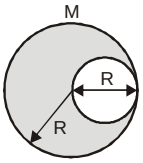
NEET (UG)-2016

Q.1 From a disc of radius R and mass M, a circular hole of diameter R, whose rim passes through the centre is cut. What is the moment of inertia of the remaining part of the disc about a perpendicular axis, passing through centre ?

(1) 15 MR^2 / 32 (2) 13 MR^2 / 32 (3) 11 MR^2 / 32 (4) 9 MR^2 / 32

Ans: (2)

Sol:



$I_{total\ disc} = \frac{MR^2}{2}$

$M_{removed} = \frac{M}{4}$ ($\because$ Mass $\propto$ area)

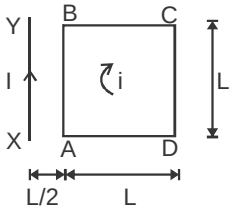
$I_{Removed}$ (about same Perpendicular axis)

$= \frac{M}{4}\frac{(R/2)^2}{2} + \frac{M}{4}\left(\frac{R}{2}\right)^2 = \frac{3MR^2}{32}$

$I_{Remaing\ disc} = I_{Total} - I_{Removed}$

$= \frac{MR^2}{2} - \frac{3}{32}MR^2 = \frac{13}{32}MR^2$

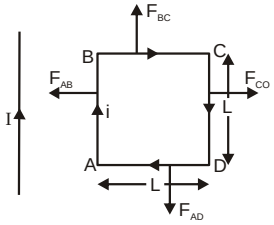
Q.2 A square loop ABCD carrying a current i, is placed near and coplanar with a long straight conductor XY carrying a current I, the net force on the loop will be :



(1) $\frac{2\mu_0 Ii}{3\pi}$ (2) $\frac{\mu_0 Ii}{2\pi}$ (3) $\frac{2\mu_0 IiL}{3\pi}$ (4) $\frac{\mu_0 IiL}{2\pi}$

Ans: (1)

Sol:



$F_{AB} = i\ell B$ (Attractive)

$F_{AB} = i(L).\frac{\mu_0 I}{2\pi\left(\frac{L}{2}\right)}(\leftarrow) = \frac{\mu_0 iI}{\pi}(\leftarrow)$

$F_{AC}(\uparrow)$ and $F_{AD}(\downarrow) \Rightarrow$ cancels each other

$F_{CD} = i\ell B$ (Repulsive)

$F_{CD} = i(L)\frac{\mu_0 I}{2\pi\left(\frac{3L}{2}\right)}(\rightarrow) = \frac{\mu_0 iI}{3\pi}(\rightarrow)$

$\Rightarrow F_{net} = \frac{\mu_0 iI}{\pi} - \frac{\mu_0 iI}{3\pi} = \frac{2\mu_0 iI}{3\pi}$

Q.3 The magnetic susceptibility is negative for :

(1) diamagnetic material only (2) paramagnetic material only

(3) ferromagnetic material only (4) paramagnetic and ferromagnetic materials

Ans: (1)

Sol: Magnetic susceptibility = χ

It is negative for diamagnetic materials only

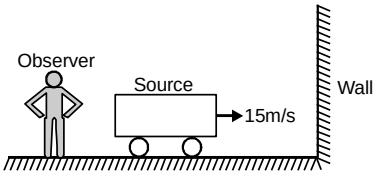
Q.4 A siren emitting a sound of frequency 800 Hz moves away from an observer towards a cliff at a speed of 15ms^{-1}. Then, the frequency of sound that the observer hears in the echo reflected from the cliff is :

(Take velocity of sound in air = 330 ms^{-1})

(1) 765 Hz (2) 800 Hz (3) 838 Hz (4) 885 Hz

Ans: (3)

Sol:



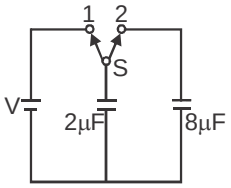
frequency at wall is n'

$n' = \frac{v}{v-v_0} n_0$

$n' = \frac{330}{330-15}(800) = \frac{330\times800}{315} = 838Hz$

Since the observer and wall are stationary so frequency of echo heard by observer will also be 838 Hz.

Q.5 A capacitor of 2μF is charged as shown in the diagram. When the switch S is turned to position 2, the percentage of its stored energy dissipated is :



(1) 0% (2) 20% (3) 75% (4) 80%

Ans: (4)

Sol: Initial energy stored in capacitor 2 μF

$U_i = \frac{1}{2}2(V)^2 = V^2$

Final voltage after switch 2 is ON

$V_f = \frac{C_1V_1}{C_1+C_2} = \frac{2V}{10} = 0.2V$

Final energy in both the capacitors

$U_f = \frac{1}{2}(C_1+C_2)V_f^2 = \frac{1}{2}10\left(\frac{2V}{10}\right)^2 = 0.2V^2$

So energy dissipated

$= \frac{V^2-0.2V^2}{V^2} \times 100 = 80\%$

Q.6 In a diffraction pattern due to a single slit of width 'a', the first minimum is observed at an angle 30° when light of wavelength 5000Å is incident on the slit. The first secondary maximum is observed at an angle of :

(1) $sin^{-1}\left(\frac{1}{4}\right)$ (2) $sin^{-1}\left(\frac{2}{3}\right)$ (3) $sin^{-1}\left(\frac{1}{2}\right)$ (4) $sin^{-1}\left(\frac{3}{4}\right)$

Ans: (4)

Sol: For first minima, $sin\,30° = \frac{\lambda}{a} = \frac{1}{2}$

First secondary maxima will be at

$sin\,\theta = \frac{3\lambda}{2a} = \frac{3}{2}\left(\frac{1}{2}\right) \Rightarrow \theta = sin^{-1}\left(\frac{3}{4}\right)$

Q.7 At what height from the surface of earth the gravitation potential and the value of g are -5.4×10^7 J kg^{-2} and 6.0 ms^{-2} respectively ? Take the radius of earth as 6400 km.

(1) 2600 km (2) 1600 km (3) 14000 km (4) 2000 km

Ans: (1)

Sol: $V = \frac{-GM}{R+h} = -5.4 \times 10^7$ ...(1)

and $g = \frac{GM}{(R+h)^2} = 6$ ...(2)

dividing (1) and (2)

$\Rightarrow \frac{5.4\times10^7}{(R+h)} = 6$

$\Rightarrow$ R + h = 9000 km so h = 2600 km

Q.8 Out of the following options which one can be used to produce a propagating electromagnetic wave ?

(1) A charge moving at constant velocity (2) A stationary charge

(3) A chargeless particle (4) An accelerating charge

Ans: (4)

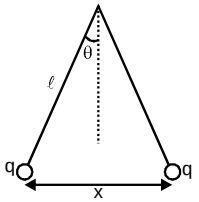
Sol: To generate electromagnetic waves we need accelerating charge particle.

Q.9 Two identical charged spheres suspended from a common point by two massless strings of lengths ℓ, are initially at a distance (d<<ℓ) apart because to their mutual repulsion. The charges begin to leak from both the spheres at a constant rate. As a result, the spheres approach each other with a velocity v. Then v varies as a function of the distance x between the spheres, as :

(1) $v \propto x^{\frac{1}{2}}$ (2) v $\propto$ x (3) $v \propto x^{-\frac{1}{2}}$ (4) v $\propto$ x^{-1}

Ans: (3)

Sol: Here, we have to assume that ball is moving very slowly



$tan\,\theta = \frac{F_e}{mg} = \theta$

$\Rightarrow \frac{Kq^2}{x^2 mg} = \frac{x}{2\ell}$

$\Rightarrow X^3 \propto q^2$

differentiating above equation w.r.t. time

$3x^2\frac{dx}{dt} \propto 2q\frac{dq}{dt}\, but\, \frac{dq}{dt}$ is constant

So x^2 (v) $\propto$ q (given x$^3 \propto$ q^2)

$\Rightarrow \boxed{v \propto x^{-\frac{1}{2}}}$

Q.10 A uniform rope of length L and mass m_1 hangs vertically from a rigid support. A block of mass m_2 is attached to the free end of the rope. A transverse pulse of wavelength λ_1 is produced at the lower end of the rope. The wavelength of the pulse when it reaches the top of the rope is λ_2. The ratio λ_2/λ_1 is :

(1) $\sqrt{\frac{m_1}{m_2}}$ (2) $\sqrt{\frac{m_1+m_2}{m_2}}$ (3) $\sqrt{\frac{m_2}{m_1}}$ (4) $\sqrt{\frac{m_1+m_2}{m_1}}$

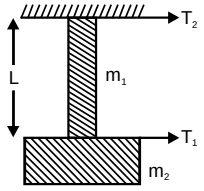
Ans: (2)

Sol: $T_1 = m_2g$

$T_2 = (m_1 + m_2)g$

$Velocity \propto \sqrt{T}$

$\Rightarrow \lambda \propto \sqrt{T}$



$\Rightarrow \frac{\lambda_1}{\lambda_2} = \frac{\sqrt{T_1}}{\sqrt{T_2}} \Rightarrow \frac{\lambda_2}{\lambda_1} = \sqrt{\frac{m_1+m_2}{m_2}}$

Q.11 A refrigerator works between 4°C and 30°C. It is required to remove 600 calories of heat every second in order to keep the temperature of the refrigerated space constant. The power required is: (Take 1 cal = 4.2 Joules)

(1) 2.365 W (2) 23.65 W (3) 236.5 W (4) 2365 W

Ans: (3)

Sol: $\beta = \frac{Q_2}{W} = \frac{T_2}{T_1 - T_2}$ (Where Q_2 is heat removed)

$\Rightarrow \frac{600 \times 4.2}{W} = \frac{277}{303-277}$

$\Rightarrow$ W = 236.5 joule

$\Rightarrow Power = \frac{W}{t} = \frac{236.5 joule}{1 sec}$

Q.12 An air column, closed at one end and open at the other , resonates with a tuning fork when the smallest length of the column is 50 cm. The next larger length of the column resonating with the same tuning fork is :

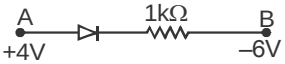
(1) 66.7 cm (2) 100 cm (3) 150 cm (4) 200 cm

Ans: (3)

Sol: First minimum resonating length for closed organ pipe = $\frac{\lambda}{4} = 50cm$

Next larger length of air column $= \frac{3\lambda}{4} = 150cm$

Q.13 Consider the junction diode as ideal. The value of current flowing through AB is :



(1) 0 A (2) 10^{-2}A (3) 10^{-1} A (4) 10^{-3} A

Ans: (2)

Sol: Since diode is in forward bias

$i = \frac{\Delta V}{R} = \frac{4-(-6)}{1\times10^3} = \frac{10}{10^3} = 10^{-2}A$

Q.14 The charge flowing through a resistance R varies with time t as Q = at–bt^2, where a and b are positive constants. The total heat produced in R is :

(1) $\frac{a^3R}{6b}$ (2) $\frac{a^3R}{3b}$ (3) $\frac{a^3R}{2b}$ (4) $\frac{a^3R}{b}$

Ans: (1)

Sol: $Q = at - bt^2 \Rightarrow i = \frac{dQ}{dt} = a - 2bt$

{for i = 0$\Rightarrow t = \frac{a}{2b}$}

From joule's law of heating dH = i^{2}Rdt

$\Rightarrow H = \int_0^{a/2b}(a-2bt)^2Rdt$

$\Rightarrow H = \frac{(a-2bt)^3R}{-3\times2b}\Big|_0^{\frac{a}{2b}} = \frac{a^3R}{6b}$

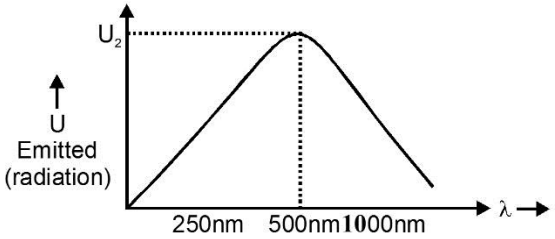
Q.15 A black body is at a temperature of 5760 K. The energy of radiation emitted by the body at wavelength 250 nm is U_1, at wavelength 500 nm is U_2 and that at 1000 nm is U_3. Wien's constant, b = 2.88 × 10^6 nmK. Which of the following is correct ?

