct** answer from the options given below :

(1) B and C only

(2) C and D only

(3) A and B only

(4) D and E only

Ans. (2)   C and D only

118. Which of the following type of immunity is present at the time of birth and is a non-specific type of defence in the human body?

(1) Humoral Immunity

(2) Acquired Immunity

(3) Innate Immunite

(4) Cell-mediated Immunity

Ans. (3)   Innate Immunite

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119. Which factor is important for termination of transcription?

(1) γ (gamma)　　　　(2) α (alpha)　　　　(3) σ (sigma)　　　　(4) ρ (rho)

Ans. (4)　ρ **(rho)**

120. Which of the following hormones released from the pituitary is actually synthesized in the hypothalamus?

(1) Adenocorticotrophic hormone (ACTH)　　　(2) Luteinizing hormone (LH)

(3) Anti-diuretic hormone (ADH)　　　(4) Follicle-stimulating hormone (FSH)

Ans. (3)　**Anti-diuretic hormone (ADH)**

121. Which of the following microbes is **NOT** involved in the preparation of household products?

A. Aspergillus niger

B. Lactobacillus

C. Trichoderma polysporuni

D. Saccharomyces cerevisiae

E. Propionibacterium sHarmanii

Choose the **correct** answer from the options given below:

(1) C and E only　　　　　　　(2) A and B only

(3) A and C only　　　　　　　(4) C and D only

Ans. (3)　**A and C only**

122. Given below are two statements :

Statement I : Fig fruit is a non-vegetarian fruit as it has enclosed fig wasps in it.

Statement II : Fig wasp and fig tree exhibit mutual relationship as fig wasp completes its life cycle in fig fruit and fig fruit gets pollinated by fig wasp.

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

(1) Statement I is incorrect but statement II is correct

(2) Both statement I and statement II are correct

(3) Both statement I and statement II are incorrect

(4) Statement I is correct but statement II is incorrect

Ans. (4)　**Statement I is correct but statement II is incorrect**

123. Role of the water vascular system in Echinoderms is :

A. Respiration and Locomotion

B. Excretion and Locomotion

C. Capture and transport of food

D. Digestion and Respiration

E. Digestion and Excretion

Choose the correct answer from the options given below :

(1) B, D and E Only　　　　　　(2) A and B Only

(3) A and C Only　　　　　　　(4) B and C Only

Ans. (3)　**A and C Only**

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124. After maturation, in primary lymphoid organs, the lymphocytes migrate for interaction with antigens to secondary lymphoid organ(s) / tissue(s) like:

A. thymus   B. Bone marrow   C. spleen   D. Lymph nodes

E. Peyer's patches

Choose the correct answer from the options given below:

(1) C, D, E only   (2) B, C, D Only   (3) A, B, C only   (4) E, A, B Only

Ans. (1)   **C, D, E only**

125. Match List I with List II :

List I	List II
A. The Evil Quartet	I. Cryopreservation
B. Ex situ conservation	II. Alein species invasion
C. Lantana camara	III. Causes of biodiversity loses
D. Dodo	IV. Extinction

Choose the option with all correct matches.

(1) A-III, B-II, C-IV, D-I   (2) A-III, B-II, C-I, D-IV

(3) A-III, B-I, C-II, D-IV   (4) A-III, B-IV, C-II, D-I

Ans. (3)   **A-III, B-I, C-II, D-IV**

126. Read the following statements on plant growth and development.

A. Parthenocarpy can be induced by auxins.

B. Plant growth regulators can be involved in promotion as well as inhibition of growth.

C. Dedifferentiation is a pre-requisite for re-differentiation.

D. Abscisic acid is a plant growth promoter.

E. Apical dominance prpjnotes the growth of lateral buds.

Choose the option with alljcorrect statements. I

(1) B, D, E only   (2) A, B, C only

(3) A, C, E only   (4) A, D, E only

Ans. (2)   **A, B, C only**

127. Match List I with List iI

List-I	List-II
A. Pteridophyte	I. Salvia
B. Bryopbhyte	II. Ginkgo
C. Angiosperm	III. Polytrichum
D. Gymnosperm	IV. Salvinia

Choose the option with all correct matches.

(1) A-IV, B-III, C-II, D-I   (2) A-III, B-IV, C-II, D-I

(3) A-IV, B-III, C-I, D-II   (4) A-III, B-IV, C-I, D-II

Ans. (3)   **A-IV, B-III, C-I, D-II**

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128. Why can't insulin be given orally to diabetic patients?

(1) Its bioavailability will be increased

(2) Human body will elicit strong immune response

(3) It will be digested in Gastro-Intestinal (GI) tract

(4) Because of structural variation

Ans. (3)   It will be digested in Gastro-Intestinal (GI) tract

129. Which one of the follpwfng is the characteristic feature of gyiiinosperms?

(1) Gymnosperms have flowers for reproduction.   (2) Seeds are enclosed in fruits.

(3) Seeds are naked.   (4) Seeds are absent.

Ans. (3)   Seeds are naked.

130. Frogs respire in water by skin and buccal cavity and on land by skin, buccal cavity and lungs. Choose the correct answer from the following :

(1) The statement is false for both the environment

(2) The statement true for water but false for land

(3) The statement environment

(4) The statement is false for water but true for land

Ans. (4)   The statement is false for water but true for land

131. Silencing of specific mRNA is possible via RNAi because of -

(1) Non-complementaiy   (2) Complementary dsRNA

(3) Inhibitory ssRNA   (4) Complementary tRNA

Ans. (2)   Complementary dsRNA

132. Twins are born to a family that lives next door to you. The twins 'are a boy and a girl. Which of the following Infest be true?

(1) They have 75% identical genetic content.

(2) They are monozygotic twins.

(3) They are fraternal twins.

(4) They were conceived through in vitro fertilization.

Ans. (3)   They are fraternal twins.

133. Match List-I with List-II

List-I	List-II
A. Scutellum	I. Persistent nucellus
B. Non-albuminous seed	II. Cotyledon of Monocot eed
C. Epiblast	III. Groundnut
D. Perisperm	IV. Rudimentary cotyledon

Chooe the option with all correct matches.

(1) A–II, B–IV, C–III, D–I   (2) A–II, B–III, C–IV, D–I

(3) A-IV, B–III, C–II, D–I   (4) A–IV, B–III, C–I, D–II

Ans. (2)   A–II, B–III, C–IV, D–I

134. In frog, the Renal portal system is a special venous connection that acts to link :

(1) Kidney and lower part of body

(2) Liver and iifOstine

(3) Liver and kidney

(4) Kidney and iiitestine

Ans. (1) **Kidney and lower part of body**

135. Match List-I with List-II

List-I	List-II
A. Heart	I. Erythropoietin
B. Kidney	II. Aldoteron
C. Gastro-intestinal tract	III. Atrial natriuretic factor
D. Adrenal Cortex	IV. Secretin

Choose the correct answer from the otpion given below :

(1) A-III, B-I, C-IV, D-II   (2) A-II, B-I, C-III, D-IV

(3) A-IV, B-IIL C-II, D-I   (4) A-I, B-III, C-IV, D-II

Ans. (1) **A-III, B-I, C-IV, D-II**

136. Cardiac activitites of the heart are regulated by :

A. Nodal tissue

B. A special neural centre in the medulla oblongata

C. Adrenal medullary hormones

D. Adrenal cortical hormones

Choose the correct answer from the options given below

(1) A,B and D only   (2) A,B and C only   (3) A,B, C and D   (4) A,C and D only

Ans. (2) **A,B and C only**

137. Streptokinase produced by bacterium Streptococcus is used for

(1) Removing clots from blood vessles

(2) Curd production

(3) Ethanol production

(4) Liver disease treatment

Ans. (1) **Removing clots from blood vessles**

Sol. **Streptokinase** produced by the bacterium **Streptococcus** and modified by genetic engineering is used as a **'clot buster'** for removing clots from the blood vessels of patients who have undergone myocardial infarction leading to heart attack.

138. Who is known as the father of Ecology in India ?

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(1) Birbal Sahni
(2) S.R. Kashyap
(3) Ramdeo Misra
(4) Ram Udar

Ans. (3) **Ramdeo Misra**

Sol. (1) Birbal Sahni - Paleobotanist

(2) S.R. Kashyap - Bryologist

(3) Ramdeo Misra is revered as the Father of Ecology in India. Born on 26 August 1908, Ramdeo Misra obtained Ph.D in Ecology (1937)

(4) Ram Udar (×) - not relevent

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

Assertion (A) : A typical unfertilised, angiosperm embryo sae at maturity is 8 nucleate and 7-celled.

Reason (R) : The egg apparatus has 2 polar nuclei.

In the light of the abfeNe statements, choose the correct answer fronvfHe options given below :

(1) A is false but Ris true

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

(3) Both A explanation and R are true of A but R is NOT the correct explation of A

(4) A is true but R are false

Ans. (4) **A is true but R are false**

Sol. Assertion (A) - The nucleus of the functional megaspore divides mitotically to form two nuclei which move to the opposite poles, forming the 2-nucleate embryo sac. Two more sequential mitotic nuclear divisions result in the formation of the 4-nucleate and later the 8-nucleate stages of the embryo sac.

a **typical unfertilized angiosperm embryo sac, at maturity, though 8-nucleate is 7-celled**

Reason (R) - There is a characteristic distribution of the cells within the embryo sac. **Three cells** are grouped together at the **micropylar** end and **constitute the egg apparatus.** The egg apparatus, in turn, consists of **two synergids and one egg cell.**

140. Neoplastic characteristics of cells refer to :

A. A mass of proliferating cell

B. Rapid growth of cells

C. Invasion and damage to the surrounding tissue

D. Those confined to original location

Choose the correct answer from the options given below:

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

Ans. (3) **A,B,C only**

141. Given below are the stages in the life cycle of pteridophytes. Arrange the following stages in the correct sequence.