(1) $U_1 = 0$ (2) $U_3 = 0$ (3) $U_1 > U_2$ (4) $U_2 > U_1$

Ans: (4)

Sol: Maximum amount of emitted radiation corresponding to $\lambda_m = \frac{b}{T}$

$$\lambda_m = \frac{2.88\times10^6 nmK}{5760K} = 500nm$$



From the graph $U_1 < U_2 < U_3$

Q.16 Coefficient of linear expansion of brass and steel rods are α_1 and α_2. Lengths of brass and steel rods are ℓ_1 and ℓ_2 respectively. If ($\ell_2 - \ell_1$) is maintained same at all temperatures, which one of the following relations holds good ?

(1) $\alpha_1 \ell_2 = \alpha_2\ell_1$ (2) $\alpha_1 \ell_2^2 = \alpha_2 \ell_1^2$ (3) $\alpha_1^2 \ell_2 = \alpha_2^2\ell_1$ (4) $\alpha_1\ell_1 = \alpha_2\ell_2$

Ans: (4)

Sol: Change in length for both rods should be same

$\Delta\ell_1 = \Delta\ell_2 \Rightarrow \ell_1\alpha_1\Delta T \Rightarrow \ell_1\alpha_1 = \ell_2\alpha_2$

Q.17 A npn transistor is connected in common emitter configuration in a given amplifier. A load resistance of 800Ω is connected in the collector circuit and the voltage drop across it is 0.8 V. If the current amplification factor is 0.96 and the input resistance of the circuit is 192Ω, the voltage gain and the power gain of the amplifier will respectively be :

(1) 4, 3.84 (2) 3.69, 3.84 (3) 4, 4 (4) 4, 3.69

Ans: (1)

Sol: $\beta = \frac{\alpha}{1-\alpha} = \frac{0.96}{0.04} = 24$

Voltage gain for common base configuration

$A_0 = \alpha\left(\frac{R_L}{R_P}\right) = 0.96 \times \left(\frac{800}{192}\right) = 4$

Power gain for common base configuration

$P_V = A_0\alpha = 4 \times 0.96 = 3.84$

Voltage gain for common emitter configuration

$A_v = \beta\left(\frac{R_L}{R_i}\right) = 24 \times \left(\frac{800}{192}\right) = 100$

Power gain for common emitter configuration

$P_V = \beta A_v = 24 \times 100 = 2400$

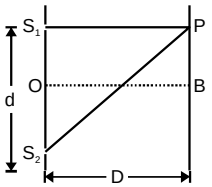
"In the question it is asked about common emitter configuration but we got above answer for common base configuration.

Q.18 The intensity at the maximum in aYoung's double slit experiment is I_0. Distance between two slits is d = 5λ, where λ is the wavelength of light used in the experiment. What will be the intensity in front of one of the slits one the screen placed at a distance D = 10 d ?

(1) I_0 (2) $\frac{I_0}{4}$ (3) $\frac{3}{4}I_0$ (4) $\frac{I_0}{2}$

Ans: (4)

Sol: Path difference



$= S_2P - S_1P$

$= \sqrt{D^2 + d^2} - D$

$= D\left(1 + \frac{1}{2}\frac{d^2}{D^2}\right) - D$

$= D\left[1 + \frac{d^2}{2D^2} - 1\right] = \frac{d^2}{2D}$

$\Delta x = \frac{d^2}{2\times 10d} = \frac{d}{20} = \frac{5\lambda}{20} = \frac{\lambda}{4}$

$\Delta\phi = \frac{2\pi}{\lambda} \cdot \frac{\lambda}{4} = \frac{\pi}{2}$

So, intensity at the desired point is

$I = I_0 \cos^2\frac{\phi}{2} = I_0 \cos^2\frac{\pi}{4} = \frac{I_0}{2}$

Q.19 A uniform circular disc of radius 50 cm at rest is free to turn about an axis which is perpendicular to its plane and passes through its centre. It is subjected to a torque which produces a constant angular acceleration of 2.0 rad s^{-2}. Its net acceleration in ms^{-2} at the end of 2.0 s is approximately :

(1) 8.0 (2) 7.0 (3) 6.0 (4) 3.0

Ans: (1)

Sol: Particle at periphery will have both radial and tangential acceleration

$a_t = R\alpha = 0.5 \times 2\ m/s^2$

$\omega = \omega_0 + \alpha t = 0 + 2 \times 2 = 4$ rad/sec.

$a_c = \omega^2 R = (4)^2 \times 0.5 = 16 \times 0.5 = 8\ m/s^2$

$a_{total} = \sqrt{a_p^2 + a_c^2} = \sqrt{1^2 + 8^2} = 8\ m/s^2$

"In this question we have assumed the point to be located at periphery of the disc.

Q.20 An electron of mass m and a photon have same energy E. The ratio of de-Broglie wavelengths associated with them is :

(1) $\frac{1}{c}\left(\frac{E}{2m}\right)^{\frac{1}{2}}$ (2) $\left(\frac{E}{2m}\right)^{\frac{1}{2}}$ (3) $c(2mE)^{\frac{1}{2}}$ (4) $\frac{1}{xc}\left(\frac{2m}{E}\right)^{\frac{1}{2}}$

(c being velocity of light)

Ans: (1)

Sol: For electron $\lambda_e = \frac{h}{\sqrt{2mE}}$

for photon E = pc

$\Rightarrow \lambda_{Ph} = \frac{hc}{E}$

$\Rightarrow \frac{\lambda_e}{\lambda_{Ph}} = \frac{h}{\sqrt{2mE}} \times \frac{E}{hc} = \left(\frac{E}{2m}\right)^{1/2}\frac{1}{c}$

Q.21 A disk and sphere of same radius but dfferent masses roll off on two inclined planes of the same altitude and length. Which one of the two objects gets to the bottom of the plane first ?

(1) Disk (2) Sphere

(3) Both reach at the same time (4) Depends on their masses

Ans: (2)

Sol: acceleration = $\frac{g\sin\theta}{1+\frac{K^2}{R^2}}$

for disc ; $\frac{K^2}{R^2} = \frac{1}{2} = 0.5$

for sphere ; $\frac{K^2}{R^2} = \frac{2}{5} = 0.4$

$\Rightarrow a_{(sphere)} > a_{(disc)}$ $\therefore$ sphere reaches first

Q.22 The angle of incidence for a ray of light at a refracting surface of a prism is 45°. The angle of prism 60°. If the ray suffers minimum deviation through the prism, the angle of minimum deviation and refractive index of the material of the prism respectively, are :

(1) 45°, $\frac{1}{\sqrt{2}}$ (2) 30°, $\sqrt{2}$ (3) 45°, $\sqrt{2}$ (4) 30°, $\frac{1}{\sqrt{2}}$

Ans: (2)

Sol: i = 45°; A = 60°; δ_m = 2i – A = 30°

$\mu = \frac{\sin\left(\frac{A+\delta_m}{2}\right)}{\sin A/2} = \frac{\sin 45^\circ}{\sin 30^\circ} = \frac{1}{\sqrt{2}} \cdot \frac{2}{1} = \sqrt{2}$

Q.23 When an α-particle of mass 'm' moving with velocity 'v' bombards on a heavy nucleus of charge 'Ze', its distance of closest approach from the nucleus depends on m as :

(1) $\frac{1}{m}$ (2) $\frac{1}{\sqrt{m}}$ (3) $\frac{1}{m^2}$ (4) m

Ans: (1)

Sol: At closest distance of approach, the kinetic energy of the particle will convert completely into electrostatic potential energy.

$\Rightarrow \frac{1}{2}mv^2 = \frac{KZe^2}{d_{min}} \Rightarrow d_{min} \propto \frac{1}{m}$

Q.24 A particle of mass 10 g moves along a circle of radius 6.4 cm with a constant tangential acceleration. What is the magnitude of this acceleration if the kinetic energy of the particle becomes equal to 8×10^{-4} J by the end of the second revolution after the beginning of the motion ?

(1) 0.1 m/s^2 (2) 0.15 m/s^2 (3) 0.18 m/s^2 (4) 0.2 m/s^2

Ans: (1)

Sol: By using work-energy theorem, W = ΔKE

$\Rightarrow (ma_t)(4\pi R) = \frac{1}{2}mv^2$

$\Rightarrow a_t = \frac{\left(\frac{1}{2}mv^2\right)}{4\pi mR}$

$\Rightarrow a_t = \frac{8\times10^{-4}}{4\times3.14\times10\times10^{-8}\times6.4\times10^{-2}}$

= 0.1 m/s^2

OR

$\frac{1}{2}mv^2 = KE \Rightarrow \frac{1}{2}\left(\frac{10}{1000}\right)v^2 = 8\times10^{-4}$

$\Rightarrow v^2 = 16\times10^{-2} \Rightarrow v = 4\times10^{-1} = 0.4$ m/s

Now,

$v^2 = u^2 + 2a_t s$ (s = $4\pi R$)

$\Rightarrow \frac{16}{100} = 0^2 + 2a_t\left(4\times\frac{22}{7}\times\frac{6.4}{100}\right)$

$\Rightarrow a_t = \frac{16}{100}\times\frac{7\times100}{8\times22\times6.4} = 0.1 m/s^2$

Q.25 The molecules of a given mass of a gas have r.m.s. velocity of 200 m/s at 27°C and 1.0×10^5 Nm^{-2} pressure. When the temperature and pressure of the gas are respectively, 127°C and 0.05×10^5 Nm^{-2}, the r.m.s. velocity of its molecules in ms^{-1} is :

(1) $100\sqrt{2}$ (2) $\frac{400}{\sqrt{3}}$ (3) $\frac{100\sqrt{2}}{3}$ (4) $\frac{100}{3}$

Ans: (2)

Sol: $v \propto \sqrt{T} \Rightarrow \frac{v}{200} = \sqrt{\frac{400}{300}} \Rightarrow v = \frac{400}{\sqrt{3}} m/s$

Q.26 A long straight wire of radius a carries a steady current I. The current is uniformly distributed over its cross-section. The ratio of the magnetic fields B and B', at radial distances $\frac{a}{2}$ and 2a respectively, from the axis of the wire is :

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

Ans: (3)

Sol: For points inside the wire

$B = \frac{\mu_0 Ir}{2\pi R^2}(r \le R)$

For points outside the wire

$B = \frac{\mu_0 I}{2\pi r}(r \ge R)$

according to the question

$\frac{B}{B'} = \frac{\frac{\mu_0 I(a/2)}{2\pi a^2}}{\frac{\mu_0 I}{2\pi(2a)}} = 1:1$

Q.27 A particle moves so that its position vector is given by $\vec{r} = cos\,\omega t\hat{x} + sin\,\omega t\hat{y}$. Where ω is a constant. Which of the following is true ?