A. Prothallus stage

B. Meiosis in spore mother cells

C. Fertilisation

D. Formation of archegonia and antheridia in gametophytet

E. Transfer of antherozoids to the archegonia in presence of water.

Choose the correct answer from the options given below :

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

Ans. (2) B, A, D, E, C

Sol.
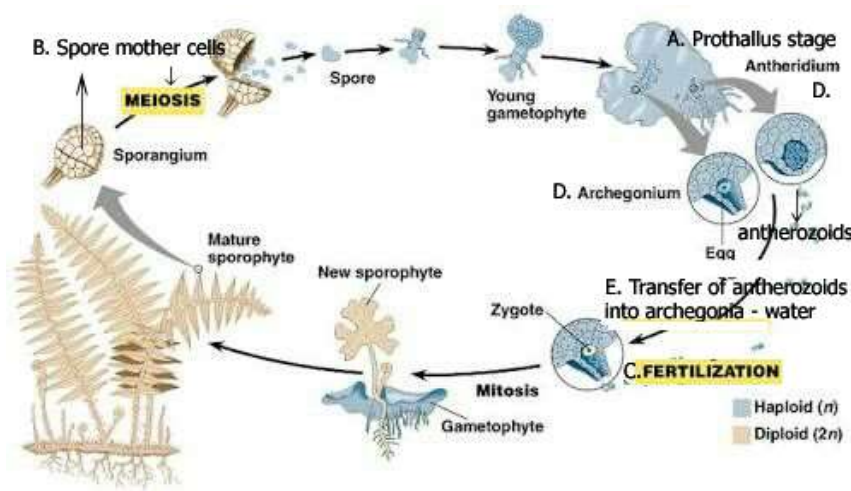
142.   Assertion(A) : Both wind and water pollinated flowers are not very colourful and do not produce nectar.

Reasron (R): The flowers produce enormours amount of pollen grains in wind and water pollinated flowers.

(1) A is false but R is true

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

(3) Both A and R are true and R is not the correct explanation of A

(4) A is true but R is false

Ans. (3) Both A and R are true and R is not the correct explanation of A

Sol.   Agents of Pollination :

Assertion(A) :- Both wind and water pollinated flowers are not very colourful and do not produce nectar. because they rely on **non-biological agents** for pollination, not insects or other animals. Since they **don't need to attract** pollinators, the energy and resources invested in colorful displays and sugary **nectar are not necessary.** Instead, they focus on producing large quantities of light, easily airborne pollen grains to facilitate pollination by wind or water.

Reason (R) :- 1. Only a small proportion of plants use abiotic agents. (wind and water)

2. Pollen grains coming in contact with the stigma is a chance factor in both wind and water pollination. **To compensate for this uncertainties** and associated loss of pollen grains, the flowers **produce enormous amount of pollen** when compared to the number of ovules available for pollination.

143. Which one of the following enzymes contains 'Haem' as the prosthetic group?

(1) Catalase

(2) RuBisCo

(3) Carbonic anhydrase

(4) Succinate dehydrogenase

Ans. (1) **Catalase**

144. Match List-I with List-II

A. Emphysema   I. Rapid spasms in muscle due to low Ca^{++} in body fluid

B. Angina pectoris   II. Damaged alveolar walls and decreased respiratory surface

C. Glomerulonephritis   III. Acute chest pain when not enough oxygen is reaching to heart muscle

D. Tetany   IV. Inflammation of glomruli of kidney

Choose the correct answer from the options given below :

(1) A-II, B-III, C-IV, D-I (2) A-III, B-I, C-IV, D-I I (3) A-III, B-I, C-II, D-IV (4) A-II, B-IV, C-III, D-I

Ans. (1) **A-II, B-III, C-IV, D-I**

145. Find the statment that is NOT correct with regard to the structure of monocot stem.

(1) Phloem parenchyma is absent.

(2) Hypodermis is parenchymatous.

(3) Vascular bundles are scattered.

(4) Vascular bundles are conjoint and closed.