(1) Velocity and acceleration both are perpendicular to $\vec{r}$

(2) Velocity and acceleration both are parallel to $\vec{r}$

(3) Velocity is perpendicular to $\vec{r}$ and acceleration is directed towards the origin

(4) Velocity is perpendicular to $\vec{r}$ and acceleration is directed away from the origin

Ans: (3)

Sol: $\vec{r} = cos\,\omega\, t\hat{x} + sin\,\omega\, t\hat{y}$

$\Rightarrow \vec{v} = \frac{d\vec{r}}{dt} = -\omega\, sin\,\omega\, t\hat{x} + \omega\, cos\,\omega\, t\hat{y}$

$\Rightarrow \vec{a} = \frac{d\vec{v}}{dt} = -\omega^2\, cos\,\omega\, t\hat{x} - \omega^2\, sin\,\omega\, t\hat{y} = -\omega^2\vec{r}$

$\vec{a}$ is directed towards the origin.

Also $\vec{r}.\vec{v} = 0$ hence, $\vec{r} \perp \vec{v}$

Q.28 What is the minimum velocity with which a body of mass m must enter a vertical loop of radius R so that it can complete the loop ?

(1) $\sqrt{gR}$ (2) $\sqrt{2gR}$ (3) $\sqrt{3gR}$ (4) $\sqrt{5gR}$

Ans: (4)

Sol: When minimum speed of body is $\sqrt{5gR}$, then no matter from where it enters the loop, it will complete full vertical loop.

Q.29 When a metallic surface is illuminated with radiation of wavelength λ, the stopping potential is V. If the same surface is illuminated with radiation of wavelength 2λ, the stopping potential is $\frac{V}{4}$. The threshold wavelength for the metallic surface is :

(1) 4λ (2) $5\,\lambda$ (3) $\frac{5}{2}\lambda$ (4) $3\,\lambda$

Ans: (4)

Sol: $eV = \frac{hc}{\lambda} - \frac{hc}{\lambda_0}$ ...(i)

$\frac{eV}{4} = \frac{hc}{2\lambda} - \frac{hc}{\lambda_0}$ ...(ii)

From equation (i) and (ii)

$\Rightarrow 4 = \frac{\frac{1}{\lambda} - \frac{1}{\lambda_0}}{\frac{1}{2\lambda} - \frac{1}{\lambda_0}}$ On solving $\lambda_0 = 3\lambda$

Q.30 A gas is compressed isothermally to half its initial volume. The same gas is compressed separately through an adiabatic process until its volume is again reduced to half. Then :

(1) Compressing the gas isothermally will require more work to be done.

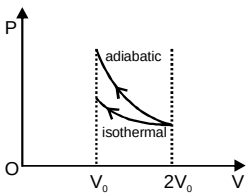
(2) Compressing the gas through adiabatic process will require more work to be done.

(3) Compressing the gas isothermally or adiabatically will require the same amount of work.

(4) Which of the case (whether compression through isothermal or through adiabatic process) requires more work will depend upon the atomicity of the gas.

Ans: (2)

Sol:



W_{ext} = negative of area with volume-axis W(adiabatic) > W(isothermal)

Q.31 A potentiometer wire is 100 cm long and a constant potential difference is maintained across it. Two cells are connected in series first to support one another and then in opposite direction. The balance points are obtained at 50 cm and 10 cm from the positive end of the wire in the two cases. The ratio of emf's is :

(1) 5 : 1 (2) 5 : 4 (3) 3 : 4 (4) 3 : 2

Ans: (4)

Sol: Here $\frac{E_1+E_2}{E_1-E_2}=\frac{50}{10}$

$\Rightarrow \frac{2E_1}{2E_2}=\frac{50+10}{50-10}=\frac{60}{40}\Rightarrow \frac{E_1}{E_2}=\frac{3}{2}$

Q.32 A astronomical telescope has objective and eyepiece of focal lengths 40 cm and 4 cm respectively. To view an object 200 cm away from the objective, the lenses must be separated by a distance :

(1) 37.3 cm (2) 46.0 cm (3) 50.0 cm (4) 54.0 cm

Ans: (4)

Sol: Using lens formula for objective lens

$\frac{1}{v_0}-\frac{1}{u_0}=\frac{1}{f_0}\Rightarrow \frac{1}{v_0}=\frac{1}{f_0}+\frac{1}{u_0}$

$\frac{1}{v_0}=\frac{1}{40}+\frac{1}{-200}=\frac{+5-1}{200}\Rightarrow v_0=50cm$

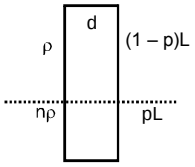
Tube length $\ell = |v_0| + f_0 = 50 + 4 = 54$ cm.

Q.33 Two non-mixing liquids of densities ρ and $n\rho$ ($n > 1$) are put in a container. The height of each liquid is h. A solid cylinder of length L and density d is put in this container. The cylinder floats with its axis vertical and length pL ($p < 1$) in the denser liquid. The density d is equal to :

(1) $\{1 + (n + 1) p\}\rho$ (2) $\{2 + (n + 1) p\}\rho$ (3) $\{2 + (n – 1) p\}\rho$ (4) $\{1 + (n – 1) p\}\rho$

Ans: (4)

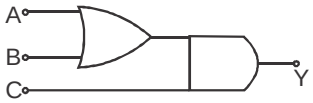
Sol: Weight of cylinder = Upthrust by the two liquids



$L A d g = (pL) A (n\rho)g + (1 – p) L A \rho g$

$\Rightarrow d = (1 – p)\rho + pn \rho = (1 + (n – 1)p]\rho$

Q.34 To get output 1 for the following circuit, the correct choice for the input is :



(1) A = 0, B = 1, C = 0 (2) A = 1, B = 0, C = 0 (3) A = 1, B = 1, C = 0 (4) A = 1, B = 0, C = 1

Ans: (4)

Sol: $Y = (A + B).C = 1 \Rightarrow C = 1$

Q.35 A piece of ice falls from a height h so that it melts completely. Only one-quarter of the heat produced is absorbed by the ice and all energy of ice gets converted into heat during its fall. The value on h is:

(Latent heat of ice is 3.4×10^5 J/kg and g = 10 N/kg)

(1) 34 km (2) 544 km (3) 136 km (4) 68 km

Ans: (3)

Sol: $\frac{mgh}{4} = mL$

$\Rightarrow h = \frac{4L}{g} = \frac{4\times3.4\times10^5}{10} = 136km.$

Q.36 The ratio of escape velocity at earth (v_e) to the escape velocity at a planet (v_p) whose radius and mean density are twice as that of earth is :

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

Ans: (2)

Sol: Escape Velocity

$= \sqrt{\frac{2GM}{R}} = \sqrt{\frac{2G}{R}\cdot\left(\frac{4}{3}nR^3\rho\right)} \propto R\sqrt{\rho}$

$\therefore$ Ratio, $\frac{v_e}{v_p} = 1:2\sqrt{2}$

Q.37 If the magnitude of sum of two vectors is equal to the magnitude of difference of the two vectors, the angle between these vectors is :

(1) 0° (2) 90° (3) 45° (4) 180°

Ans: (2)

Sol: $\left|\vec{A}+\vec{B}\right| = \left|\vec{A}-\vec{B}\right|$

$\Rightarrow A^2 + B^2 + 2AB\cos\theta = A^2 + B^2 - 2AB\cos\theta$

$\Rightarrow \cos\theta = 0 \Rightarrow \theta = 90°.$

Q.38 Given the value of Rydberg constant is 10^7 m^{-1}, the wave number of the last line of the Balmer series in hydrogen spectrum will be :

(1) 0.025×10^4 m^{-1} (2) 0.5×10^7 m^{-1} (3) 0.25×10^7 m^{-1} (4) 2.5×10^7 m^{-1}

Ans: (3)

Sol: Wave number, $\frac{1}{\lambda} = RZ^2\left(\frac{1}{n_2^2}-\frac{1}{n_1^2}\right)$

$= 10^7\times1^2\left(\frac{1}{2^2}-\frac{1}{\infty^2}\right) = 0.25\times10^7 m^{-1}$

Q.39 A body of mass 1 kg begins to move under the action of a time dependent force $\vec{F}(2t\hat{\imath}+3t^2\hat{\jmath})N$, where $\hat{\imath}$ and $\hat{\jmath}$ are unit vectors along x and y axis. What power will be developed by the force at the time t ?

(1) $(2t^2 + 3t^3)$ W (2) $(2t^2 + 4t^4)$ W (3) $(2t^3 + 3t^4)$ W (4) $(2t^3 + 3t^5)$ W

Ans: (4)

Sol: $\vec{F} = 2t\hat{\imath}+3t^2\hat{\jmath} \Rightarrow m\frac{d\vec{v}}{dt} = 2t\hat{\imath}+3t^2\hat{\jmath}(m=1kg)$

$\Rightarrow \int_0^{\vec{v}} d\vec{v} = \int_0^t (2t\hat{\imath}+3t^2\hat{\jmath})dt \Rightarrow \vec{v} = t^2\hat{\imath}+t^3\hat{\jmath}$

Power $= \vec{F}.\vec{v} = (2t^3+3t^5)W$

Q.40 An inductor 20 mH, a capacitor 50μF and a resistor 40Ω are connected in series across a source of emf V = 10 sin 340 t. The power loss in AC circuit is :

(1) 0.51 W (2) 0.67 W (3) 0.76 W (4) 0.89 W

Ans: (1)

Sol: $X_C = \frac{1}{\omega C} = \frac{1}{340\times50\times10^{-6}} = 58.8\Omega$

$X_L = \omega L = 340 \times 20 \times 10^{-3} = 6.8\ \Omega$

$Z = \sqrt{R^2 + (X_C - X_L)^2}$

$= \sqrt{40^2 + (58.8 - 6.8)^2} = \sqrt{4304}\Omega$

$P = i_{ms}^2 R = \left(\frac{V_{rms}}{Z}\right)^2 R$

$= \left(\frac{10/\sqrt{2}}{\sqrt{4304}}\right)^2 \times 40 = \frac{50 \times 40}{4304} = 0.47W$

So best answer (nearest answer) will be (1)

Q.41 If the velocity of a particle is v = At + Bt^2, where A and B are constants, then the distance travelled by it between 1s and 2s is :

(1) $\frac{3}{2}A + 4B$ (2) 3A + 7B (3) $\frac{3}{2}A + \frac{7}{3}B$ (4) $\frac{A}{2} + \frac{B}{3}$

Ans: (3)

Sol: $v = At + Bt^2 \Rightarrow \frac{ds}{dt} = At + Bt^2$

$\Rightarrow \int_0^s ds = \int_1^2 (At + Bt^2)dt$

$\Rightarrow s = \frac{A}{2}(2^2 - 1^2) + \frac{B}{3}(2^3 - 1^3) = \frac{3A}{2} + \frac{7B}{3}$

Q.42 A long solenoid has 1000 turns. When a current of 4A flows through it, the magnetic flux linked with each turn of the solenoid is 4 × 10^{-3} Wb. The self inductance of the solenoid is :

(1) 4 H (2) 3 H (3) 2 H (4) 1 H

Ans: (4)

Sol: Flux linked with each turn = 4 × 10^{-3} Wb

$\therefore$ Total flux linked = 1000[4 × 10^{-3}]Wb = 4 Wb

ϕ_{total} = Li = 4 $\Rightarrow$ L = 1H

Q.43 A small signal voltage V(t) = V_0 sin ωt is applied across an ideal capacitor C :

(1) Current I(t), lags voltage V(t) by 90°

(2) Over a full cycle the capacitor C does not consume any energy from the voltage source.

(3) Current I (t) is in phase with voltage V(t).

(4) Current I(t) leads voltage V(t) by 180°.

Ans: (2)

Sol: Input voltage, V(t)= $V_0 \sin\omega t$

For capacitor,

$I(t) = \frac{dq}{dt} = C\frac{dV}{dt} = \omega C V_0 \cos\omega t$

$\Rightarrow$ Current I(t) leads voltage V(t) by 90°

Also, Capacitor does not consume any energy over a full cycle.

Q.44 Match the corresponding entries of column-1 with column-2 (Where m is the magnification produced by the mirror) :

Column-1	**Column-2**
(A) m = – 2	(a) Convex mirror
(B) $m = -\frac{1}{2}$	(b) Concave mirror
(C) m = + 2	(c) Real image
(D) $m = +\frac{1}{2}$	(d) Virtual image

(1) A → b and c, B → b and c, C → b and d,D → a and d.

(2) A → a and c, B → a and d, C → a and b,D → c and d.

(3) A → a and d, B → b and c, C → b and d,D → b and c.

(4) A → c and d, B → b and d, C → b and c,D → a and d.

Ans: (1)

Sol: For spherical mirrors

m = +ve ⇒ virtual image

m = –ve ⇒ real image

|m| > 1 ⇒ magnified image

|m| < 1 ⇒ diminished image

Q.45 A car is negotiating a curved road of radius R. The road is banked at an angle θ. The coefficient of friction between the tyres of the car and the road is μ_s. The maximum safe velocity on this road is :

(1) $\sqrt{gR^2\frac{\mu_s+\tan\theta}{1-\mu_s\tan\theta}}$ (2) $\sqrt{gR\frac{\mu_s+\tan\theta}{1-\mu_s\tan\theta}}$ (3) $\sqrt{\frac{g}{R}\frac{\mu_s+\tan\theta}{1-\mu_s\tan\theta}}$ (4) $\sqrt{\frac{g}{R^2}\frac{\mu_s+\tan\theta}{1-\mu_s\tan\theta}}$

Ans: (2)

Sol: $\frac{v^2}{Rg} = tan(\phi+\theta) = \frac{\tan\phi+\tan\theta}{1-\tan\phi\tan\theta}$

$= \left(\frac{\mu_s+\tan\theta}{1-\mu_s\tan\theta}\right)$ $(\mu_s = tan\,\phi)$

$\Rightarrow v = \sqrt{Rg\left[\frac{\mu_s+\tan\theta}{1-\mu_s\tan\theta}\right]}$

OR

Check by dimensions.

Q.46 Consider the molecules CH_4, NH_3 and H_2O. Which of the given statements is false?

(1) The H–C–H bond angle in CH_4, the H–N–H bond angle in NH_3, and the H–O–H bond angle in H_2O are all greater than 90°

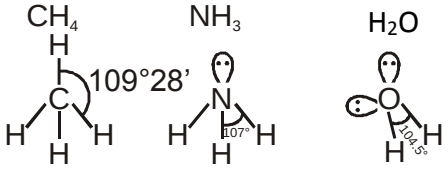
(2) The H–O–H bond angle in H_2O is larger than the H–C–H bond angle in CH_4.

(3) The H–O–H bond angle in H_2O is smaller than the H–N–H bond angle in NH_3.

(4) The H–C–H bond angle in CH_4 is larger than the H–N–H bond angle in NH_3.

Ans: (2)

Sol:



Q.47 In the reaction

$$H-C\equiv CH \xrightarrow[(2)CH_3CH_2Br]{(1)NaNH_2/liq.NH_3} X \xrightarrow[(2)CH_3CH_2Br]{(1)NaNH_2/liq.NH_3} Y$$

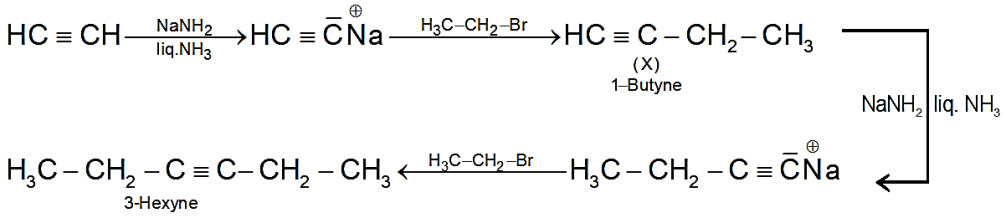
X and Y are :-

(1) X = 1-Butyne; Y = 3-Hexyne (2) X = 2-Butyne; Y = 3-Hexyne

(3) X = 2-Butyne; Y = 2-Hexyne (4) X = 1-Butyne; Y = 2-Hexyne

Ans: (1)

Sol:



Q.48 Among the following, the correct order of acidity is

(1) $HClO_3 < HClO_4 < HClO_2 < HClO$ (2) $HClO < HClO_2 < HClO_3 < HClO_4$

(3) $HClO_2 < HClO < HClO_3 < HClO_4$ (4) $HClO_4 < HClO_2 < HClO < HClO_3$

Ans: (2)

Sol: Acidic strength $\propto$ EN $\propto$ + ve O.S.

$HClO < HClO_2 < HClO_3 < HClO_4$

+1 +3 +5 +7

Q.49 The rate of a first-order reaction is 0.04 mol $L^{-1}s^{-1}$ at 10 seconds and 0.03 mol $L^{-1}s^{-1}$ at 20 seconds after initiation of the reaction. The half-life period of the reaction is:

(1) 24.1 s (2) 34.1 s (3) 44.1 s (4) 54.1 s

Ans: (1)

Sol: $K = \frac{2.303}{(t_2-t_1)} log \frac{(a-x_1)}{(a-x_2)}$

$K = \frac{2.303}{(20-10)} log \left(\frac{0.04}{0.03}\right)$

$K = \frac{2.303\times0.1249}{10}$

$\frac{2.303\times log\,2}{t_{1/2}} = \frac{2.303\times0.1249}{10}$

$t_{1/2} = \frac{0.3010\times10}{0.1249} = 24.1sec$

Q.50 Which one of the following characteristics is associated with adsorption?

(1) ΔG is negative but ΔH and ΔS are positive (2) ΔG, ΔH and ΔS all are negative

(3) ΔG and ΔH are negative but ΔS is positive (4) ΔG and ΔS are negative but ΔH is positive

Ans: (2)

Sol: Adsorption is spontaneous process,

so ΔG = negative

Adsorption is exothermic process,

so ΔH = negative

In adsorption entropy decreases,

so ΔS = negative

so ΔG, ΔH and ΔS all are negative

Q.51 In which of the following options the order of arrangement does not agree with the variation of property indicated against it?

(1) $Al^{3+} < Mg^{2+} < Na^+ < F^-$ (increasing ionic size)

(2) B<C<N<O (increasing first ionisation enthalpy)

(3) I<Br<Cl<F (increasing electron gain enthalpy)

(4) Li<Na<K<Rb (increasing metallic radius)

Ans: (Both 2 & 3)

Sol: (2) B < C < N < O (given I.P. order)
B < C < O < N (correct)
(3) I < Br < Cl < F (given ΔH_{eg} order)
I < Br < F < Cl (correct)

Q.52 Which of the following statements is false?
(1) Mg^{2+} ions form a complex with ATP
(2) Ca^{2+} ions are important in blood clotting
(3) Ca^{2+} ions are not important in maintaining the regular beating of the heart.
(4) Mg^{2+} ions are important in the green parts of plants.

Ans: (3)

Sol:

Q.53 Which of the following statements about hydrogen is incorrect ?
(1) hydrogen has three isotopes of which tritium is the most common.
(2) Hydrogen never acts as cation in ionic salts
(3) Hydronium ion, H_3O^+ exists freely in solution
(4) Dihydrogen does not act as a reducing agent

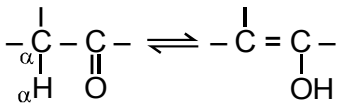
Ans: (Both 1 & 4)

Sol: Theory based.

Q.54 The correct statement regarding a carbonyl compound with a hydrogen atom on its alpha carbon, is :-
(1) a carbonyl compound with a hydrogen atom on its alpha-carbon never equilibrates with its corresponding enol.
(2) a carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known as aldehyde-ketone equilibration.
(3) a carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known as carbonylation.
(4) a carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known as keto-enol tautomerism.