Ans. (2) **Hypodermis is parenchymatous.**

Sol. **Monocotyledonous Stem-**

The monocot stem has a **sclerenchymatous hypodermis**, a large number of **scattered vascular bundles,** each surrounded by a sclerenchymatous bundle sheath, and a large, conspicuous ͏ndles ͏ater-
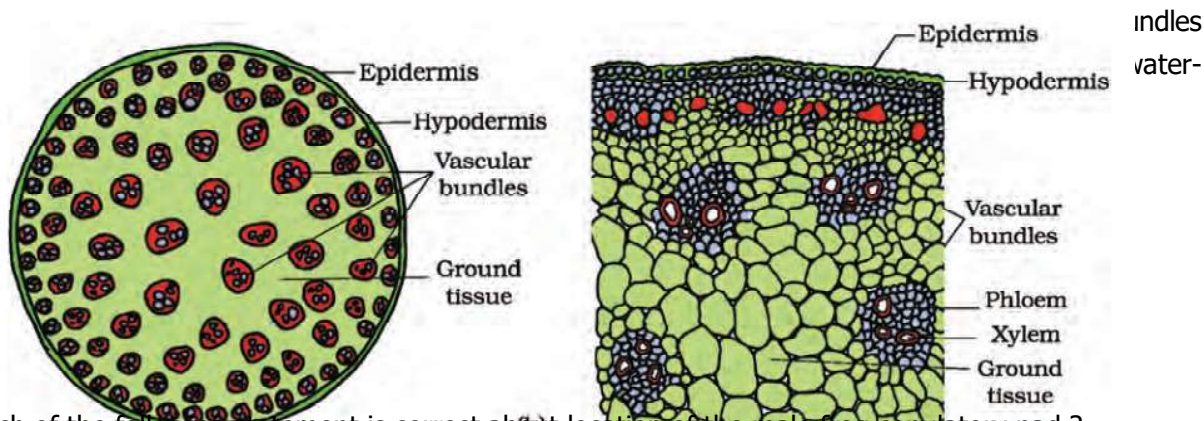
146. Which of the following statement is correct about location of the male frog copulatory pad ?

(1) First digit of the fore limb

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(2) First and Second digit of fore limb

(3) First digit of hind limb

(4) Second digit of fore limb

Ans. (1) **First digit of the fore limb**

147. Statement-I : The primary source of energy in an ecosystem is solar energy.

Statement-II : The rate of production of organic matter during photosynthesis in an ecosystem is called net primary productivity (NPP)

In the lights of the above statements, choose the most appropriate answer from the options given below :

(1) Statement I is incorrect but statement II is correct

(2) Both statmenet I and statement II are correct

(3) Both statment I and statemnet II are incorrect

(4) Statement I is correct but statement II is incorrect

Ans. (4) **Statement I is correct but statement II is incorrect**

Sol. Statement-I : Except for the deep sea hydro-thermal ecosystem, **sun is the only source** of energy for **all ecosystems** on Earth.

Statement-II : The rate of biomass production is called productivity.

It can be divided into gross primary productivity (GPP) and net primary productivity (NPP). Gross primary productivity of an ecosystem is the rate of production of organic matter during photosynthesis. A considerable amount of GPP is utilised by plants in respiration. Gross primary productivity minus respiration losses (R), is the **net primary productivity (NPP).**

GPP − R = NPP

148. Identify the part of a bio-reactor which is used as a foam braker from the given figure.
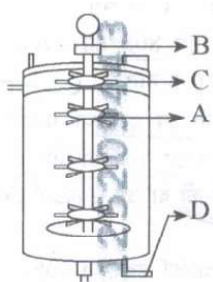
(1) C   (2) A   (3) B   (4) D

Ans. (1) **C**

149. Polymerase chain reaction (PCR) amplifies DNA following the equation

(1) $2N^2$ (2) N^2 (3) 2^n (4) 2n+1

Ans. (3) 2^n

150. Match List-I with List-II

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List-I	List-II
A. Head	I. Enzymes
B. Middle, piece	II. Sperm motility
C. Acrosome	III. Energy
D. Tail	IV. Genetic material

Choose the correct answer from the options given below.

(1) A-III, B-II, C-I, D-IV

(2) A-IV, B-III,C-I,D-II

(3) A-IV,B-III,C-II,D-I

(4) A-III, B-IV, C-II, D-I

Ans. (2)   **A-IV, B-III,C-I,D-II**

151. Statement-I : In a floral formula $\oplus$ stands for zygomorphic nature of the flower, and $\underline{G}$ stands for inerior ovary.

Statement-II : In a floral formula $\oplus$ stands for actinomorphic nature of the flower and $\underline{G}$ stands for superior ovary.

(1) Staement I is incorrect but statement II is correct

(2) Both statement I and statement II are correct

(3) Both statement I and statement II are incorrect

(4) Staement I is correct but statement II is incorrect

**Ans. (1)**   **Staement I is incorrect but statement II is correct**

Sol. The floral formula is represented by some symbols. In the floral formula, Br stands for bracteate K stands for calyx , C for corolla, P for perianth, A for androecium and G for Gynoecium, **$\underline{G}$ for superior ovary and $\overline{G}$ for inferior** ovary, $\male$ for male, $\female$ for female, $\male\female$ for bisexual plants, $\oplus$ **for actinomorphic and $^{0}/_{0}$ for zygomorphic** nature of flower.