Ans: (4)

Sol: Keto-enol Tautomerism



(Keto) (enol)

Q.55 MY and NY_3, two nearly insoluble salts, have the same K_{sp} values of 6.2×10^{-13} at room temperature. Which statement would be true in regard to MY and NY_3?
(1) The molar solubilities of MY and NY_3 in water are identical.
(2) The molar solubility of MY in water is less than that of NY_3
(3) The salts MY and NY_3 are more soluble in 0.5 M KY than in pure water.
(4) The addition of the salt of KY to solution of MY and NY_3 will have no effect on their solubilities

Ans: (2)

Sol: MY $\rightarrow$ $K_{sp} = s^2 = 6.2 \times 10^{-13}$

$s = \sqrt{6.2 \times 10^{-13}}$

$s = 7.87 \times 10^{-7}$ mol L^{-1}

$NY_3 \rightarrow K_{sp} = 27\ s^4 = 6.2 \times 10^{-13}$

$s = \left(\frac{6.2 \times 10^{-13}}{27}\right)^{1/4}$

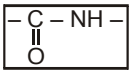
$S = 3.89 \times 10^{-4}$ mol L^{-1}

$\therefore$ Molar solubility of NY_3 is more than MY in water

Q.56 In a protein molecule various amino acids are linked together by :

(1) α-glycosidic bond (2) β-glycosidic bond (3) peptide bond (4) dative bond

Ans: (3)

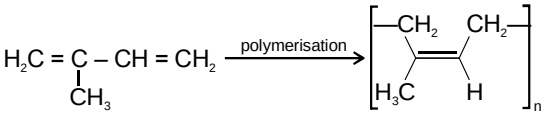
Sol: Peptide bond 

Q.57 Natural rubber has

(1) All cis-configuration (2) All trans-configuration

(3) Alternate cis-and trans-configuration (4) Random cis-and trans-configuration

Ans: (1)

Sol: 

Isoprene cis-polyisoprene

Q.58 Match items of Column-I with the items of Column-II and asign the correct code :

	Column-I		**Column-II**
(a)	Cyanide process	(i)	Ultrapure Ge
(b)	Froth floatation process	(ii)	Dressing of ZnS
(c)	Electrolytic reduction	(iii)	Extraction of Al
(d)	Zone refining	(iv)	Extraction of Au
		(v)	Purification of Ni

Code :

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

Ans: (1)

Sol:

Q.59 Which one of the following statements is correct when SO_2 is passed through acidified $K_2Cr_2O_7$ solution?

(1) The solution turns blue (2) The solution is decolourized

(3) SO_2 is reduced (4) Green $Cr_2(SO_4)_3$ is formed

Ans: (4)

Sol: $K_2Cr_2O_7 + SO_2 + H_2SO_4 \rightarrow K_2SO_4 + Cr_2(SO_4)_3 + H_2O$

green colour

Q.60 The electronic configuration of Eu(Atomic No. 63), Gd(Atomic No. 64) and Tb (Atomic No. 65) are :

(1) $[Xe]4f^7\,6s^2$, $[Xe]4f^8\,6s^2$ and $[Xe]4f^8\,5d^1\,6s^2$

(2) $[Xe]4f^6\,5d^1\,6s^2$, $[Xe]4f^7\,5d^1\,6s^2$ and $[Xe]4f^9\,6s^2$

(3) $[Xe]4f^6 5d^1 6s^2$, $[Xe]4f^7 5d^1 6s^2$ and $[Xe]4f^8\,5d^1 6s^2$

(4) $[Xe]4f^7 6s^2$, $[Xe]4f^7\,5d^1\,6s^2$ and $[Xe]4f^9\,6s^2$

Ans: (4)

Sol:

Q.61 Two electrons occupying the same orbital are distinguished by

(1) Principal quantum number (2) Magnetic quantum number

(3) Azimuthal quantum number (4) Spin quantum number

Ans: (4)

Sol: Two electrons occupying the same orbital differ by spin quantum number.

Q.62 When copper is heated with conc. HNO_3 it produces

(1) $Cu(NO_3)_2$ and NO_2 (2) $Cu(NO_3)_2$ and NO

(3) $Cu(NO_3)_2$, NO and NO_2 (4) $Cu(NO_3)_2$ and N_2O

Ans: (1)

Sol: $Cu + 4HNO_3(conc.) \rightarrow Cu(NO_3)_2 + 2NO_2 + 2H_2O$

Q.63 Which of the following reagents would distinguish cis-cyclopentane-1, 2-diol from its trans-isomer?

(1) Acetone (2) Ozone

(3) MnO_2 (4) Aluminium isopropoxide

Ans: (1)

Sol:

Q.64 The correct thermodynamic conditions for the spontaneous reaction at all temperatures is :

(1) $\Delta H < 0$ and $\Delta S = 0$ (2) $\Delta H > 0$ and $\Delta S < 0$ (3) $\Delta H < 0$ and $\Delta S > 0$ (4) $\Delta H < 0$ and $\Delta S < 0$

Ans: (3)

Sol: $\Delta G = \Delta H - T\Delta S$

For, $\Delta H < 0$ and $\Delta S > 0$, ΔG = –ve (always)

$\therefore$ spontaneous at all temperatures.

Q.65 Lithium has a bcc structure. Its density is 530 kg m^{-3} and its atomic mass is 6.94 g mol^{-1}. Calculate the edge length of a unit cell of Lithium metal. ($N_A = 6.02 \times 10^{23}$ mol^{-1})

(1) 154 pm (2) 352 pm (3) 527 pm (4) 264 pm

Ans: (2)

Sol: $\rho = \frac{Z \times M}{N_A \times a^3}$

For bcc structure

Z = 2, ρ = 530 kg m^{-3} = 0.530 g cm^{-3}

$0.530 = \frac{2 \times 6.94}{6.02 \times 10^{23} \times a^3}$

$a^3 = 4.348 \times 10^{-23}$ cm^3

$a = 3.52 \times 10^{-8}$ cm

a = 352 pm

Q.66 Which one of the following orders is correct for the bond dissociation enthalpy of halogen molecules?

(1) $I_2 > Br_2 > Cl_2 > F_2$ (2) $Cl_2 > Br_2 > F_2 > I_2$ (3) $Br_2 > I_2 > F_2 > Cl_2$ (4) $F_2 > Cl_2 > Br_2 > I_2$

Ans: (2)

Sol: $Cl_2 + Br_2 > F_2 > I_2$

↓

due to high lp-lp repulsion.

Q.67 Which of the following is an analgesic?

(1) Novalgin (2) Penicillin (3) Streptomycin (4) Chloromycetin

Ans: (1)

Sol: Novalgin used as analgesic

Q.68 Equal moles of hydrogen and oxygen gases are placed in a container with a pin-hole through which both can escape. What fraction of the oxygen escapes in the time required for one-half of the hydrogen to escape?

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

Ans: (1)

Sol: $n_{H_2} = n_{O_2} and\ t_{H_2} = t_{O_2}$

According to Graham's law

$\frac{r_{H_2}}{r_{O_2}} = \sqrt{\frac{M_{O_2}}{M_{H_2}}} \Rightarrow \frac{v_1/t_1}{v_2/t_2} = \sqrt{\frac{32}{2}}$

$\frac{1/2}{1/x} = \sqrt{16} = 4$

$\frac{x}{2} = 4$

$\therefore$ x = 8

$\therefore$ Fraction of O_2 = 1/8

Q.69 Consider the nitration of benzene using mixed conc. H_2SO_4 and HNO_3. If a large amount of $KHSO_4$ is added to the mixture, the rate of nitration will be :-

(1) faster (2) slower (3) unchanged (4) doubled

Ans: (2)

Sol: Slower, as large amount of HSO_4^- will decrease ionisation of H_2SO_4 that result in lesser ionisation of nitric acid and lesser formation of nitronium ion $[NO_2^+]$

Q.70 Predict the correct order among the following :-

(1) lone pair-lone pair > lone pair-bond pair > bond pair-bond pair

(2) lone pair-lone pair > bond pair-bond pair > lone pair-bond pair

(3) bond pair-bond pair > lone pair-bond pair > lone pair-lone pair

(4) lone pair-bond pair > bond pair-bond pair > lone pair-lone pair

Ans: (1)

Sol:

Q.71 The product obtained as a result of a reaction of nitrogen with CaC_2 is :-

(1) $CaCN_2$ (2) CaCN (3) $CaCN_3$ (4) Ca_2CN

Ans: (1)

Sol: $CaC_2 + N_2 \rightarrow CaCN_2 + C$

Q.72 Consider the following liquid – vapour equilibrium.

Liquid $\rightleftharpoons$ Vapour

Which of the following relations is correct ?

(1) $\frac{d\ell nG}{dT^2} = \frac{\Delta H_v}{RT^2}$ (2) $\frac{d\ell nP}{dT} = \frac{-\Delta H_v}{RT}$ (3) $\frac{d\ell nP}{dT^2} = \frac{-\Delta H_v}{T^2}$ (4) $\frac{d\ell nP}{dT} = \frac{\Delta H_v}{RT^2}$

Ans: (4)

Sol: Clausius – Clapeyron's equation

$\frac{d\ ln\ P}{dT} = \frac{\Delta H_v}{RT^2}$

Q.73 Match the compounds given in column-I with the hybridisation and shape given in column-II and mark the correct option.

	Column-I		**Column-II**
(a)	XeF_6	(i)	Distorted octahedral
(b)	XeO_3	(ii)	Square planar
(c)	$XeOF_4$	(iii)	Pyramidal
(d)	XeF_4	(iv)	Square pyramidal

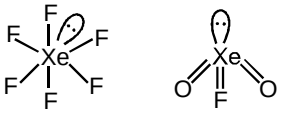
Code :

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

Ans: (1)

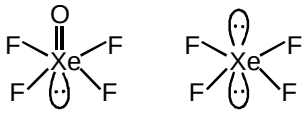
Sol:

XeF_6 XeO_3



distorted octahedral Pyramidal

$XeOF_4$ XeF_4



Square pyramidal Square planar

Q.74 Which of the following has longest C–O bond length? (Free C–O bond length in CO is 1.128Å).

(1) $Ni(CO)_4$ (2) $[Co(CO)_4]^-$ (3) $[Fe(CO)_4]^{2-}$ (4) $[Mn(CO)_6]^+$

Ans: (3)

Sol: $[Fe(CO_4)]^{2-}$

Since metal atom is carrying maximum –ve charge therefore it would show maximum synergic bonding as result C–O bond length would be maximum.

Q.75 The pressure of H_2 required to make the potential of H_2-electrode zero in pure water at 298 K is:-

(1) 10^{-14} atm (2) 10^{-12} atm (3) 10^{-10} atm (4) 10^{-4} atm

Ans: (1)

Sol: $2H^+(aq) + 2e^- \rightarrow H_2(g)$

$$\therefore E = E^o - \frac{0.0591}{2} log \frac{P_{H_2}}{[H^+]^2}$$

$$0 = 0 - 0.0295\, log \frac{P_{H_2}}{(10^{-7})^2}$$

$$\frac{P_{H_2}}{(10^{-7})^2} = 1$$

$$P_{H_2} = 10^{-14} atm$$

Q.76 The addition of a catalyst during a chemical reaction alters which of the following quantities?

(1) Entropy (2) Internal energy (3) Enthalpy (4) Activation energy

Ans: (4)

Sol: The addition of catalyst during a chemical reaction alters the activation energy.

Q.77 The ionic radii of A^+ and B^- ions are 0.98×10^{-10}m and 1.81×10^{-10} m. The coordination number of each ion in AB is :-

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

Ans: (1)

Sol: radii ratio = $\frac{r_+}{r_-} = \frac{0.98\times10^{-10}}{1.81\times10^{-10}} = 0.54$

radii ratio is in between 0.414 to 0.732

so, coordination number is 6.

Q.78 Which is the correct statement for the given acids?

(1) Phosphinic acid is a diprotic acid while phosphonic acid is a monoprotic acid

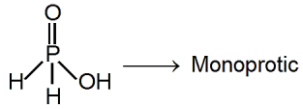
(2) Phosphinic acid is a monoprotic acid while phosphonic acid is a diprotic acid

(3) Both are triprotic acids

(4) Both are diprotic acids

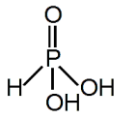
Ans: (2)

Sol: Phosphinic acid (H_3PO_2)



⟶ Monoprotic

Phosphonic acid (H_3PO_3)



⟶ Diprotic acid

Q.79 Fog is colloidal solution of :-

(1) Liquid in gas (2) Gas in liquid (3) Solid in gas (4) Gas in gas

Ans: (1)

Sol: Frog is a coloidal solution of liquid in gas.

Q.80 Which of the following statement about the composition of the vapour over an ideal a 1 : 1 molar mixture of benzene and toluene is correct? Assume that the temperature is constant at 25°C. (Given : Vapour Pressure Data at 25°C, benzene = 12.8 kPa, Toluene = 3.85 kPa)

(1) The vapour will contain a higher percentage of benzene

(2) The vapour will contain a higher percentage of toluene

(3) The vapour will contain equal amounts of benzene and toluene

(4) Not enough information is given to make a predication

Ans: (1)

Sol: A→ benzene, B→ toluene

1 : 1 molar mixture of A and B

$\therefore x_A = \frac{1}{2}$and $x_B = \frac{1}{2}$

$P_s = P_A^0 X_A + P_B^0 X_B$

$P_s = 12.8 \times \frac{1}{2} + 3.85 \times \frac{1}{2} = 8.325kPa$

$Y_A = \frac{P_A^0 X_A}{P_s} = \frac{12.8 \times \frac{1}{2}}{8.325} = 0.768$

$\therefore Y_B = 1 - Y_A = 1 - 0.768 = 0.232$

so, the vapour will contain higher percentage of benzene.

Q.81 The correct statement regarding the comparison of staggered and eclipsed conformation of ethane, is:

(1) The staggered conformation of ethane is less stable than eclipsed conformation, because staggered conformation has torsional strain

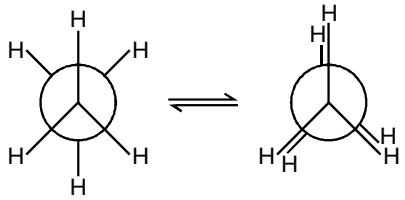
(2) The eclipsed conformation of ethane is more stable than staggered conformation, because eclipsed conformation has no torsional strain

(3) The eclipsed conformation of ethane is more stable than staggered conformation even through the eclipsed conformation has torsional strain

(4) The staggered conformation of ethane is more stable than eclipsed conformation, because staggered conformation has no torsional strain.

Ans: (4)

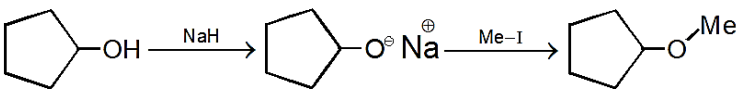
Sol:



Staggered form
No torsional strain

Edipsed form

Q.82 The reaction



Can be classified as :-

(1) Williamson ether synthesis reaction

(2) Alcohol formation reaction

(3) Dehydration reaction

(4) Williamson alcohol synthesis reaction

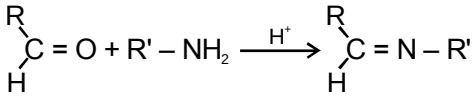
Ans: (1)

Sol: This is an example of Williamson ether synthesis reaction in which sodium alkoxide reacts with alkyl halide and gives ether.

Q.83 The product formed by the reaction of an aldehyde with a primary amine is :-

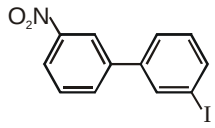
(1) Schiff base (2) Ketone (3) Carboxylic acid (4) Aromatic acid

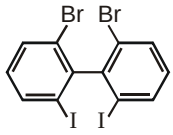
Ans: (1)

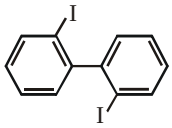


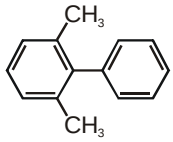
Sol: Aldehyde + primary amine Schiff base

Q.84 Which of the following biphenyls is optically active?

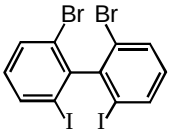
(1) 

(2) 

(3) 

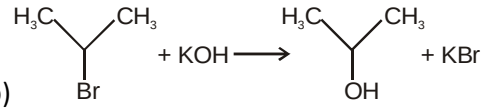
(4) 

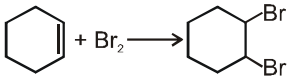
Ans: (2)

Sol:  is optically active due to absence of plane of symmetry and center of symmetry

Q.85 For the following reactions :-

(a) $CH_3CH_2CH_2Br + KOH \rightarrow CH_3CH{=}CH_2 + KBr + H_2O$

(b) 

(c) 

Which of the following statement is correct ?

(1) (a) and (b) are elimination reaction and (c) is addition reaction

(2) (a) is elimination, (b) is substitution and (c) is addition reaction

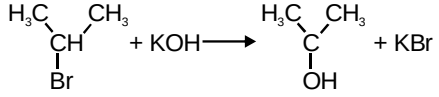
(3) (a) is elimination, (b) and (c) are substitution reactions

(4) (a) is substitution, (b) and (c) are addition reaction

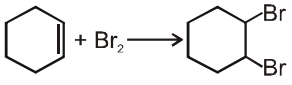
Ans: (2)

Sol: (a) $CH_3CH_2CH_2 - Br + KOH \rightarrow CH_3CH = CH_2 + KBr + H_2O$

breaking of 2σ bonds and formation of 1π bond so it is an example of elimination reaction.

(b) 

replacement of Br^- by OH^- is substitution reaction

(c) 

breaking of 1π bond and formation of 2σ bonds is addition reaction

Q.86 At 100°C the vapour pressure of a solution of 6.5g of a solute in 100g water is 732 mm. If K_b = 0.52 the boiling point of this solution will be :-

(1) 101°C (2) 100°C (3) 102°C (4) 103°C

Ans: (1)

Sol: $\left(\frac{P^0-P_s}{P^0}\right) = \frac{n}{N} = \frac{w_{solute}}{M_{solute}} \times \frac{M_{solvent}}{W_{solvent}}$

at 100 °C, P^0 = 760 mm

$\frac{760-732}{760} = \frac{6.5\times18}{M_{solute}\times100}$

M_{solute} = 31.75 g mol^{-1}

$\Delta T_b = mxK_b = \frac{w_{solute}\times1000}{M_{solute}\times w_{solvent}} \times K_b$

boiling point of solution.

100°C + 1.06°C = 101°C

Q.87 The correct statement regarding RNA and DNA, respectively is :

(1) The sugar component in RNA is arabinose and the sugar component in DNA is 2'-deoxyribose

(2) The sugar component in RNA is ribose and the sugar component in DNA is 2'-deoxyribose.

(3) The sugar component in RNA is arabinose

(4) The sugar component in RNA is 2'-deoxyribose and the sugar component in DNA is arabinose.

Ans: (2)

Sol: RNA $\rightarrow$ Ribose Nucleic Acid

DNA $\rightarrow$ 2'-Deoxyribose Nucleic Acid

Q.88 The correct statement regarding the basicity of arylamines is:-

(1) Arylamines are generally less basic than alkylamines because the nitrogen lone-pair electrons are delocalized by interaction with the aromatic ring π electron system.

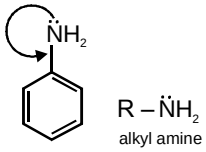
(2) Arylamines are generally more basic than alkylamines because the nitrogen lone-pair electrons are not delocalized by interaction with the aromatic ring π electron system.

(3) Arylamines are generally more basic than alkylamines because of aryl group.

(4) Arylamines are generally more basic than alkylamines, because the nitrogen atom in arylamines is sp-hybridized.

Ans: (1)

Sol:



Aryl amine

$R-\ddot{N}H_2$

alkyl amine

* Delocalized lone pair of nitrogen
* less basic

Q.89 Which one given below is a non-reducing sugar?

(1) Maltose (2) Lactose (3) Glucose (4) Sucrose

Ans: (4)

Sol: Sucrose is non reducing sugar.

Q.90 The pair of electron in the given carbanion, $CH_3C \equiv C^-$, is present in which of the following orbitals?

(1) 2p (2) sp^3 (3) sp^2 (4) sp

Ans: (4)

Sol: $CH_3 - C \equiv C^{\ominus}$

$$\left.\begin{matrix}\text{No. of } \sigma \text{ bp} - 1 \\ \ell p - 1\end{matrix}\right] 2 \text{ \& hybridisation is sp}$$

Q.91 Gause's principle of competitive exclusion states that :

(1) More abundant species will exclude the less abundant species through competition.

(2) Competition for the same resources excludes species having different food preferences.

(3) No two species can occupy the same niche indefinitely for the same limiting resources.

(4) Larger organisms exclude smaller ones through competition.

Ans: (3)

Sol:

Q.92 The two polypeptides of human insulin are linked together by :-

(1) Hydrogen bonds (2) Phosphodiester bond

(3) Covalent bond (4) Disulphide bridges

Ans: (4)

Sol:

Q.93 The coconut water from tender coconut represents:-

(1) Endocarp (2) Fleshy mesocarp

(3) Free nuclear proembryo (4) Free nuclear endosperm

Ans: (4)

Sol:

Q.94 Which of the following statements is wrong for viroids?

(1) They lack a protein coat (2) They are smaller than viruses

(3) They cause infections (4) Their RNA is of high molecular weight

Ans: (4)

Sol:

Q.95 Which of the following features is not present in the Phylum - Arthropoda?

(1) Chitinous exoskeleton (2) Metameric segmentation

(3) Parapodia (4) Jointed appendages

Ans: (3)

Sol:

Q.96 Which of the following most appropriately describes haemophilia?

(1) Recessive gene disorder (2) X-linked recessive gene disorder

(3) Chromosomal disorder (4) Dominant gene disorder

Ans: (2)

Sol:

Q.97 Emerson's enhancement effect and Red drop have been instrumental in the discovery of :-

(1) Photophosphorylation and non-cyclic electron transport

(2) Two photosystems operating simultaneously

(3) Photophosphorylation and cyclic electron transport
(4) Oxidative phosphorylation

Ans: (2)

Sol:

Q.98 In which of the following, all three are macronutrients?