152. Frolm the statemnets given below choose the correct option

A. The eukryotic ribosomes are 80S and prokaryotic ribosomes are 70S.

B. Each ribosomes has two sub-units

C. The two sub-8nits of 80S ribosomes are 60S and 40S while that of 70S are 50S and 30 S.

D. The two sub-untis of 80S ribosomes are 60S and 20S and that of 70S are 50S and 20S

E. The two sub-untis of 80S ribosomes are 60S and 30S and that of 70S are 50S and 30 S

(1) B,D,E are true   (2) A,B,C are true   (3) A,B,D are true   (4) A,B,E are true

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Ans. (2)   **A,B,C are true**

Sol.   **(i) Ribosomes** are the granular structures first observed under the electron microscope as dense particles by George Palade (1953).

They are composed of ribonucleic acid (RNA) and proteins and are not surrounded by any membrane.

A. The eukaryotic ribosomes are 80S while the prokaryotic ribosomes are 70S.

B. Each ribosome has two subunits, larger and smaller subunits.

C. The two subunits of 80S ribosomes are 60S and 40S

D. while that of 70S ribosomes are 50S and 30S. Here 'S' (Svedberg's Unit) stands for the sedimentation coefficient; it is indirectly a measure of density and size.

E. Both 70S and 80S ribosomes are composed of two subunits.

153.   Each of the following characteristics represents a kingdom proposed by Whittaker. Arranage the following in increasing order of complexity of body organization.

A. Multicellular heterotrophs with cell wall made of chitin.

B. Heterotrophs with tissue/organ /organ system level of body organization.

C. Prokaryotes with cell Wall made of polysaccharides and amines acids.

D. Eukaryotic autotrophs with tissue/organ level of body organization.

E. Eukaryotes with cellular body organization

Choose the correct answer from the options given below.

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

Ans. (3)   **C,E,A,D,B**

ol.

TABLE 2.1   Characteristics of the Five Kingdoms

Characters	Five Kingdoms				
	Monera	**Protista**	**Fungi**	**Plantae**	**Animalia**
Cell type	Prokaryotic	Eukaryotic	Eukaryotic	Eukaryotic	Eukaryotic
Cell wall	Noncellulosic (Polysaccharide + amino acid)	Present in some	Present with chitin	Present (cellulose)	Absent
Nuclear membrane	Absent	Present	Present	Present	Present
Body organisation	Cellular	Cellular	Multiceullar/ loose tissue	Tissue/ organ	Tissue/organ/ organ system
Mode of nutrition	Autotrophic (chemosynthetic and photosynthetic) and Heterotrophic (saprophytic/parasitic)	Autotrophic (Photosynthetic) and Heterotrophic	Heterotrophic (Saprophytic/ Parasitic)	Autotrophic (Photosynthetic)	Heterotrophic (Holozoic/ Saprophytic etc.)

R.H. Whittaker (1969) proposed a Five Kingdom Classification.

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154. The correct sequence of events in the life cycle of bryophytes is

A. Fusion of antherozoid with egg.

B. Attachment of gametophyte to substratum.

C. Reduction division to produce haploid spores.

D. Formation of sporophyte.

E. Release of antherozoids into water.

Choose the correct answer from the options given below :

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

Ans. (4)   **B,E,A,D,C**

Sol.
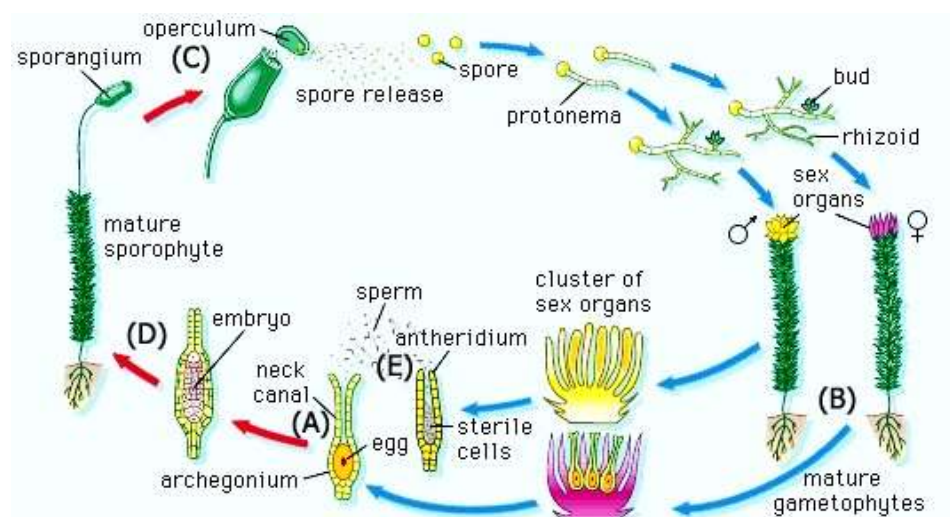
155. Which are correct

A. Computed tomography and magnetic resonance imaging detect cancers of internal organs.

B. Chemotherapeutics drugs are used to kill non-cancerous cells.

C. α -interferon activate the cancer patients' immune system and helps m destroying the tumour.

D. Chemotherapeutic drugs are biological response modifiers.

In the case of leukaemia blood cell counts are decreased.

Choose the correct answer from the options given below:

(1) A and C only   (2) B and D only   (3) D and E only   (4) C and D only

Ans. (1)   **A and C only**

156. Name the class of enzyme that usually catalyze the following reaction

S–G+S# $\rightarrow$ S+S#–G
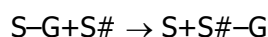
Where , G $\rightarrow$ a group other than hydorgen

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S →a substrate

S# → another substrate

(1) Ligase   (2) Hydrolase   (3) Lyase   (4) Transferase

Ans. (4)   **Transferase**

157.   Find the correct statements :

A. In human.pregnancy, the major organ systems are formed at the end of 12 weeks.

B. In human pregnancy the major organ systems are formed at the end of 8 weeks.

C. In human pregnancy heart is formed after one month of gestation.

D. In human pregnancy, limbs and digits develop by the end of second month.

E. In human pregnancy the appearance of hair is usually observed in the fifth month.

Choose the correct answer from the options given below :

(1) A,C,D and E only   (2) A and E only   (3) B and C only   (4) B,C,D and E only

Ans. (1)   **A,C,D and E only**

158.   Which of the following is an example of nondistilled alcoholic beverage produced by yeast?

(1) Rum   (2) Whisky   (3) Brandy   (4) Beer

Ans. (4)   **Beer**

Sol.   **Depending** on the type of the raw material used for fermentation and the **type of processing (with or without distillation)** different types of alcoholic drinks are obtained. **Wine and beer are produced without distillation** whereas whisky, brandy and rum are produced by distillation of the fermented broth.

159.   Statement I : In the RNA world, RNA is considered the first genetic material evolved to carry out essential life processes. RNA acts as a genetic material and also as a catalyst for some important biochemical reactions in living systems. Being reactive, RNA is unstable.

Statement II : DNA evolved from RNA and is a more stable genetic material. Its double helical strands being complementary, resist changes by evolving repairing mechanism.

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

(1) Statement I is incorrect but statement II is correct

(2) Both statement I and statement II are correct

(3) Both statement I and statement II are incorrect

(4) Statement I is correct but statement II is incorrect

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Ans. (2)   **Both statement I and statement II are correct**

160.   Statement I : Transfer RNAs and ribosomal RNA do not interact with mRNA.

Statement II : RNA interference (RNAi) takes place in all eukaryotic organisms as a method of cellular defence.

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

(1) Statement I is incorrect but Statement II is correct

(2) Both Statement I and Statement II are correct

(3) Both Statement I and Statement II are incorrect

(4) Statement I is correct but Statement II is incorrect

Ans. (1)   **Statement I is incorrect but Statement II is correct**

161.   Which of the following diagrams is correct with regard to the proximal (P) and distal (D) tubule of the Nephron.
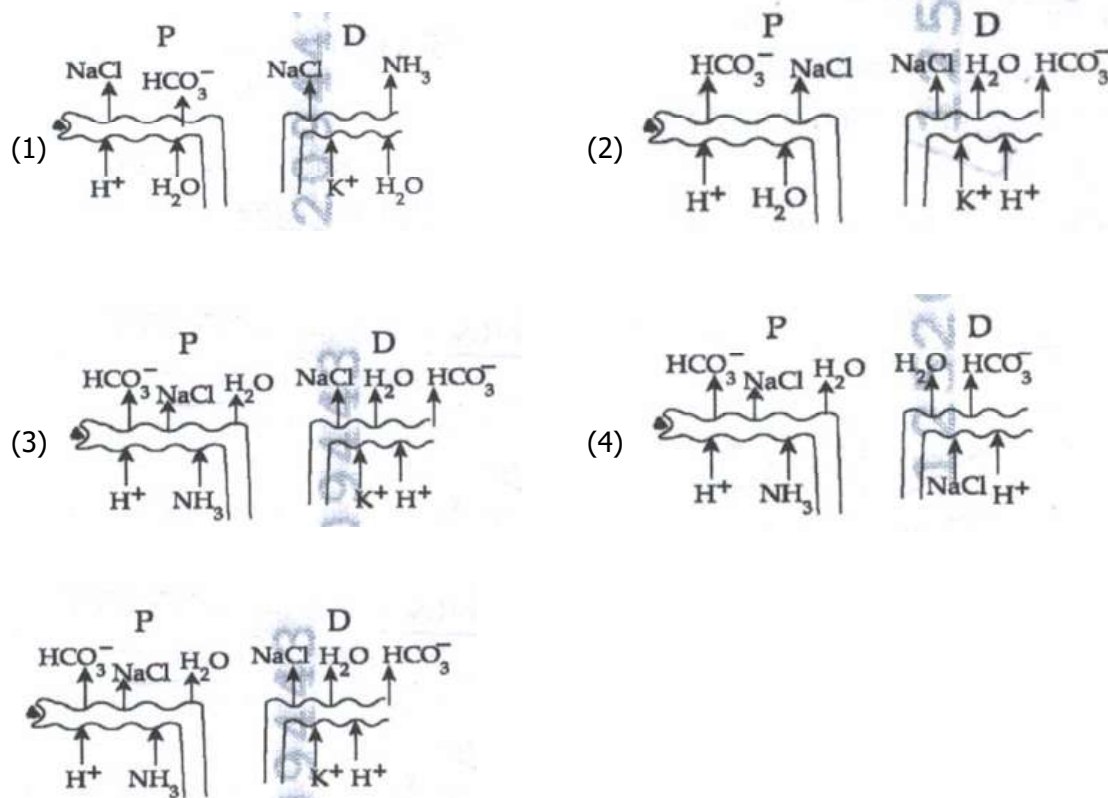
Ans. (3)

162.   What is the pattern of inheritance for polygenic trait?

(1) X-linked recessive inheritance pattern

(2) Mendelian inheritance pattern

(3) Non-mendelian inheritance pattern

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(4) Autosomal dominant pattern

Ans. (3) **Non-mendelian inheritance pattern**

Sol. Examples include incomplete dominance, codominance, multiple alleles, sex-linked inheritance, and **polygenic traits.**

163. In the seeds of cereals, the outer covering of endosperm separtes the embryo by a protein rich layer called :

(1) Aleurone layer   (2) Coleoptile   (3) Coleorhiza   (4) Integument

Ans. (1) **Aleurone layer**

Sol.
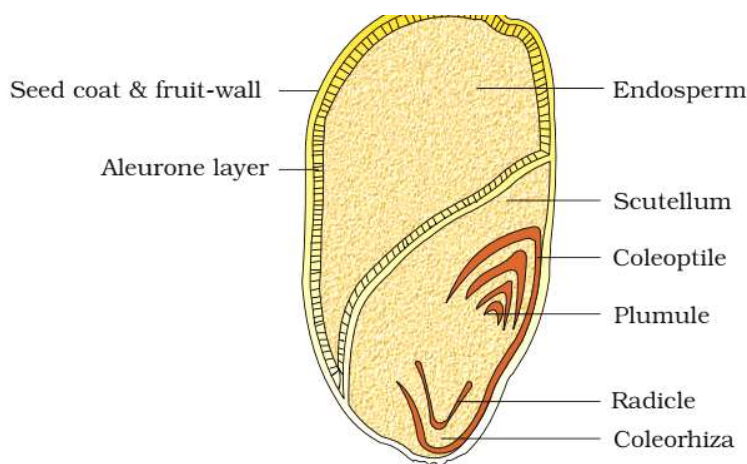
164. Match List I with List II :

List I	List II
A. Chlorophyll	I. Yellow-green
B. Chlorophyll	II. Yellow
C. Xanthophylls	III. Blue-green
D. Carotenoids	IV. Yellow to Yellow-orange

Choose the option witli all correct matches.

(1) A-I, B-IV, C-III, D-II   (2) A-III, B-1V, C-Il, D-I

(3) A-III, B-I, c-II, b-IV   (4) A-I, B-II, C-IV, D-III

Ans. (3) **A-III, B-I, c-II, b-IV**

Sol. A chromatographic separation of the leaf pigments shows that the colour that we see in leaves is not due to a single pigment but due to four pigments:

- Chlorophyll a (bright or blue green in the chromatogram),

- chlorophyll b (yellow green),

- xanthophylls (yellow) and

- carotenoids (yellow to yellow-orange).

165. Which of the following genetically engineered organisms was used by Eli Lilly to prepare human insulin?

(1) Phage　　　　(2) Bacterium　　　　(3) Yeast　　　　(4) Virus

Ans. (2) **Bacterium**

166. Which of the following are the posttranscriptional events in an eukaryotic cell?

A. Transport of pre-mRNA to cytoplasm prior to splicing

B. Removal of introns and joining of exons.

C. Addition of methyl group at 5' end of hnRNA.

D. Addition of adenine residues at 3' end of hnRNA.

E. Base pairing of two complementary RNAs.

Choose the correct answer from the options given below :

(1) C,D,E only　　　(2) A,B,C only　　　(3) B,C,D only　　　(4) B,C,E only

Ans. (3) **B,C,D only**

167. Match List-I with List-II

List-I	List-II
A. Centromere	I. Mitochondrion
B. Cilium	II. Cell division
C. Cristae	III. Cell movement
D. Cell membrane	IV. Phospholipid Bilayer

(1) A-II,B-III,C-I,D-IV　　　(2) A-I,B-II,C-III,D-IV

(3) A-II,B-I,C-IV,D-III　　　(4) A-IV,B-II,C-III,D-I

Ans. (1) **A-II,B-III,C-I,D-IV**

168. Match List-I with List-II

List-I	List-II
A. Alred Hershey and Martha Chase	I. Streptococcus pneumoniae
B. Euchromatin	II. Densely packed and dark-stained
C. Frederic Grifrfith	III. Loosely packed and light - stained
D. Heterochromatin	IV. DNA as genetic material confirmation

(1) A-III,B-II,C-IV,D-I　　(2) A-II,B-IV,C-I,D-III　　(3) A-IV,B-II,C-I,D-III　　(4) A-IV,B-III,C-I,D-II

Ans. (4) **A-IV,B-III,C-I,D-II**

169. Which chromosome in the human genome has the highest number of genes?

(1) Chromosome 10　　(2) Chromosome X　　(3') Chromosome Y　　(4) Chromosome 1

Ans. (4) **Chromosome 1**

170. What are the potential drawbacks in adoption of the IVF method ?

A. High fatality risk to mother

B. Expensive instruments and reagents

C. Husband/wife necessary for being donors

D. Less adoption of orphans

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E. Not available in India

F. Possibility that the early embryo does not survive

Choose the correct answer from the options given below :

(1) A, B, C, E, F only   (2) B, D, F only   (3) A, C, D, F only   (4) A, B, C, D only

Ans. (2)   **B, D, F only**

171. Which one of the following is an example of ex- situ conservation?

(1) Protected areas   (2) National Park

(3) Wildlife Sanctuary   (4) Zoos and botanical gardens

Ans. (4)   **Zoos and botanical gardens**

172. A specialised membranous structure in a prokaryotic cell which helps in cell wall formation, DNA replication and respiration is :

(1) Endoplasmic Reticulum   (2) Mesosome CD

(3) Chromatophores   (4) Cristae

Ans. (2)   **Mesosome CD**

Sol. In prokaryotic cell a special membranous structure is the mesosome which is formed by the extensions of plasma membrane into the cell. These extensions are in the form of vesicles, tubules and lamellae. They help in cell wall formation, DNA replication and distribution to daughter cells. They also help in respiration, secretion processes, to increase the surface area of the plasma membrane and enzymatic content.

173.

In the above represented plasmid an alien piece of DNA is inserted at EcoRI site. Which of the following strategies will be chosen to select the recombinant colonies?

(1) Blue color colonies grown on ampicillinplates can be selected.

(2) Using ampicillin & tetracyclin containing medium plate.

(3) Blue color colonies will be selected.

(4) White color colonies will be selected.

Ans. (4)   **White color colonies will be selected.**

174. What is the name of the blood vessel that carries deoxygenated blood from the body to the heart in a frog ?

(1) Vena cava   (2) Aorta   (3) Pulmonary artery   (4) Pulmonary vein

Ans. (1)   **Vena cava**

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175. Which of the following organisms cannot fix nitrogen ?

A. Azotobacter   B. Oscillatoria   C. Anabaena   D. Volvox

E. Nostoc

Choose the correct answer from the options given below:

(1) E only   (2) A only   (3) D only   (4) B only

Ans. (3)   D only

176. While trying to find out the characteristic of a newly found animal, a researcher did the histology of adult animal and observed a cavity with presence of mesodermal tissue towards the body wall but no - mesodermal tissue was observed towards the alimentary canal. What could be the possible coelome of that animal ?

(1) Spongocoelomate   (2) Acoelomate   (3) Pseudocoeloraate (4) Schizocoelomate

Ans. (3)   Pseudocoeloraate

177. Which one of the following statements refers to Reductionist Biology?

(1) Behavioural approach to study and understand living organisms.

(2) Physico-chemical approach to study and understand living organisms.

(3) Physiological approach to study and understand living organisms.

(4) Chemical approach to study and understand living organisms.

Ans. (2)   Physico-chemical approach to study and understand living organisms.

Sol. I.Q what is the molecular basis of all physiological processes?

Ans. It can also explain the abnormal processes that occur during any diseased condition.

This **physico-chemical approach** to study and understand living organisms is called **'Reductionist Biology'. (Ref - NCERT - Introduction about cell)**

178. Epiphytes that are growing on a mango branch is an example of which of the following?

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

Ans. (2)   Commensalism

Sol. **Commensalism:** This is the interaction in which one species benefits and the other is neither harmed nor benefited. An orchid growing as an epiphyte on a mango branch, and barnacles growing on the back of a whale benefit while neither the mango tree nor the whale derives any apparent benefit.

179. Which one of th£ following phytohormones promotes nutrient mobilization which helps in the delay of leaf senescence in plants?

(1) Cytokinin   (2) Ethylene   (3) Abscisic acid   (4) Gibberellin

Ans. (1)   Cytokinin

Sol. **(1) Cytokinin-** promotes nutrient mobilization which helps in the delay of leaf senescence in plants.

(2) Ethylene - fruit ripening harmone

(3) Abscisic acid - seed dormance

(4) Gibberellin - seed germination

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180. The complex II of mitochondrial electron transport chain is also known as

(1) NADH dehydrogenase

(2) Cytochrome bc_1

(3) Succinate dehydrogenase

(4) Cytochrome c oxidase

Ans. (3) Succinate dehydrogenase

Sol.

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