(1) Boron, zinc, manganese
(2) Iron, copper, molybdenum
(3) Molybdenum, magnesium, manganese
(4) Nitrogen, nickel, phosphorus

Ans: (2)

Sol:

Q.99 Name the chronic respiratory disorder caused mainly by cigarette smoking :-

(1) Emphysema
(2) Asthma
(3) Respiratory acidosis
(4) Respiratory alkalosis

Ans: (1)

Sol:

Q.100 A system of rotating crops with legume or grass pasture to improve soil structure and fertility is called :-

(1) Ley farming (2) Contour farming (3) Strip farming (4) Shifting agriculture

Ans: (1)

Sol:

Q.101 Mitochondria and chloroplast are :-

(a) semi-autonomous organelles
(b) formed by division of pre-existing organelles and they contain DNA but lack protein synthesizing machinery

Which one of the following options is correct ?

(1) Both (a) and (b) are correct
(2) (b) is true but (a) is false
(3) (a) is true but (b) is false
(4) Both (a) and (b) are false

Ans: (3)

Sol:

Q.102 In context of Amniocentesis, which of the following statement is incorrect ?

(1) It is usually done when a woman is between 14-16 weeks pregnant.
(2) It is used for prenatal sex determination
(3) It can be used for detection of Down syndrome
(4) It can be used for detection of Cleft palate

Ans: (4)

Sol:

Q.103 In a chloroplast the highest number of protons are found in:-

(1) Stroma
(2) Lumen of thylakoids
(3) Inter membrane space
(4) Antennae complex

Ans: (2)
Sol:

Q.104 Photosensitive compound in human eye is made up of :-
(1) Guanosine and Retinol
(2) Opsin and Retinal
(3) Opsin and Retinol
(4) Transducin and Retinene
Ans: (2)
Sol:

Q.105 Spindle fibres attach on to :-
(1) Telomere of the chromosome
(2) Kinetochore of the chromosome
(3) Centromere of the chromosome
(4) Kinetosome of the chromosome
Ans: (2)
Sol:

Q.106 Which is the National Aquatic Animal of India?
(1) Gangetic shark (2) River dolphin (3) Blue whale (4) Sea-horse
Ans: (2)
Sol:

Q.107 Which of the following is required as inducer(s) for the expression of Lac operon?
(1) Glucose (2) Galactose (3) Lactose (4) Lactose and galactose
Ans: (3)
Sol:

Q.108 Which of the following pairs of hormones are not antagonistic (having opposite effects) to each other?
(1) Parathormone – Calcitonin
(2) Insulin – Glucagon
(3) Aldosterrone – Atrial Natriuretic Factor
(4) Relaxin – Inhibin
Ans: (4)
Sol:

Q.109 Microtubules are the constituents of :-
(1) Cilia, Flagella and Peroxisomes
(2) Spindle fibres, Centrioles and Cilia
(3) Centrioles, Spindle fibres and Chromatin
(4) Centrosome, Nucleosome and Centrioles
Ans: (2)
Sol:

Q.110 A complex of ribosomes attached to a single strand of RNA is known as :-
(1) Polysome
(2) Polymer
(3) Polypeptide
(4) Okazaki fragment
Ans: (1)
Sol:

Q.111 Fertilization in humans is practically feasible only if :-

(1) the sperms are transported into vagina just after the release of ovum in fallopian tube

(2) the ovum and sperms are transported simultaneously to ampullary isthmic junction of the fallopian tube

(3) the ovum and sperms are transported simultaneously to ampullary – isthmic junction of the cervix

(4) the sperms are transported into cervix within 48 hrs of release of ovum in uterus

Ans: (2)

Sol:

Q.112 Asthma may be attributed to :-

(1) bacterial infection of the lungs

(2) allergic reaction of the mast cells in the lungs

(3) inflammation of the trachea

(4) accumulation of fluid in the lungs

Ans: (2)

Sol:

Q.113 The *Avena* curvature is used for bioassay of :

(1) ABA (2) GA_3 (3) IAA (4) Ethylene

Ans: (3)

Sol:

Q.114 The standard petal of a papilionaceous corolla is also called :

(1) Carina (2) Pappus (3) Vexillum (4) Corona

Ans: (3)

Sol:

Q.115 Tricarpellary syncarpous gynoecium is found in flowers of :

(1) Liliaceae (2) Solanaceae (3) Fabaceae (4) Poaceae

Ans: (1)

Sol:

Q.116 One of the major components of cell wall of most fungi is :-

(1) Chitin (2) Peptidoglycan (3) Cellulose (4) Hemicellulose

Ans: (1)

Sol:

Q.117 Select the incorrect statement :

(1) FSH stimulates the sertoli cells which help in spermiogenesis

(2) LH triggers ovulation in ovary

(3) LH and FSH decrease gradually during the follicular phase

(4) LH triggers secretion of androgens from the Leydig cells

Ans: (3)

Sol:

Q.118 In meiosis crossing over is initiated at :

(1) Pachytene (2) Leptotene (3) Zygotene (4) Diplotene

Ans: (1)

Sol:

Q.119 A tall true breeding garden pea plant is crossed with a dwarf true breeding garden pea plant. When the F_1 plants were selfed the resulting genotypes were in the ratio of :

(1) 1 : 2 : 1 : : Tall homozygous : Tall heterozygous : Dwarf

(2) 1 : 2 : 1 : : Tall heterozygous : Tall hormozygous : Dwarf

(3) 3 : 1 : : Tall : Dwarf

(4) 3 : 1 : : Dwarf : Tall

Ans: (1)

Sol:

Q.120 Which of the following is the most important cause of animals and plants being driven to extinction?

(1) Over – exploitation (2) Alien species invasion

(3) Habitat loss and fragmentation (4) Co-extinctions

Ans: (3)

Sol:

Q.121 Which of the following is a characteristic feature of cropland ecosystem?

(1) Absence of soil organisms (2) Least genetic diversity

(3) Absence of weeds (4) Ecological succession

Ans: (1)

Sol:

Q.122 Changes in GnRH pulse frequency in females is controlled by circulating levels of :-

(1) estrogen and progesterone (2) estrogen and inhibin

(3) progesterone only (4) progesterone and inhibin

Ans: (1)

Sol:

Q.123 Which of the following is not a feature of the plasmids?

(1) Independent replication (2) Circular structure

(3) Transferable (4) Single – stranded

Ans: (4)

Sol:

Q.124 Which of the following features is not present in *Periplaneta americana* ?

(1) Schizocoelom as body cavity

(2) Indeterminate and radial cleavage during embryonic development

(3) Exoskeleton composed of N-acetylglucosamine

(4) Metamerically segmented body

Ans: (2)

Sol:

Q.125 In higher vertebrates, the immune system can distinguish self-cells and non-self. If this property is lost due to genetic abnormality and it attacks self cells, then it leads to :

(1) Allergic response (2) Graft rejection

(3) Auto-immune disease (4) Active immunity

Ans: (3)

Sol:

Q.126 Match the terms in Column-I with their description in Column-II and choose the correct option :

	Column-I		**Column-II**
(a)	Dominance	(i)	Many genes govern a single character
(b)	Codominance	(ii)	In a heterozygous organism only one allele expresses itself
(c)	Pleiotropy	(iii)	In a heterozygous organism both alleles express themselves fully
(d)	Polygenic inheritance	(iv)	A single gene influences many characters

Code :

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

Ans: (2)

Sol:

Q.127 Joint Forest Management Concept was introduced in India during :

(1) 1960 s (2) 1970 s (3) 1980 s (4) 1990 s

Ans: (3)

Sol:

Q.128 Pick out the correct satements :-

(a) Haemophilia is a sex-linked recessive disease

(b) Down's syndrome is due to aneuploidy

(c) Phenylketonuria is an autosomal recessive gene disorder

(d) Sickle cell anaemia is a X-linked recessive gene disorder

(1) (a) and (d) are correct (2) (b) and (d) are correct

(3) (a), (c) and (d) are correct (4) (a), (b) and (c) are correct

Ans: (4)

Sol:

Q.129 Which one of the following statements is wrong?

(1) Cyanobacteria are also called blue-green algae

(2) Golden algae are also called desmids

(3) Eubacteria are also called false bacteria

(4) Phycomycetes are also called algal fungi

Ans: (3)

Sol:

Q.130 Proximal end of the filament of stamen is attached to the

(1) Anther (2) Connective (3) Placenta (4) Thalamus or petal

Ans: (4)

Sol:

Q.131 Which of the following approaches does not give the defined action of contraceptive?

(1)	Barrier methods	Prevent fertilization
(2)	Intra uterine devices	Increase phagocytosis of sperms, suppress sperm motility and fertilizing capacity of sperms
(3)	Hormonal contraceptives	Prevent/retard entry of sperms, prevent ovulation and fertilization
(4)	Vasectomy	Prevents spermatogenesis

Ans: (4)

Sol:

Q.132 The taq polymerase enzyme is obtained from:

(1) *Thermus aquaticus* (2) *Thiobacillus ferroxidans*

(3) *Bacillus subtilis* (4) *Pseudomonas putida*

Ans: (1)

Sol:

Q.133 Identify the correct satement on 'inhibin' :-

(1) Inhibits the secretion of LH, FSH and Prolactin.

(2) Is produced by granulose cells in ovary and inhibits the secretion of FSH.

(3) Is produced by granulose cells in ovary and inhibits the secretion of LH.

(4) Is produced by nurse cells in testes and inhibits the secretion of LH.

Ans: (2)

Sol:

Q.134 Which part of the tobacco plant is infected by *Meloidogyne incognita* ?

(1) Flower (2) Leaf (3) Stem (4) Root

Ans: (4)

Sol:

Q.135 Antivenom injection contains preformed antibodies while polio drops that are administered into the body contain :-

(1) Activated pathogens (2) Harvested antibodies

(3) Gamma globulin (4) Attenuated pathogens

Ans: (4)
Sol:

Q.136 Which one of the following cell organelles is enclosed by a single membrane?
(1) Mitochondria (2) Chloroplasts (3) Lysosomes (4) Nuclei
Ans: (3)
Sol:

Q.137 Lack of relaxation between successive stimuli in sustained muscle contraction is known as :
(1) Spasm (2) Fatigue (3) Tetanus (4) Tonus
Ans: (3)
Sol:

Q.138 Which of the following is not a stem modification?
(1) Pitcher of *Nepenthes* (2) Thorns of citrus
(3) Tendrils of cucumber (4) Flattened structures of *Opuntia*
Ans: (1)
Sol:

Q.139 Water soluble pigments found in plant cell vacuoles are :-
(1) Xanthophylls (2) Chlorophylls (3) Carotenoids (4) Anthocyanins
Ans: (4)
Sol:

Q.140 Select the correct statement :-
(1) Gymnosperms are both homosporous and heterosporous
(2) *Salvinia*, *Ginkgo* and *Pinus* all are gymnosperms
(3) Sequoia is one of the tallest trees
(4) The leaves of gymnosperms are not well adapted to extremes of climate
Ans: (3)
Sol:

Q.141 Which of the followning is not required for any of the techniques of DNA fingerprinting available at present?
(1) Polymerase chain reaction (2) Zinc finger analysis
(3) Restriction enzymes (4) DNA-DNA hybridization
Ans: (2)
Sol:

Q.142 Which type of tissue correctly matches with its location?

	Tissue	**Location**
(1)	Smooth muscle	Wall of intestine
(2)	Areolar tissue	Tendons
(3)	Transitional epithelium	Tip nose
(4)	Cuboidal epithelium	Lining of stomach

Ans: (1)

Sol:

Q.143 A plant in your garden avoids photorespiratory losses, has improved water use efficiency shows high rates of photosynthesis at high temperatures and has improved efficiency of nitrogen utilisation. In which of the following physiological groups would you assign this plant?

(1) C_3 (2) C_4 (3) CAM (4) Nitrogen fixer

Ans: (2)

Sol:

Q.144 Which of the following structures is homologous to the wing of a bird?

(1) Dorsal fin of a Shark (2) Wing of a Moth (3) Hind limb of Rabbit (4) Flipper of whale

Ans: (4)

Sol:

Q.145 Which of the following characteristic features always holds true for the corresponding group of animals?

(1)	Cartilaginous endoskeleton	Chondrichthyes
(2)	Viviparous	Mammalia
(3)	Possess a mouth with an upper and a lower jaw	Chordata
(4)	3-Chambered heart with one incompletely divided ventricle	Reptilia

Ans: (1)

Sol:

Q.146 Which of the following statements is not true for cancer cells in relation to mutations?

(1) Mutations in proto-oncogenes accelerate the cell cycle.

(2) Mutations destroy telomerase inhibitor.

(3) Mutations inactive the cell control.

(4) Mutations inhibit production of telomerase.

Ans: (4)

Sol:

Q.147 The amino acid Tryptophan is the precursor for the synthesis of :-

(1) Melatonin and Serotonin (2) Thyroxine and Triiodothyronine

(3) Estrogen and Progesterone (4) Cortisol and Cortisone

Ans: (1)

Sol:

Q.148 Following are the two statements regarding the origin of life :-

(a) The earliest organisms that appeared on the earth were non-green and presumably anaerobes.

(b) The first autotrophic organisms were the chemoautotrophs that never released oxygen.

Of the above statements which one of the following options is correct ?

(1) (a) is correct but (b) is false. (2) (b) is correct but (a) is false.
(3) Both (a) and (b) are correct. (4) Both (a) and (b) are false.

Ans: (3)

Sol:

Q.149 Reduction in pH of blood will :-
(1) reduce the rate of heart beat.
(2) reduce the blood supply to the brain.
(3) decrease the affinity of hemoglobin with oxygen.
(4) release bicarbonate ions by the liver.

Ans: (3)

Sol:

Q.150 Analogous structures are a result of :-
(1) Divergent evolution (2) Convergent evolution
(3) Shared ancestry (4) Stabilizing selection

Ans: (2)

Sol:

Q.151 Which of the following is a restriction endonuclease?
(1) Hind II (2) Protease (3) DNase I (4) RNase

Ans: (1)

Sol:

Q.152 The term ecosystem was coined by :-
(1) E.P. Odum (2) A.G. Tansley (3) E. Haeckel (4) E. Warming

Ans: (2)

Sol:

Q.153 Which one of the following statements is wrong?
(1) Sucrose is a disaccharide (2) Cellulose is a polysaccharide
(3) Uracil is a pyrimidine (4) Glycine is a sulphur containing amino acid

Ans: (4)

Sol:

Q.154 In bryophytes and pteridophytes, transport of male gametes requires :-
(1) Wind (2) Insects (3) Birds (4) Water

Ans: (4)

Sol:

Q.155 When does the growth rate of a population following the logistic model equal zero? The logistic model is given as $dN/dt = rN(1–N/K)$:-
(1) when N/K is exactly one.
(2) when N nears the carrying capacity of the habitat.
(3) when N/K equals zero.
(4) when death rate is greater than birth rate.

Ans: (1)
Sol:

Q.156 Which one of the following statements is not true?
(1) Tapetum helps in the dehiscence of anther
(2) Exine of pollen grains is made up of sporopollenin
(3) Pollen grains of many species cause severe allergies
(4) Stored pollen in liquid nitrogen can be used in the crop breeding programmes
Ans: (1)
Sol:

Q.157 Which of the following would appear as the pioneer organisms on bare rocks?
(1) Lichens (2) Liverworts (3) Mosses (4) Green algae
Ans: (1)
Sol:

Q.158 Which one of the following is the starter codon?
(1) AUG (2) UGA (3) UAA (4) UAG
Ans: (1)
Sol:

Q.159 Which one of the following characteristic is not shared by birds and mammals?
(1) Ossified endoskeleton (2) Breathing using lungs
(3) Viviparity (4) Warm blooded nature
Ans: (3)
Sol:

Q.160 Nomenclature is governed by certain universal rules. Which one of the following is contrary to the rules of nomenclature?
(1) Biological names can be written in any language
(2) The first word in a biological name represents the genus name, and the second is a specific epithet
(3) The names are written in Latin and are italicised
(4) When written by hand, the names are to be underlined
Ans: (1)
Sol:

Q.161 Blood pressure in the pulmonary artery is :-
(1) same as that in the aorta. (2) more than that in the carotid.
(3) more than that in the pulmonary vein. (4) less than that in the venae cavae.
Ans: (3)
Sol:

Q.162 Cotyledon of maize grain is called :-
(1) plumule (2) coleorhiza (3) coleoptile (4) scutellum
Ans: (4)

Sol:

Q.163 In the stomach, gastric acid is secreted by the :-

(1) gastrin secreting cells (2) parietal cells (3) peptic cells (4) acidic cells

Ans: (2)

Sol:

Q.164 Depletion of which gas in the atmosphere can lead to an increased incidence of skin cancers :-

(1) Nitrous oxide (2) Ozone (3) Ammonia (4) Methane

Ans: (2)

Sol:

Q.165 Chrysophytes, Euglenoids, Dinoflagellates and Slime moulds are included in the kingdom :-

(1) Monera (2) Protista (3) Fungi (4) Animalia

Ans: (2)

Sol:

Q.166 Water vapour comes out from the plant leaf through the stomatal opening. Through the same stomatal opening carbon dioxide diffuses into the plant during photosynthesis. Reason out the above statements using one of following options:

(1) Both processes cannot happen simultaneously

(2) Both processes can happen together because the diffusion coefficient of water and CO_2 is different

(3) The above processes happen only during night time

(4) One process occurs during day time, and the other at night

Ans: (2)

Sol:

Q.167 In mammals, which blood vessel would normally carry largest amount of urea?

(1) Renal Vein (2) Dorsal Aorta (3) Hepatic Vein (4) Hepatic Portal Vein

Ans: (3)

Sol:

Q.168 Seed formation without fertilization in flowering plants involves the process of :-

(1) Sporulation (2) Budding

(3) Somatic hybridization (4) Apomixis

Ans: (4)

Sol:

Q.169 Which of the following is wrongly matched in the given table?

	Microbe	**Product**	**Application**
(1)	*Trichoderma polysporum*	Cyclosporin A	immunosup-pressive drug
(2)	*Monascus purpureus*	Statins	lowering of blood cholesterol

(3)	*Streptococcus*	Streptokinase	removal of clot from blood vessel
(4)	*Clostridium butylicum*	Lipase	removal of oil stains

Ans: (4)

Sol:

Q.170 In a testcross involving F_2 dihybrid flies, more parental-type offspring were produced than the recombinant-type offspring. This indicates :-

(1) The two genes are located on two different chromosomes

(2) Chromosomes failed to separate during meiosis

(3) The two genes are linked and present on the same chromosome

(4) Both of the characters are controlled by more than one gene

Ans: (3)

Sol:

Q.171 It is much easier for a small animal to run uphill than for a large animal, because :-

(1) It is easier to carry a small body weight

(2) Smaller animals have a higher metabolic rate

(3) Small animals have a lower O_2 requirement

(4) The efficiency of muscles in large animals is less than in the small animals

Ans: (2)

Sol:

Q.172 Which of the following is not a characteristic feature during mitosis in somatic cells?

(1) Spindle fibres (2) Disappearance of nucleolus

(3) Chromosome movement (4) Synapsis

Ans: (4)

Sol:

Q.173 Which of the following statements is not correct?

(1) Pollen grains of many species can germinate on the stigma of a flower, but only one pollen tube of the same species grows into the style.

(2) Insects that consume pollen or nectar without bringing about pollination are called pollen/nectar robbers.

(3) Pollen germination and pollen tube growth are regulated by chemical components of pollen interacting with those of the pistil.

(4) Some reptiles have also been reported as pollinators in some plant species.

Ans: (1)

Sol:

Q.174 Specialised epidermal cells surrounding the guard cells are called :-

(1) Complementary cells (2) Subsidiary cells (3) Bulliform cells (4) Lenticels

Ans: (2)

Sol:

Q.175 Which of the following guards the opening of hepatopancreatic duct into the duodenum?
(1) Semilunar valve (2) Ileocaecal valve (3) Pyloric sphincter (4) Sphincter of Oddi
Ans: (4)
Sol:

Q.176 Stems modified into flat green organs performing the functions of leaves are known as :-
(1) Cladodes (2) Phyllodes (3) Phylloclades (4) Scales
Ans: (3)
Sol:

Q.177 The primitive prokaryotes responsible for the production of biogas from the dung of ruminant animals, include the :-
(1) Halophiles (2) Thermoacidiophiles (3) Methanogens (4) Eubacteria
Ans: (3)
Sol:

Q.178 A river with an inflow of domestic sevage rich in organic waste may result in :-
(1) Drying of the river very soon due to algal bloom.
(2) Increased population of aquatic food web organisms.
(3) An increased production of fish due to biodegradable nutrients.
(4) Death of fish due to lack of oxygen.
Ans: (4)
Sol:

Q.179 A cell at telophase stage is observed by a student in a plant brought from the field. He tells his teacher that this cell is not like other cells at telophase stage. There is no formation of cell plate and thus the cell is containing more number of chromosomes as compared to other dividing cells. This would result in :-
(1) Aneuploidy (2) Polyploidy
(3) Somaclonal variation (4) Polyteny
Ans: (2)
Sol:

Q.180 A typical fat molecule is made up of :-
(1) Three glycerol molecules and one fatty acid molecule
(2) One glycerol and three fatty acid molecules
(3) One glycerol and one fatty acid molecule
(4) Three glycerol and three fatty acid molecules
Ans: (2)
Sol: