CBSE EXAMINATION PAPER-2016

NEET-ZOOLOGY

(Solved)

Time allowed : 3 hours | Maximum Marks : 722

General Instructions :

Read the following instructions carefully and follow them :

i. This question paper contains **180 questions.** All questions are **compulsory.**

ii. This question paper is divided into **1 sections.**

iii. **Section A** – questions number **1 to 180** are multiple choice questions

iv. There is no overall choice given in the question paper. However, an internal choice has been provided in few questions.

v. Use of calculator is NOT allowed.

Section A

Question 1.

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 :

[4 Marks]

(A) 3/2 A + 4B

(B) A/2 + B/3

(C) 3/2 A+ 7/3 B

(D) 3A + 7B

Explanation:

.

Given : Velocity $v = At + Bt^2$

$$\Rightarrow \quad \frac{dv}{dt} = At + Bt^2$$

By integrating we get distance travelled by the particle between 1s and 2s,

$$\Rightarrow \quad \int_0^x dx = \int_1^2 \left(At + Bt^2\right) dt$$

$$x = \frac{A}{2}\left(2^2 - 1^2\right) + \frac{B}{3}\left(2^3 - 1^3\right) = \frac{3A}{2} + \frac{7B}{3}$$

Question 2.

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 :

[4 Marks]

(A) 90°

(B) 0°

(C) 180°

(D) 45°

Explanation:

|□□ + □□| = |□□ - □□|

Squaring on both sides

|□□ + □□|² = |□□ - □□|²

⇒ □□ .□□ +2□□ .□□+□□.□□

= □□ .□□ - 2□□ .□□+□□.□□

⇒ 4□□ .□□ = 0

⇒ 4AB cosθ =0 ⇒ cosθ = 0 ⇒ θ = 90°

Question 3.

A particle moves so that its position vector is given by □□ = cos ωtx̂ + sin ωtŷ. Where ω is a constant . Which of the following is true ?

[4 Marks]

(A) Velocity is perpendicular to □□ and acceleration is directed towards the origin

(B) Velocity is perpendicular to □□ and acceleration is directed away from the origin

(C) Velocity and acceleration both are parallel to □□

(D) Velocity and acceleration both are perpendicular to □□

Explanation:

Position vector

□□ = cos ωt x̂ + sin ωt ŷ

Velocity vector, □□= - ωsin t x̂ + ωcos ωt ŷ acceleration vωector,

□□ = -ω² cos ωt x̂ - ω² sin ωt ŷ = - ω²□□

□□ .□□ 0 hence □□ ⊥□□ and □□ is directed towards the origin.

Question 4.

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:

[4 Marks]

(A) $\sqrt{g/R(\mu_s+\tan\theta/1-\mu_2 \tan\theta)}$

(B) $\sqrt{g/R^2(\mu_s+\tan\theta/1-\mu_s \tan\theta)}$

(C) $\sqrt{gR^2(\mu_s+\tan\theta/1-\mu_s \tan\theta)}$

(D) $\sqrt{gR(\mu_s+\tan\theta/1-\mu_s \tan\theta)}$

Explanation:

On a banked road,

$V^2_{max}/Rg = (\mu_s + \tan\theta/ 1-\mu_s \tan\theta)$

Maximum safe velocity of a car on the banked road

$V_{max} = \sqrt{Rg}\ [\mu_s + \tan\theta / 1 - \mu_s \tan\theta]$

Question 5.

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 ?

[4 Marks]

(A) $\sqrt{2gR}$

(B) $\sqrt{3gR}$

(C) $\sqrt{gR}$

(D) $\sqrt{5gR}$

Explanation:

$\sqrt{5gR}$ is the minimum velocity which the body must possess at the bottom of the circle so as to go round the circle completely.

Question 6.

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?

[4 Marks]

(A) 0.15 m/s^2

(B) 0.1 m/s^2

(C) 0.2 m/s^2

(D) 0.18 m/s^2

Explanation:

Given : Mass of particle, M = 10g = 10/1000 kg

radius of circle R= 6.4 cm

Kinetic energy E of particle = 8×10^{-4} J

acceleration a_t = ?

$1/2\ mv^2 = E \Rightarrow 1/2\ (10/1000)\ v^2 = 8\times10^{-4}$

⇒ $v^2 = 16 \times 10^{-2}$

⇒ $v = 4 \times 10^{-1} = 0.4$ m/s

Now using

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

$(0.4)^2 = 0^2 + 2a_t (4 \times 22/7 \times 6.4/100)$

⇒ $a_t = (0.4)^2 \times 7 \times 100 / 8 \times 22 \times 6.4 = 0.1$ m/s²

Question 7.

A body of mass 1 kg begins to move under the action of a time dependent force □□=(2tî+3t2ĵ) N, where î and ĵ are unit vectors along x and y axes. What power will be developed by the force at the time t ?

[4 Marks]

(A) $(2t^3 + 3t^4)$W

(B) $(2t^3 + 3t^5)$W

(C) $(2t^2 + 3t^3)$W

(D) $(2t^2 + 4t^4)$W

Explanation:

.

Given force $\vec{F} = 2\hat{i} + 3t^2\hat{j}$

According to Newton's second law of motion,

$$m\frac{d\vec{v}}{dt} = 2\hat{i} + 3t^2\hat{j} \quad (m = 1\,\text{kg})$$

$$\Rightarrow \int_0^{\vec{v}} d\vec{v} = \int_0^t (2\hat{i} + 3t^2\hat{j})\,dt$$

$$\Rightarrow \vec{v} = t^2\hat{i} + t^3\hat{j}$$

$$\text{Power } P = \vec{F} \cdot \vec{v} = (2\hat{i} + 3t^2\hat{j}) \cdot (t^2\hat{i} + t^3\hat{j})$$

$$= (2t^3 + 3t^5)\,\text{W}$$

Question 8.

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 rads^{-2}. Its net acceleration in ms^{-2} at the end of 2.0 s is approximately:

[4 Marks]

(A) 6.0

(B) 3.0

(C) 7.0

(D) 8.0

Explanation:

Given, Radius of disc, R= 50 cm

Angular acceleration, a = 2.0 rads^{-2}; time t= 2s

Particle at periphery (assume) will have both radial (one) and tangential acceleration

$a_t = R\alpha = 0.5 \times 2 = 1$ m/s^2

Angular speed $\omega = \omega_0 + \alpha t$

$\omega = 0 + 2 \times 2 = 4$ rad/sec

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

Linear acceleration, $a_t = \alpha.R = 1$ m/sec^2

Net acceleration, $a_{total} = \sqrt{(a_t^2 + a_c^2)} = \sqrt{(1^2 + 8^2)} \approx 8$ m/s^2

Question 9.

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 the centre?

[4 Marks]

(A) 13MR^2/32

(B) 15MR^2/32

(C) 9MR^2/32

(D) 11MR^2/32

Explanation:

Moment of inertia of complete disc about point ’O’.

I_total disc = MR²/2

Mass of removed disc

M_Removed = M/4 (mass ∝ area)

Moment of inertia of removed disc about point ’O’.

I_Removed (about same perpendicular axis)

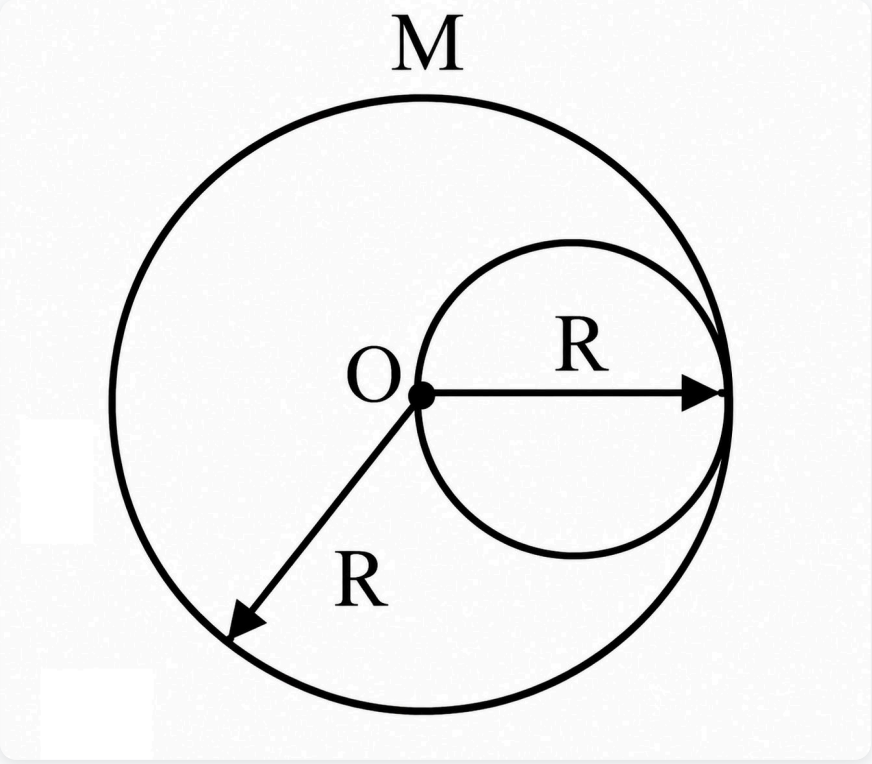
= I_cm + mx²

= M/4.(R/2)²/2 + M/4 (R/2)² = 3MR²/32

Therefore the moment of inertia of the remaining part of the disc about a perpendicular axis passing through the centre,

I_Removed disc = I_Total -T _Removed

= MR²/2 - 3/32 MR²= 13/32 MR²



Question 10.

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

[4 Marks]

(A) Both reach at the same time

(B) Depends on their masses

(C) Sphere

(D) Disk

Explanation:

Time of descent $\propto K^2/R^2$

Order of value of K^2/R^2

for disc; $K^2/R^2 = 1/2 = 0.5$

for sphere; $K^2/R^2 = 2/5 = 0.4$

(sphere) < (disc)

Sphere reaches first

Question 11.

At what height from the surface of earth the gravitational potential and the value of g are -5.4×10^7 J kg^{-1} and $6.0 ms^{-2}$ respectively? Take the radius of earth as 6400 km:

[4 Marks]

(A) 2600 km

(B) 1600 km

(C) 1400 km

(D) 2000 km

Explanation:

As we know, gravitational potential (V) and acceleration due to gravity (g) with height

$V = -GM/(R+h) = -5.4 \times 10^7$ ...(1)

and $g = GM/(R+h)^2 = 6$ ...(2)

Dividing (1) by (2)

$-GM/(R+h)/GM/(R+h)^2 = -5.4 \times 10^7/6$

$\Rightarrow 5.4 \times 10^7/(R+h) = 6$

$\Rightarrow (R+h) = 9000$ km so, $h = 2600$ km

Question 12.

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:

[4 Marks]

(A) 1:2

(B) 1:4

(C) 1:2√2

(D) 1:2

Explanation:

As we know, escape velocity,

$v_e = \sqrt{2GM/R} = \sqrt{2G/R \cdot (4/3\pi R^3 \rho)}$

$v_e \propto R\sqrt{\rho}$

$v_e/v_p = R_e/R_p . \sqrt{\rho_e/\rho_p}$

$\Rightarrow v_e/v_p = R_e/2R_e . \sqrt{\rho_e/2\rho_e}$

Ratio $v_e/v_p = 1 : 2\sqrt{2}$

Question 13.

Two non-mixing liquids of densities ρ and nρ (n>1) are put in a container. The height of each liquid is h. A solid cylinder of length L and density ρ1 is put in this container. The cylinder floats with its axis vertical and length pL (p<1) in the denser liquid. The density ρ1 is equal to:

[4 Marks]

(A) $\{ 1 + (n + 1) p \}$ □

(B) $\{ 2 + (n - 1) p \}$ □

(C) { 1 + (n − 1) p } □

(D) { 2 + (n + 1) p } □

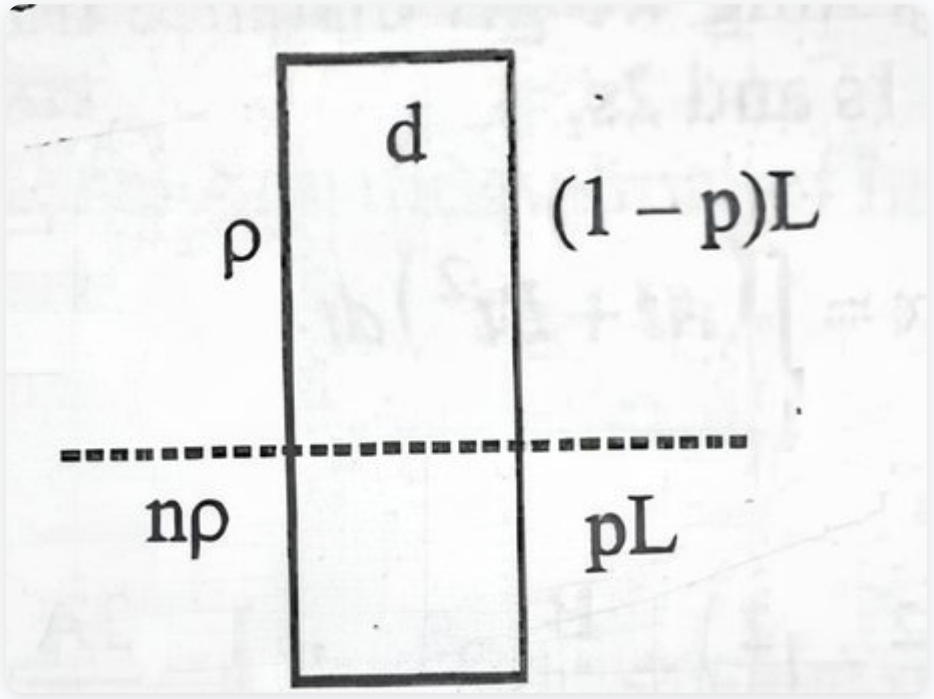
Explanation:

As we know,

Pressure P= Vdg

Here, LA dg = (pL) A (nρ)g + (1-ρ) LA ρg

⇒ d = (1-p) ρ = [1+ (n-1) p] ρ



Question 14.

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?

[4 Marks]

(A) □ ₁ ℓ_2 = □₂ ℓ_1

(B) □₁ ℓ_1 = □₂ ℓ_2

(C) □₁ ℓ_2 = □₂ ℓ_1

(D) □₁ ℓ_2 = □₂ ℓ_1

Explanation:

From question, (ℓ_2 - ℓ_1) is maintained same at all temperatures hence change in length for both rods should be same i.e., $\Delta \ell_1 = \Delta \ell_2$

As we know, coefficient of linear expansion,

$\square = \Delta\ell / \ell_0 \Delta T$

$\ell_1 \square_1 \Delta T = \ell_2 \square_2 \Delta T$

$\ell_1 \square_1 = \ell_2 \square_2$

Question 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?

[4 Marks]

(A) $U_1 = 0$

(B) $U_1 > U_2$

(C) $u_2 > U_1$

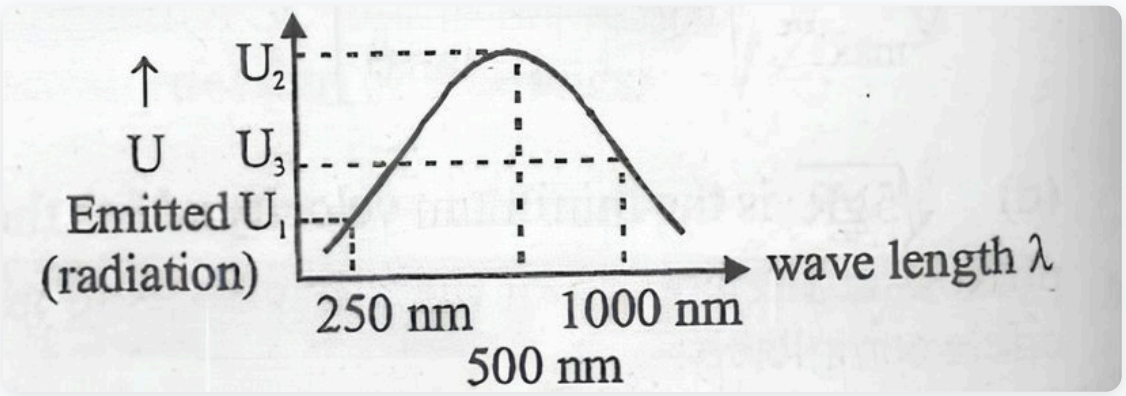
(D) $U_3 = 0$

Explanation:

According to Wein's displacement law, maximum amount of emitted radiation corresponding to λ_m = b/T

$\lambda_m = 2.88 \times 10^6 nmK / 5760K = 500nm$

From the graph $U_1 < U_2 > U_3$



Question 16.

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 of h is:

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

[4 Marks]

(A) 34 km

(B) 544 km

(C) 136 km

(D) 68 km

Explanation:

According to question only one - quarter of the heat produced by falling piece of ice is absorbed in the melting of ice.

i.e., mgh/4 = mL

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

Question 17.

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:

[6 Marks]

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

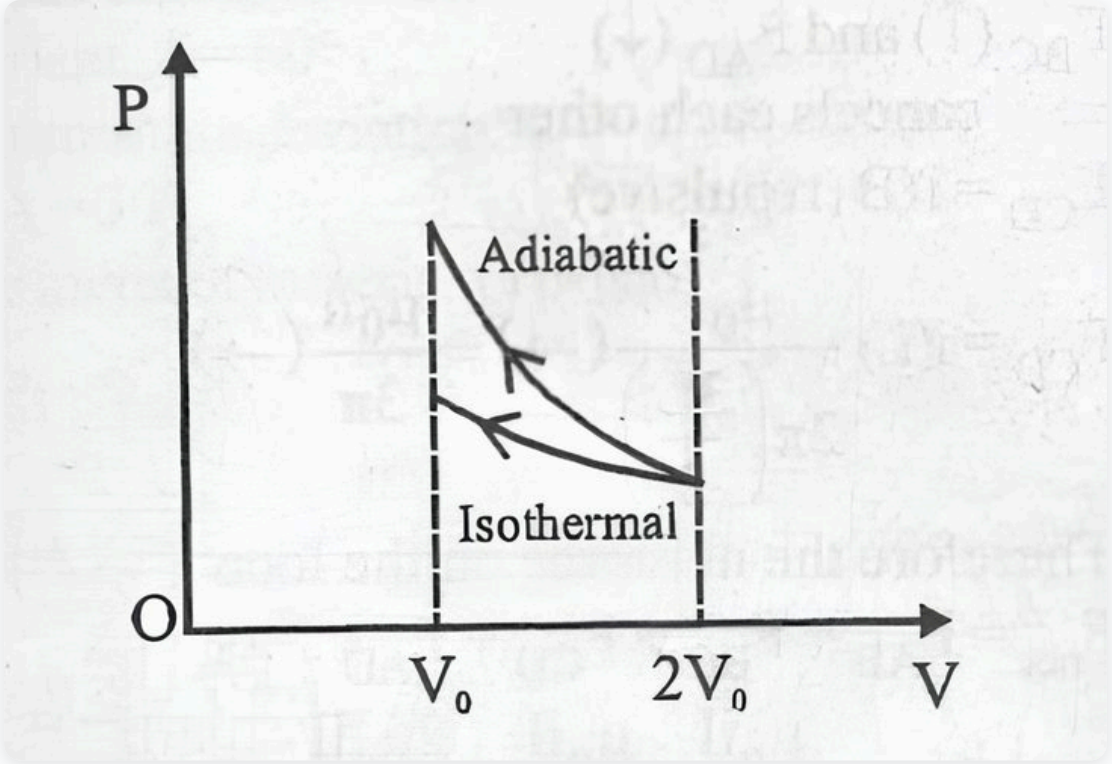
(B) Which of the case (whether compression through isothermal or through adiabatic process) requires more work will depend upon the atomicity of the gas.

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

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

Explanation:

W_ext = negative of area with volume - axis W (adiabatic) > W (isothermal)



Question 18.

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)

[4 Marks]

(A) 2365 W

(B) 236.5 W

(C) 23.65 W

(D) 2.365 W

Explanation:

Given : T_2 =4°C = 4+ 273 = 277 K

T_1 = 30°C = 30+273 = 303 K

$\beta = Q_2/W = T_2/T_1-T_2$

$\therefore \beta = 600\times4.2/W = 277/303-277$

$\Rightarrow$ W = 236.5 joule

Power P = W/t = 236.5/1 sec = 236.5 watt

Question 19.

The molecules of a given mass of gas have r.m.s. velocity of 200 m s^{-1} 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 m s^{-1} is:

[4 Marks]

(A) 100√2

(B) 400/√3

(C) 100/3

(D) 100√2/3

Explanation:

Here v_1 = 200m/s;

temperature T_1 = 27°C = 27+273 = 300 k

temperature T_2 = 127°C = 127 + 273 = 400k, v_2 = ?

R.M.S.Velocity, v ∝√T

⇒ v_2/200 = √(400/300)

⇒ v_2 = 200×2/√3 m/s ⇒v_2 = 400/√3 m/s

Question 20.

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:

[4 Marks]

(A) 66.7 cm

(B) 100 cm

(C) 200 cm

(D) 150 cm

Explanation:

For a closed organ first minimum resonating length

$L_1 = \lambda/4 = 50$ cm

Next or second resonating length, L_2

$\Rightarrow 3\lambda/4 = 150$cm

Question 21.

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

[4 Marks]

(A) $\sqrt{m_1/m_2}$

(B) $\sqrt{m_1+m_2/m_2}$

(C) $\sqrt{m_1+m_2/m_1}$

(D) $\sqrt{m_2/m_1}$

Explanation:

From figure, tension $T_1 = m_2g$

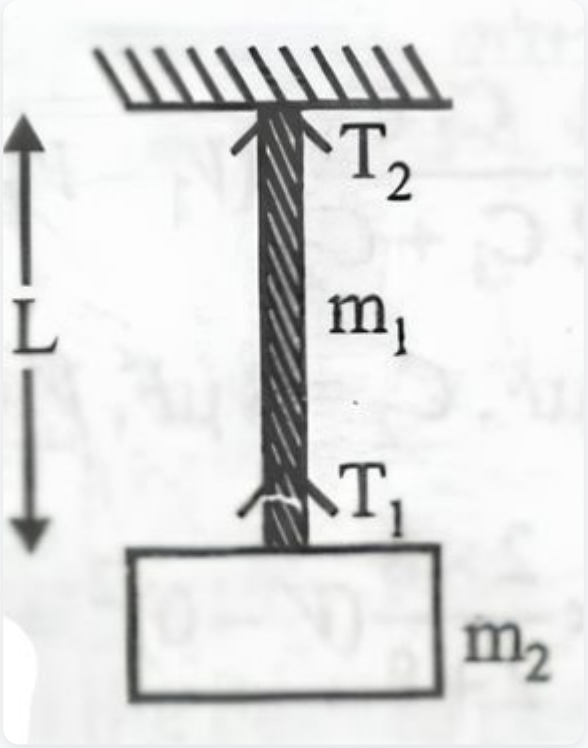
$T_2 = (m_1 + m_2)g$ (Rigid support)

As we know Velocity $\propto \sqrt{T}$

so, $\lambda \propto \sqrt{T}$

$\Rightarrow \lambda_1/\lambda_2 = \sqrt{T_1}/\sqrt{T_2}$

$\Rightarrow \lambda_2/\lambda_1 = \sqrt{(m_1+m_2/m_2)}$



Question 22.

A siren emitting a sound of frequency 800 Hz moves away from an observer towards a cliff at a speed of 15 m s^{-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 m s^{-1})

[4 Marks]

(A) 765 Hz

(B) 838 Hz

(C) 800 Hz

(D) 885 Hz

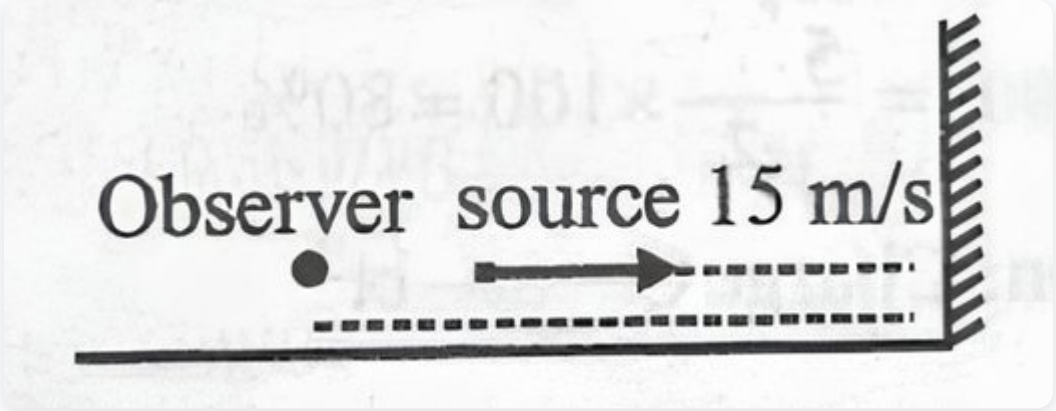
Explanation:

According to Doppler's effect in sound Apparent frequency,

$n' = (v/v\text{-}v_s)\ n_0$

= 330/330-15 (800) = 330×800/315 = 838 Hz

The frequency of sound observer hears in the echo reflected from the cliff is 838 Hz.



Question 23.

Two identical charged spheres suspended from a common point by two massless strings of lengths l, are initially at a distance d (d≪l) apart because of 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:

[4 Marks]

(A) $v \propto x^{1/2}$

(B) $v \propto x^{1/2}$

(C) $v \propto x^{-1}$

(D) $v \propto x$

Explanation:

From figure T cos θ = mg

T sin θ = kq^2/x^2

so, tan θ = $F_e/mg \approx \theta$

tan θ = kq^2/x^2 mg

As θ is small tan θ ≈ sin θ = $x/2l$

kq^2/x^2 mg = x/2l

or $x^3 \propto q^2$ ...(i)

or $x^{3/2} \propto q$ ...(ii)

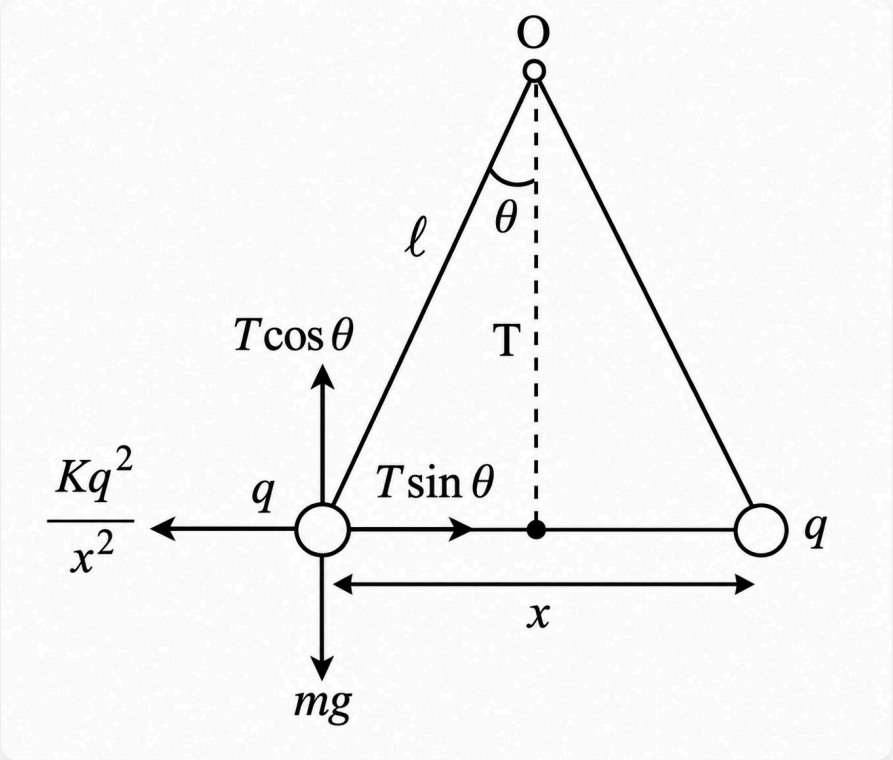
Differentiating eq.(i) w.r.t. time

$3x^2$ dx/dt ∝ 2q.dq/dt but dq/dt is constant

so x^2 (v) ∝ q

Replace q from eq. (ii)

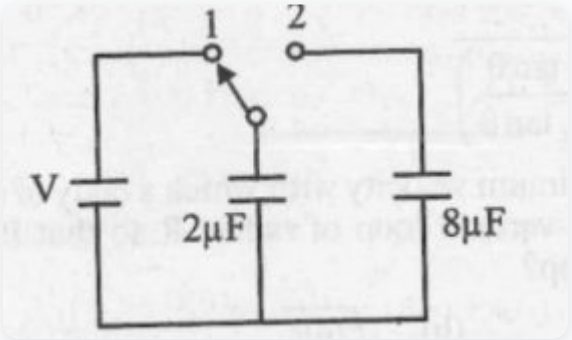
$x^2(v) \propto x^{3/2}$ or $v \propto x^{-1/2}$



Question 24.

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 :

[4 Marks]



(A) 75%

(B) 80%

(C) 20%

(D) 0%

Explanation:

When S and 1 are connected

The 2 μF capacitor gets charged. The potential difference across its plates will be V.

The potential energy stored in 2 μF capacitor

$U_i = 1/2\ CV^2 = 1/2 \times 2 \times V^2 = V^2$

When S and 2 are connected

The 8 μF capacitor also gets charged. During this charging process current flows in the wire and some amount of energy is dissipated as heat. The energy loss is

$\Delta U = 1/2\ .\ C_1C_2/C_1C_2\ (v_1\text{-}v_2)^2$

Here, $C_1 = 2\mu F$, $C_2 = 8\mu F$, $V_1 = V$, $V_2 = 0$

$\Delta U = 1/2 \times 2 \times 8/2+8\ (V\text{-}0)^2 = 4/5V^2$

The percentage of the energy dissipated

$= \Delta U/U_i \times 100 = 4/5V^2 \times 100 = 80\%$

Question 25.

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:

[4 Marks]

(A) a^3R/b

(B) $a^3R/2b$

(C) $a^3R/3b$

(D) $a^3R/6b$

Explanation:

.

Given: Charge $Q = at - bt^2$

$$\therefore \quad \text{Current} \quad i = \frac{\partial Q}{\partial t} = a - 2bt$$

$$\left\{\text{for } i = 0 \;\Rightarrow\; t = \frac{a}{2b}\right\}$$

From joule's law of heating, heat produced

$dH = i^2 R dt$

$$H = \int_0^{a/2b} (a - 2bt)^2 R \, dt$$

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

Question 26.

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 e.m.f.s is:

[4 Marks]

(A) 5 : 1

(B) 5 : 4

(C) 3 : 2

(D) 3 : 4

Explanation:

When two cells are connected in series i.e., $(E_1 + E_2)$ the balance point is at 50 cm. And when two cells are connected in opposite direction i.e., $(E_1 - E_2)$ the balance point is at 10 cm. According to principle of potential

$E_1+E_2/E_1-E_2=50/10$

$\Rightarrow 2E_1/2E_2 = 50+10/50-10 \Rightarrow E_1/E_2 = 3/2$

Question 27.

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 a/2 and 2a respectively, from the axis of the wire is:

[4 Marks]

(A) 1

(B) 4

(C) 1/4

(D) 1/2

Explanation:

For points inside the wire i.e., ($r \leq R$)

Magnetic field $B=\mu_0 Ir/2\pi R^2$

For points outside the wire ($r \geq R$)

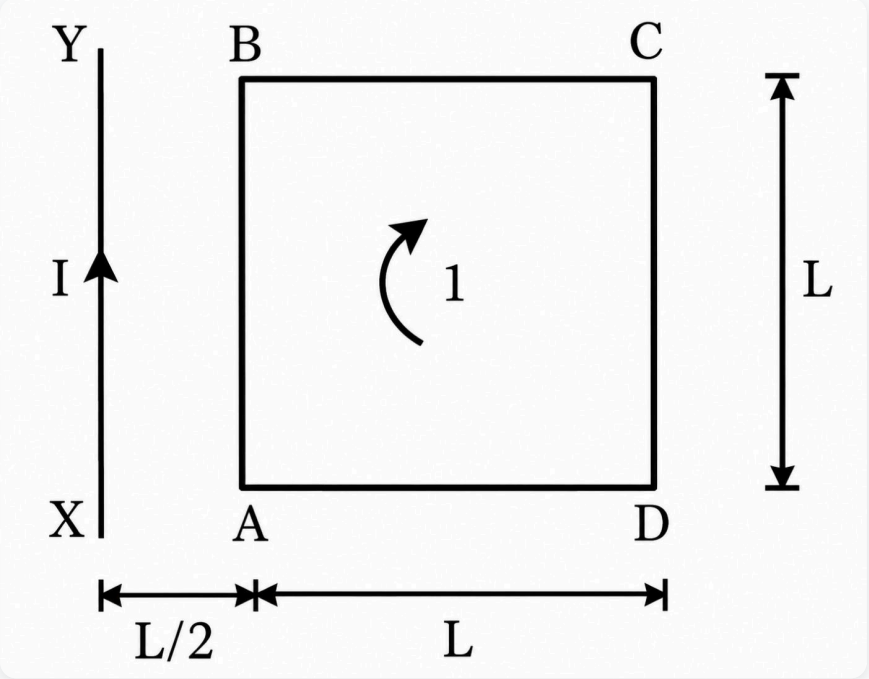
Magnetic field $B/B' = \mu_0 I/2\pi R$

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

Question 28.

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:

[4 Marks]



(A) $2\mu_0 Ii/3\pi$

(B) $\mu_0 IiL/2\pi$

(C) $\mu_0 Ii/2\pi$

(D) $2\mu_0 IiL/3\pi$

Explanation:

The direction of current in conductor

XY and AB is same

F_AB = ilB (attractive)

F_AB = i(L). $\mu_0 I/2\pi(L/2)$ (←) = $\mu_0 iI/\pi$ (←)

F_BC opposite to F_AD

F_BC (↑) and F_AD(↓)

⇒ cancels each other

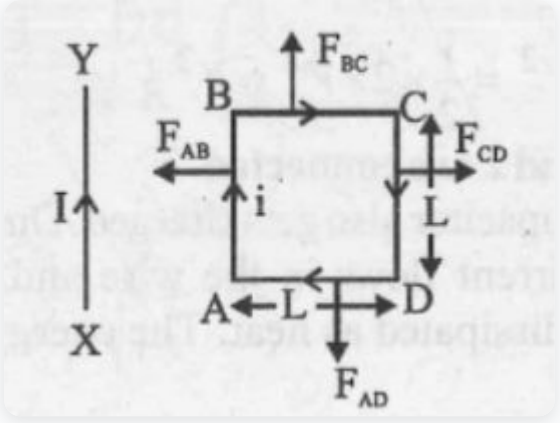
F_CD = ilB (repulsive)

F_CD = i(L) $\mu_0 I/2\pi(3L/2)$ (→) = $\mu_0 iI/3\pi$

Therefore the net force on the loop

F_{net} = F_AB + F_BC + F_CD + F_AD

⇒ $F_{net} = \mu_0 iI/\pi - \mu_0 iI/3\pi = 2\mu_0 iI/3\pi$



Question 29.

The magnetic susceptibility is negative for:

[4 Marks]

(A) paramagnetic material only

(B) diamagnetic material only

(C) ferromagnetic material only

(D) paramagnetic and ferromagnetic materials

Explanation:

Magnetic susceptibility χ for diamagnetic materials only is negative and low $|\chi|=1$; for paramagnetic substances low but positive $|\chi|=1$; and for ferromagnetic substances positive and high $|\chi|=10^2$.

Question 30.

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:

[4 Marks]

(A) 4H

(B) 2H

(C) 3H

(D) 1H

Explanation:

Here, number of turns n = 1000; current through the solenoid i = 4A; flux linked with each turn = 4×10^{-3} Wb

⇒ Total flux linked=1000(4×10 $^{-3}$) = 4 Wb

Φ_{total} = 4 ⇒ Li = 4

⇒ L = 1 H

Question 31.

A small signal voltage V(t)=V_0sinωt is applied across an ideal capacitor C:

[4 Marks]

(A) Current I (t) leads voltage V(t) by 180°

(B) Current I (t) is in phase with voltage V(t)

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

(D) Current I (t) lags voltage V (t) by 90°.

Explanation:

As we know, power P = V_{rms}·I_{rms}·cosϕ As cosϕ=0

(∵ ϕ = 90∘)

∴ Power consumed = 0 (in one complete cycle)

Question 32.

An inductor 20 mH, a capacitor 50 μF and a resistor 40Ω are connected in series across a source of emf V=10sin340t. The power loss in A.C. circuit is:

[4 Marks]

(A) 0.51 W

(B) 0.67 W

(C) 0.76 W

(D) 0.89 W

Explanation:

Given: $L = 20$ mH; C = 50 μF; R = 40 Ω

$V = 10 \sin 340\ t$

$\therefore \quad V_{rms} = \frac{10}{\sqrt{2}}$

$X_C = \frac{1}{\omega C} = \frac{1}{340 \times 50 \times 10^{-6}} = 58.8\ \Omega$

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

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

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

Power loss in A.C. circuit,

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

$= \left(\frac{10/\sqrt{2}}{\sqrt{4304}}\right)^2 \times 40 = \frac{50 \times 40}{4304} = 0.51$ W

Question 33.

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

[4 Marks]

(A) An accelerating charge

(B) A chargeless particle

(C) A charge moving at constant velocity

(D) A stationary charge

Explanation:

To generate electromagnetic waves we need accelerating charge particle.

Question 34.

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

[4 Marks]

	Column-1		Column-2
(P)	$m = -2$	(A)	Convex mirror
(Q)	$m = -\frac{1}{2}$	(B)	Concave mirror
(R)	$m = +2$	(C)	Real image
(S)	$m = +\frac{1}{2}$	(D)	Virtual image

(a) P → B and C, Q → B and C, R → B and D, S → A and D.

(b) P → A and C, Q → A and D, R → A and B, S → C and D

(c) P → A and D, Q → B and C, R → B and D, S → B and C

(d) P → C and D, Q → B and D, R → B and C, S → A and D

(A) a

(B) b

(C) c

(D) d

Explanation:

Magnitude m=+ve ⇒ virtual image

m=−ve ⇒ real image

Magnitude of magnification:

|m|>1 ⇒ magnified image

|m|<1 ⇒ diminished image

Question 35.

The angle of incidence for a ray of light at a refracting surface of a prism is 45°. The angle of prism is 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:

[4 Marks]

(A) 30°,1/√2

(B) 30°,√2

(C) 45°,√2

(D) 45°,1/√2

Explanation:

Given: Angle of incidence i = 45°

Angle of prism, A = 60°

Angle of minimum deviation:

$\delta_m = 2i - A = 30°$

Refractive index of material of prism:

$\mu = \sin(A+\delta_m/2) / \sin(A/2)$

$= \sin 45°/\sin 30° = 1/\sqrt{2} \cdot (2/1) = \sqrt{2}$

Question 36.

An 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:

[4 Marks]

(A) 50.0cm

(B) 54.0cm

(C) 37.3cm

(D) 46.0cm

Explanation:

Given: Focal length of objective, $f_0 = 40$ cm

Focal length of eye-piece, $f_e = 4$ cm

Image distance, $v_0 = 200$ cm

Using lens formula for objective lens:

$1/v_0 - 1/u_0 = 1/f_0 \Rightarrow 1/v_0 = 1/f_0 + 1/u_0$

$\Rightarrow 1/v_0 = 1/40 + 1/-200 = +5-1/200$

$\Rightarrow v_0 = 50$cm

Tube length $l = v_0 + f_e = 50+4 = 54$cm.

Question 37.

The intensity at the maximum in a Young'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 on the screen placed at a distance D = 10d?

[4 Marks]

(A) $I_0/2$

(B) $I_0/4$

(C) (3/4)I_0

(D) I_0

Explanation:

Let P is a point in front of one slit at which intensity is to be calculated. From figure path difference = S_2P-S_1P

$= \sqrt{(D^2+d^2)} - D = D(1+1/2.d^2/D^2)-D$

$= D[1+d^2/2D^2-1] = d^2/2D$

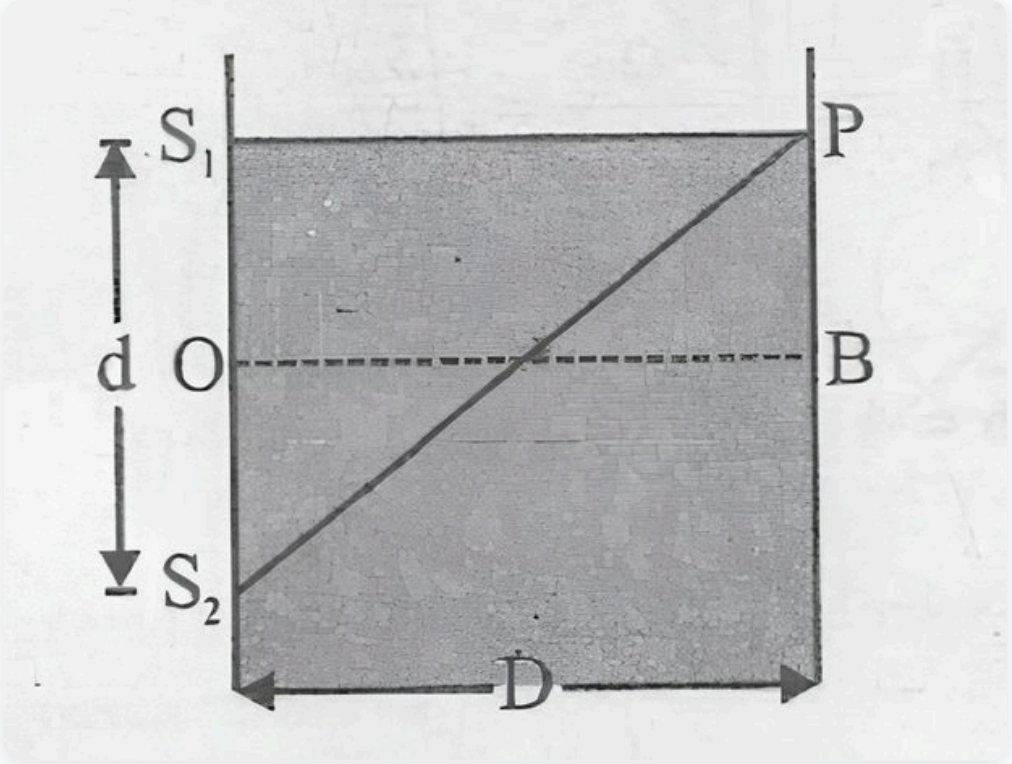
$\Delta x = d^2/2\times10d = d/20 = 5\lambda/20 = \lambda/4$

Phase difference,

$\Delta\Phi = 2\pi/\lambda \times \lambda/4 = \pi/2$

So, resultant, intensity at the desired point 'p' is

$I = I_0\cos^2\Phi/2 = I_0\cos^2\pi/4 = I_0/2$



Question 38.

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 5000 Å is incident on the slit. The first secondary maximum is observed at an angle of:

[4 Marks]

(A) $\sin^{-1}(1/4)$

(B) $\sin^{-1}(2/3)$

(C) $\sin^{-1}(1/2)$

(D) $\sin^{-1}(3/4)$

Explanation:

For the first minima,

$\theta=\eta\lambda/a \Rightarrow \sin30°=\lambda/a=1/2$

First secondary maxima will be at

$\sin\theta=3\lambda/2a=3/2(1/2)\Rightarrow \theta=\sin^{-1}(3/4)$

Question 39.

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

[4 Marks]

(A) (1/c) $(E/2m)^{1/2}$

(B) $(E/2m)^{1/2}$

(C) $c(2mE)^{1/2}$

(D) $(1/xc)\ (2m/E)^{1/2}$

Explanation:

For electron De-Broglie wavelength,

$\lambda_e = h/\sqrt{2mE}$

For photon E = pc

⇒De-Bronglie wavelength, $\lambda_{ph} = hc/E$

$\lambda_e/\lambda_{ph} = h/\sqrt{2mE} \times E/hc = (E/2m)^{1/2}\ 1/c$

Question 40.

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 V/4. The threshold wavelength for the metallic surface is:

[4 Marks]

(A) 3λ

(B) (5/2)λ

(C) 4λ

(D) 5λ

Explanation:

According to Einstein's photoelectric effect,

$eV = hc/\lambda - hc/\lambda_0$ ...(i)

$eV/4 = hc/2\lambda - hc/\lambda_0$ ...(ii)

Dividing equation (i) by (ii) by

⇒ $4 = 1/\lambda - 1/\lambda_0\ /\ 1/2\lambda - 1/\lambda_0$ on solving we get,

$\lambda_0 = 3\lambda$

Question 41.

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:

[4 Marks]

(A) 1/m

(B) $1/\sqrt{m}$

(C) m

(D) $1/m^2$

Explanation:

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

Kinetic energy K.E. = $1/2\ mv^2$

Potential energy P.E. = KQq/r

$1/2\ mv^2 = KQq/r$

$\Rightarrow r \propto 1/m$

Question 42.

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:

[4 Marks]

(A) $0.025 \times 10^4\ m^{-1}$

(B) $0.5 \times 10^7\ m^{-1}$

(C) $0.25 \times 10^7\ m^{-1}$

(D) $2.5 \times 10^7\ m^{-1}$

Explanation:

According to Bohr's theory, the wave number of the last line of the Balmer series in hydrogen spectrum, For hydrogen atom Z=1

$1/\lambda = RZ^2 (1/n_2^2 - 1/n_1^2)$

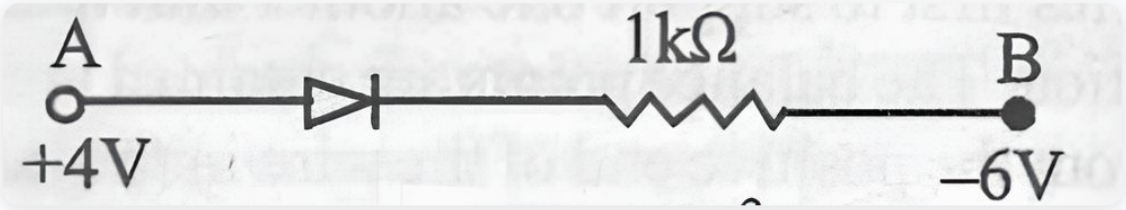
$=10^7 \times 1^2 (1/2^2 - 1/\infty^2)$

$\Rightarrow$wave number $1/\lambda = 0.25 \times 10^7\ m^{-1}$

Question 43.

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

[4 Marks]



(A) 10^{-3} A

(B) 10^{-2}A

(C) 10^{-1} A

(D) 0A

Explanation:

Since Diode is in forward bias, so the value of current flowing through AB

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

Question 44.

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 0.8V. 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:

[4 Marks]

(A) 4, 3.69

(B) 4, 4

(C) 3.69, 3.84

(D) 4, 3.84

Explanation:

Given: amplification factor α = 0.96

Load resistance, R_L = 800 Ω

Input resistance, R_i = 192 Ω

So, β = α/1-α = 0.96/0.04 ⇒ β = 24

Voltage gain for common emitter configuration

$A_v = \beta.R_L/R_i = 24\times800/192 = 100$

Power gain for common emitter configuration

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

Voltage gain for common base configuration

$A_v = \alpha, R_L/R_p = 0.96\times800/192=4$

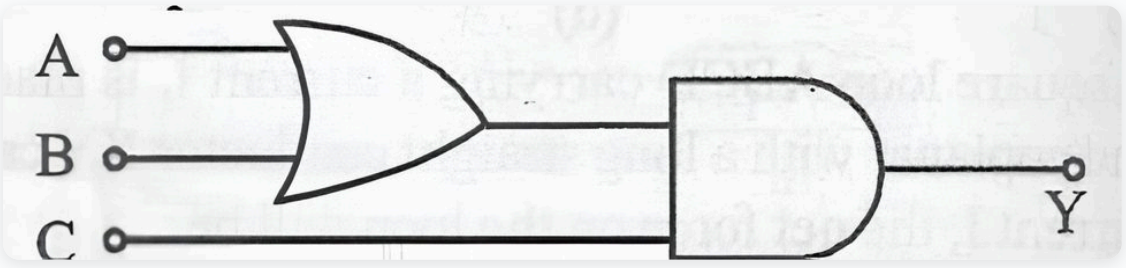
Power gain for common base configuration

$P_v = A_v\alpha = 4\times0.96 = 3.84$

Question 45.

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

[4 Marks]



(A) A = 1, B = 0, C = 1

(B) A = 1, B = 1, C = 0

(C) A = 1, B = 0, C = 0

(D) A = 0, B = 1, C = 0

Explanation:

The Boolen expression for the given combination is output Y=(A+B).C

Truth table

A	B	C	$Y=(A+B)\cdot C$
0	0	0	0
1	0	0	0
0	1	0	0
0	0	1	0
1	1	0	0
0	1	1	1
1	0	1	1
1	1	1	1

Hence, $A=1, B=0, C=1$

Question 46.

Two electrons occupying the same orbital are distinguished by

[4 Marks]

(A) Spin quantum number

(B) Principal quantum number

(C) Magnetic quantum number

(D) Azimuthal quantum number

Explanation:

Two electrons occupying the same orbital should have opposite spins i.e. they differ in spin quantum number.

Question 47.

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

[4 Marks]

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

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

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

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

Explanation:

The correct order is B < C < O < N

Generally ionisation energy increases across a period. But here first I.E. of O is less than the first I.E. of N. This is due to the half-filled 2p orbital in N ($1s^2$, $2s^2$, $2p^3$) which is more stable than the 2p orbital in O ($1s^2$, $2s^2$, $2p^4$).

Question 48.

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

[4 Marks]

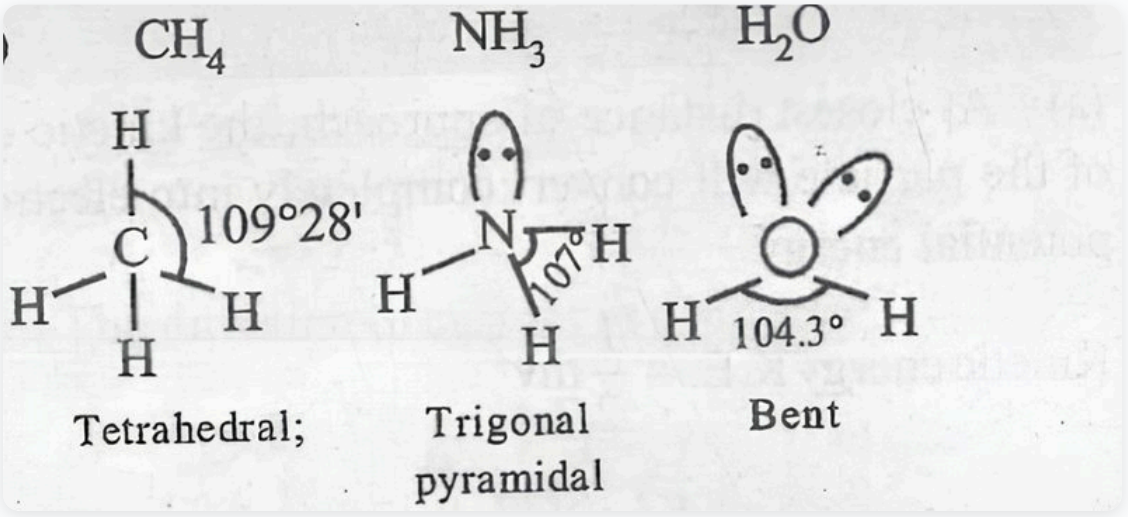
(A) The H–C–H bond angle in CH_4, the H–N–H bond angle in NH_3, and the H–O–H bond angle in H_2O are all greater than 90°.

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

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

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

Explanation:



Question 49.

Predict the correct order of electron repulsion among the following:

[4 Marks]

(A) lone pair–lone pair > lone pair–bond pair > bond pair–bond pair

(B) lone pair–lone pair > bond pair–bond pair > lone pair–bond pair

(C) bond pair–bond pair > lone pair–bond pair > lone pair–lone pair

(D) lone pair–bond pair > bond pair–bond pair > lone pair–lone pair

Explanation:

According to VSEPR theory order of repulsion in between lp – lp, lp – bp and bp – bp is as under lp – lp > lp – bp > bp – bp

Question 50.

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?

[4 Marks]

(A) 1/8

(B) 1/2

(C) 3/8

(D) 1/4

Explanation:

.

Given, $n_{H_2} = n_{O_2}$ and $t_{H_2} = t_{O_2}$

According to Graham's law of diffusion for two different gases.

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

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

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

$$\therefore x = 8$$

$$\therefore \text{Fraction of } O_2 = \frac{1}{8}$$

Question 51.

The correct thermodynamic conditions for the spontaneous reaction at all temperatures is

[4 Marks]

(A) $\Delta H < 0$ and $\Delta S < 0$

(B) $\Delta H < 0$ and $\Delta S > 0$

(C) $\Delta H > 0$ and $\Delta S < 0$

(D) $\Delta H > 0$ and $\Delta S > 0$

Explanation:

$\Delta G = \Delta H - T \cdot \Delta S$

For a spontaneous reaction ΔG = –ve (always)

which is possible only if

$\Delta H < 0$ and $\Delta S > 0$

∴ spontaneous at all temperatures.

Question 52.

Consider the following liquid-vapour equilibrium.

Liquid ⇌ Vapour

Which of the following relations is correct?

[4 Marks]

(A) $d\ln G/dT^2 = \Delta Hv/RT^2$

(B) $d\ln P/dT = \Delta Hv/RT$

(C) $d\ln P/dT = -\Delta Hv/RT^2$

(D) $d\ln P/dT^2 = -\Delta Hv/T^2$

Explanation:

Clausius–Clapeyron's equation

$d\ln P/dT = \Delta H_v/RT^2$

Question 53.

MY and NY_3, two nearly insoluble salts, have the same Ksp values of 6.2×10^{-13} at room temperature. Which statement would be true in regard to MY and NY_3?

[4 Marks]

(A) The molar solubility of MY in water is less than that of NY_3.

(B) The molar solubilities of MY and NY_3 in water are identical.

(C) The salts MY and NY_3 are more soluble in 0.5 M KY than in pure water.

(D) The addition of the salt of KY to solution of MY and NY_3 will have no effect on their solubilities.

Explanation:

.

$$MY \rightleftharpoons M^+ + Y^-$$

$$K_{sp} = s^2 = 6.2 \times 10^{-13}$$

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

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

$$NY_3 \rightleftharpoons N^{3+} + 3Y^-$$

$$K_{sp} = s \times (3s)^3 = 27s^4 = 6.2 \times 10^{-13}$$

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

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

$$\therefore \text{ molar solubility of } NY_3 \text{ is more than MY in water.}$$

Question 54.

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

[4 Marks]

(A) faster

(B) unchanged

(C) slower

(D) doubled

Explanation:

The presence of large amount of $KHSO_4$ will decrease ionisation of $H2SO_4$, resulting in lesser ionisation of nitric acid and lesser formation of nitronium ion [NO^+_2]. Hence the rate of nitration will be slower.

Question 55.

Which of the following statements about hydrogen is incorrect?

[4 Marks]

(A) Dihydrogen does not act as a reducing agent.

(B) Hydrogen never acts as cation in ionic salts.

(C) In hydronium ion, H_3O^+ exists freely in solution.

(D) Hydrogen has three isotopes of which tritium is the most common.

Explanation:

Among the three isotopes of hydrogen, Protium (^1_1H) is most common. It is an energetic reducing agent. It reduces oxides, chlorides and sulphides of certain metals and produces free metals at ordinary temperature.

$CuO + 2H \rightarrow Cu + H_2O$

Question 56.

Which of the following statements is false?

[4 Marks]

(A) Mg^{2+} ions form a complex with ATP

(B) Ca^{2+} ions are important in blood clotting

(C) Ca^{2+} ions are not important in maintaining the regular beating of the heart

(D) Mg^{2+} ions are important in the green parts of plants

Explanation:

Calcium regulates muscle contraction, including beating of heart muscle, so that it can contract and pump out blood to all our body.

Question 57.

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

[4 Marks]

(A) sp^3

(B) 2p

(C) sp^2

(D) sp

Explanation:

$CH_3—C \equiv C^-\ominus$

No. of σ bp = 1

lp = 1

2 & hybridisation is sp

Question 58.

The correct statement regarding the comparison of staggered and eclipsed conformation of ethane, is

[4 Marks]

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

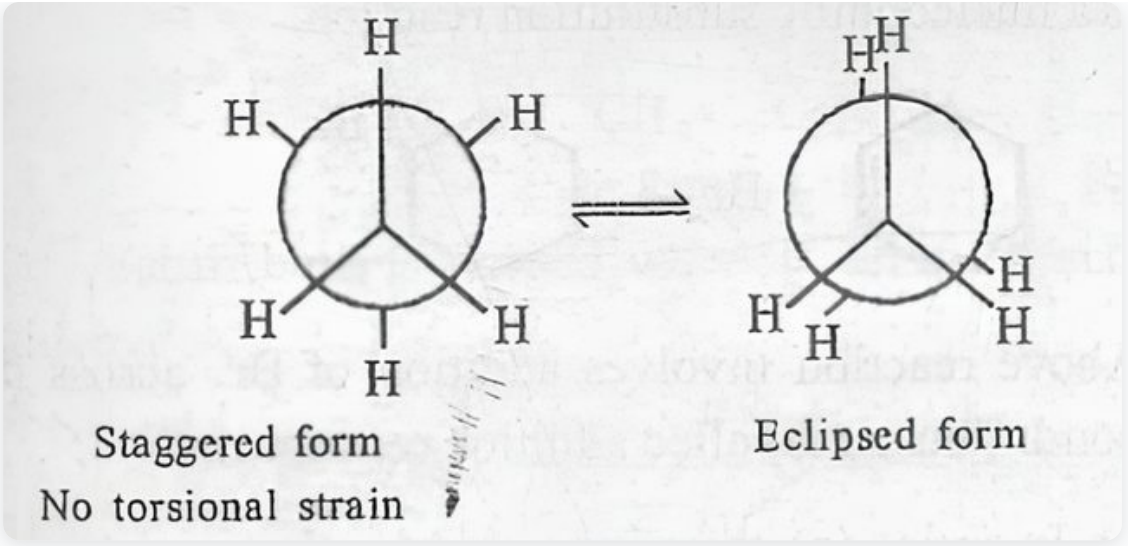
(B) The eclipsed conformation of ethane is more stable than staggered conformation, because eclipsed conformation has no torsional strain

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

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

Explanation:

In staggered conformation any two hydrogen atoms on adjacent carbon atoms are as far apart as possible, thereby minimising repulsion between the electron clouds of σ-bonds of two non-bonded H-atoms (torsional strain).



Question 59.

In the reaction

X and Y are

[4 Marks]

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

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

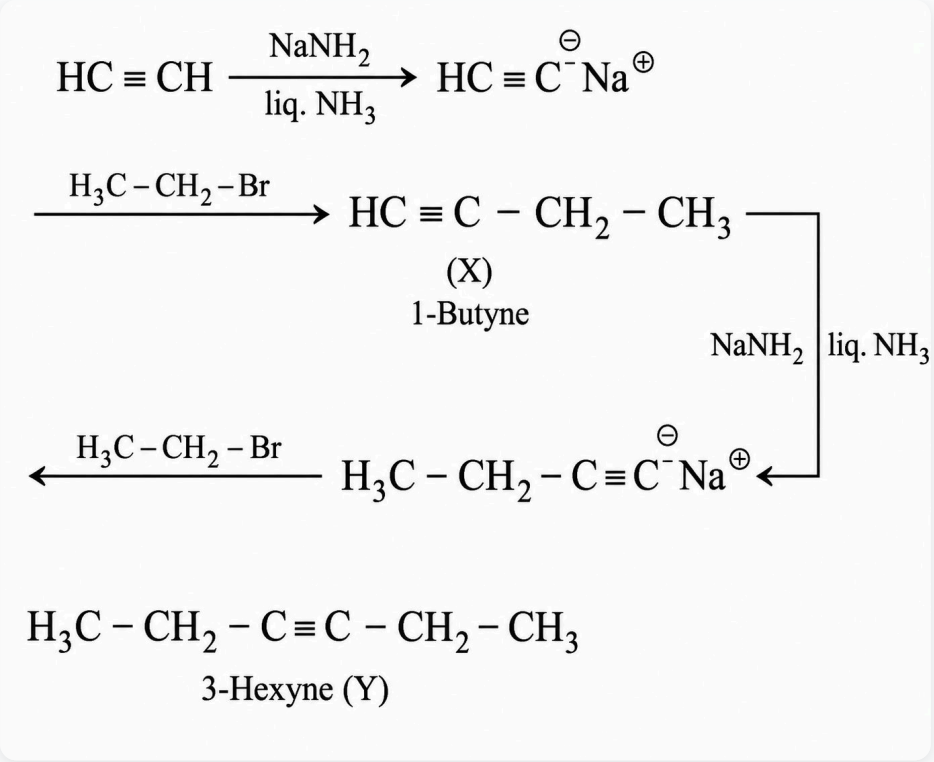
(B) X = 1-Butyne; Y = 3-Hexyne

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

(D) X = 2-Butyne; Y = 2-Hexyne

Explanation:

.



Question 60.

Which of the following statement about the composition of the vapour over an ideal 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)

[4 Marks]

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

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

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

(D) Not enough information is given to make a prediction

Explanation:

Let us consider that A is benzene and B is toluene 1:1 molar mixture of A and B

$x_A = 1/2$ and $x_B = 1/2$

Total Pressure of solution (P) $P^0_A x_A + P^0_B x_B$

$P = 12.8 \times 1/2 + 3.85 \times 1/2 = 8.325$ kPa

$y_A = P^0_A x_A/P = (12.8 \times 1/2)/ 8.325 = 0.768$

$y_B = 1-y_A = 1-0.768=0.232$

so, the vapour will contain higher percentage of benzene

Question 61.

At 100°C the vapour pressure of a solution of 6.5 g of a solute in 100 g water is 732 mm. If Kb = 0.52, the boiling point of this solution will be

[4 Marks]

(A) 102°C

(B) 100°C

(C) 101°C

(D) 103°C

Explanation:

$(P°-P_s/P°) = n/N = W_1/M_1 \times M_2/W_2$

Where, W_1 = wt of solute

W_2 = wt of solvent

M_1 = Mass of solute

M_2 = Mass of solvent

at 100°C, P°=760 mm

$760-732/760= 6.5\times18/M_1\times100$

$M_1 = 31.75 g\ mol^{-1}$

$\Delta T_b\ m\times K_b = (W_1\times1000/M_1 \times W_2) \times K_b$

$\Delta T_b = (0.52\times6.5\times1000/31.75\times100)=1.06\ °C$

boiling point of solution

= 100 °C + 1.06 °C = 101 °C

Question 62.

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

[4 Marks]

(A) 10^{-4} atm

(B) 10^{-14} atm

(C) 10^{-10} atm

(D) 10^{-12} atm

Explanation:

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

$E = E° - 0.0591/2 \log P_H_2/ [H^+]^2$

$0 = 0- 0.0295 \log P_H_2/ (10^{-7})^2$

$P_H_2/(10^{-7})^2 = 1$

$P_H_2 = 10^{-14}$atm

Question 63.

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

[4 Marks]

(A) 34.1 s

(B) 24.1 s

(C) 54.1 s

(D) 44.1 s

Explanation:

For a first order reaction

$K= 2.303/(t_2-t_1) \log (a-x_1/a-x_2)$

$K= 2.303 / (20-10) \log (0.04/0.03)$

$K = 2.303 \times 0.1249/10$

$0.6932/t_1/_2 = 2.303\times0.1249/10$

$t_1/_2 = 0.6932 \times10 / 2.303\times0.1249=24.1$ sec

Question 64.

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

[4 Marks]

(A) Entropy

(B) Internal energy

(C) Activation energy

(D) Enthalpy

Explanation:

A catalyst provides an alternative route for the reaction with a lower activation energy.

Question 65.

Which one of the following characteristics is associated with adsorption?

[4 Marks]

(A) ΔG and ΔH are negative but ΔS is positive

(B) ΔG and ΔS are negative but ΔH is positive

(C) ΔG, ΔH and ΔS all are negative

(D) ΔG is negative but ΔH and ΔS are positive

Explanation:

Adsorption is spontaneous process, therefore change in the free energy (ΔG) for the process is negative. According to Gibbs Helmholtz equation,

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

ΔS is negative because adhering of gas molecules to the surface lowers the randomness. ∴ ΔG can be –ve only when ΔH is –ve.

Question 66.

Fog is colloidal solution of

[4 Marks]

(A) Gas in liquid

(B) Liquid in gas

(C) Gas in gas

(D) Solid in gas

Explanation:

Fog is a colloidal system having dispersed phase as liquid and dispersion medium as gas.

Question 67.

Which is the correct statement for the given acids?

[4 Marks]

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

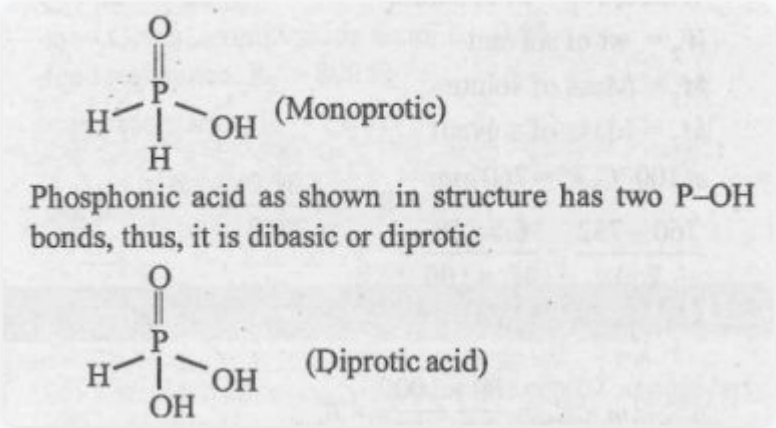
(B) Phosphinic acid is a monoprotic acid while phosphonic acid is a diprotic acid

(C) Both are diprotic acids

(D) Both are triprotic acids

Explanation:

Phosphinic acid as shown in structure below has one P–OH bond, thus, it is monobasic or monoprotic.



Question 68.

The product obtained as a result of a reaction of nitrogen with CaC_2 is

[4 Marks]

(A) $CaCN_2$

(B) CaCN

(C) $CaCN_3$

(D) Ca_2CN

Explanation:

$CaC_2 + N_2 \rightarrow CaCN_2 + C$

Question 69.

Among the following, the correct order of acidity is

[4 Marks]

(A) $HClO_2 < HClO < HClO_3 < HClO_4$

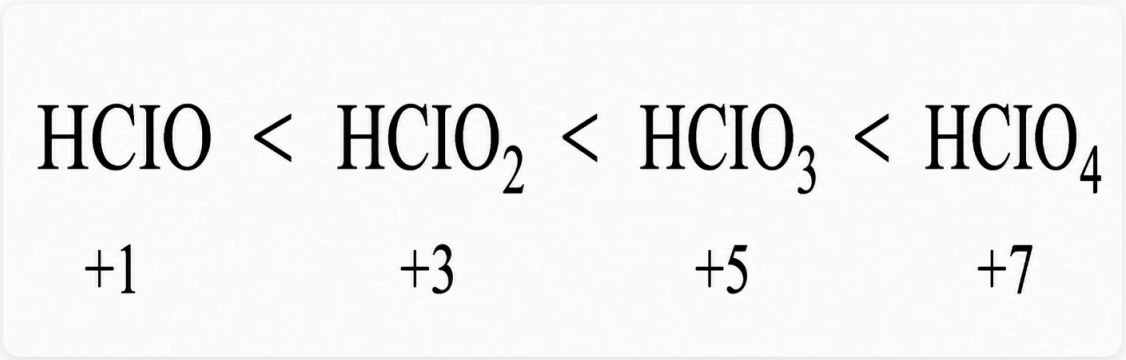
(B) $HClO_4 < HClO_2 < HClO < HClO_3$

(C) $HClO_3 < HClO_4 < HClO_2 < HClO$

(D) $HClO < HClO_2 < HClO_3 < HClO_4$

Explanation:

Acidic strength increases as the oxidation number of central atom increases.



Question 70.

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

[4 Marks]

(A) $F_2 > Cl_2 > Br_2 > I_2$

(B) $Br_2 > I_2 > F_2 > Cl_2$

(C) $I_2 > Br_2 > Cl_2 > F_2$

(D) $Cl_2 > Br_2 > F_2 > I_2$

Explanation:

Bond dissociation enthalpy decreases as the bond distance increases from F_2 to I_2. This is due to increase in the size of the atom, on moving from F to I. F–F bond dissociation enthalpy is smaller than Cl–Cl and even smaller than Br–Br. This is because F atom is very small and hence the three lone

pairs of electrons on each F atom repel the bond pair holding the F-atoms in F_2 molecules. The increasing order of bond dissociation enthalpy is $I_2 < F_2 < Br_2 < Cl_2$

Question 71.

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

[4 Marks]

Column–I	Column–II
1. XeF_6	(i) Distorted octahedral
2. XeO_3	(ii) Square planar
3. $XeOF_4$	(iii) Pyramidal
4. XeF_4	(iv) Square pyramidal

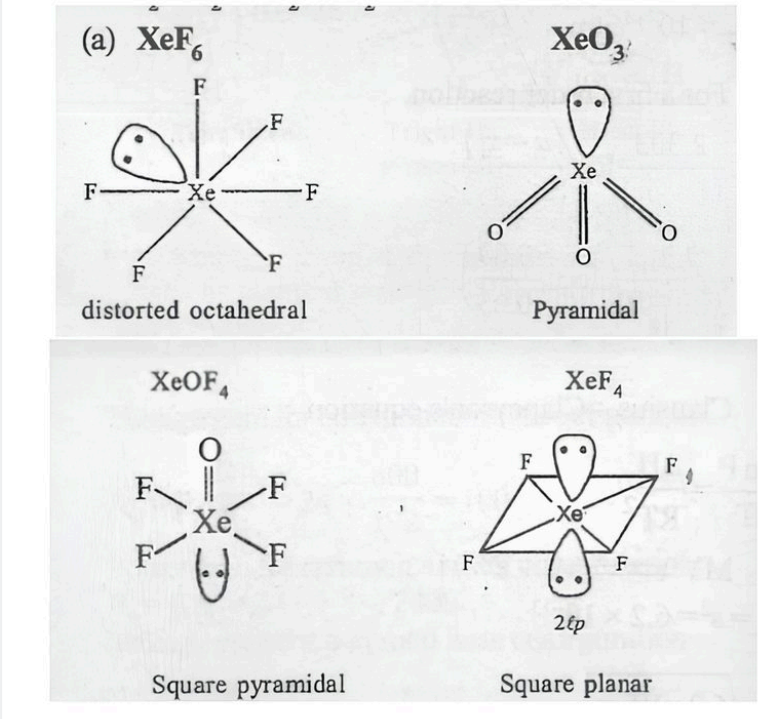
(A) 1 (i), 2 (ii), 3 (iv), 4 (iii)

(B) 1 (i), 2 (iii), 3 (iv), 4 (ii)

(C) 1 (i), 2 (iii), 3 (iv), 4 (ii)

(D) 1 (iv), 2 (iii), 3 (ii), 4 (i)

Explanation:



Question 72.

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

[4 Marks]

(A) The solution turns blue

(B) The solution is decolourized

(C) SO_2 is reduced

(D) Green $Cr_2(SO_4)_3$ is formed

Explanation:

$K_2Cr_2O_7 + SO_2 + H_2SO_4$

$\rightarrow K_2SO_4 + Cr_2(SO_4)_3 + H_2O$

green colour

Question 73.

When copper is heated with conc. HNO_3 it produces

[4 Marks]

(A) $Cu(NO_3)_2$ and N_2O

(B) $Cu(NO_3)_2$ and NO

(C) $Cu(NO_3)_2$, NO and NO_2

(D) $Cu(NO_3)_2$ and NO_2

Explanation:

Less active metals like Cu, Ag etc. react with conc. acid and form nitrate and nitrogen dioxide.

Question 74.

The electronic configurations of Eu (Atomic No. 63), Gd (Atomic No. 64) and Tb (Atomic No. 65) are

[4 Marks]

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

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

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

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

Explanation:

Eu (63) = $[Xe]\ 4f^7\ 6s^2$ Gd (64) = $[Xe]\ 4f^7\ 5d^1\ 6s^2$ Tb (65) = $[Xe]\ 4f^9\ 6s^2$

Question 75.

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

[4 Marks]

(A) $[Mn(CO)_6]^+$

(B) $[Fe(CO)_4]^{2-}$

(C) $[Co(CO)_4]^-$

(D) $[Ni(CO)_4]$

Explanation:

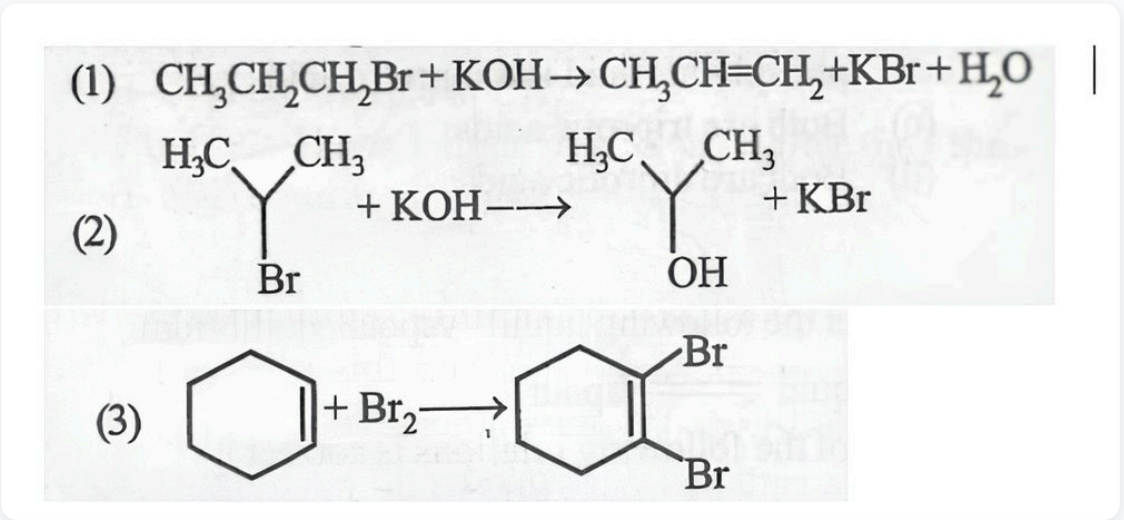
$[Fe(CO)_4]^{2-}$ Since metal atom is carrying maximum –ve charge therefore, it would show maximum synergic bonding as a resultant C—O bond length would be maximum.

Question 76.

For the following reactions :

Which of the following statements is correct?

[4 Marks]



(A) (1) and (2) are elimination reactions and (3) is addition reaction

(B) (1) is elimination, (2) is substitution and (3) is addition reaction

(C) (1) is substitution, (2) and (3) are addition reactions

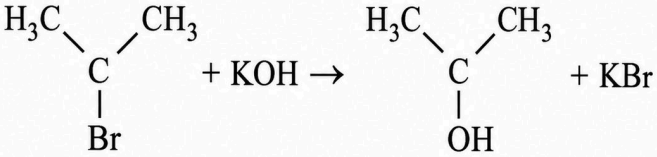
(D) (1) is elimination, (2) and (3) are substitution reactions

Explanation:

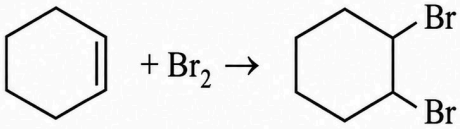
.

(1) $CH_3CH_2CH_2{-}Br + KOH \rightarrow CH_3CH{=}CH_2 + KBr + H_2O$

This is dehydrohalogenation reaction which is an example of elimination reaction.

(2) 

Replacement of Br^- by OH^- is substitution reaction thus, it is a nucleophilic substitution reaction.

(3) 

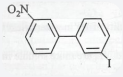
Above reaction involves addition of Br_2 across double bond. Thus, it is called addition reaction.

Question 77.

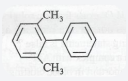
Which of the following biphenyls is optically active?

[4 Marks]

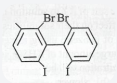
(A) a



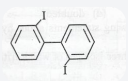
(B) d



(C) b



(D) c



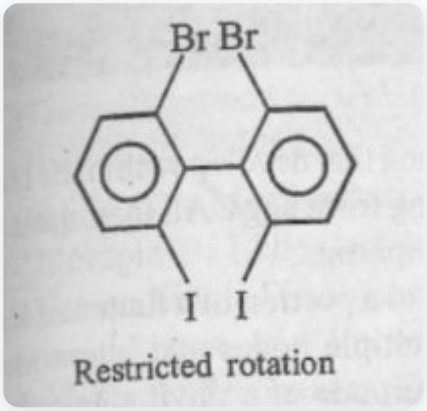
Explanation:

In option (a), there is no chiral carbon.

In option (c), there exist a center of symmetry.

In option (d), there exist a plane of symmetry.

In option (d), both the rings are not in the same plane and the rotation is restricted around the single bond.



Question 78.

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

[4 Marks]

(A) Acetone

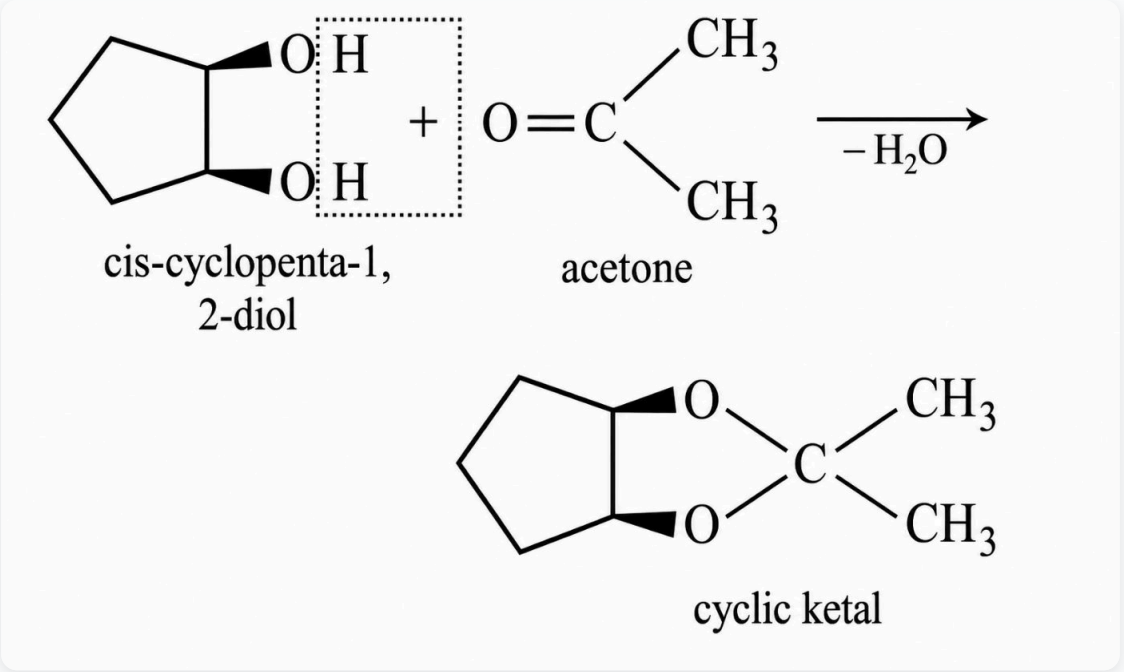
(B) Ozone

(C) MnO_2

(D) Aluminium isopropoxide

Explanation:

.

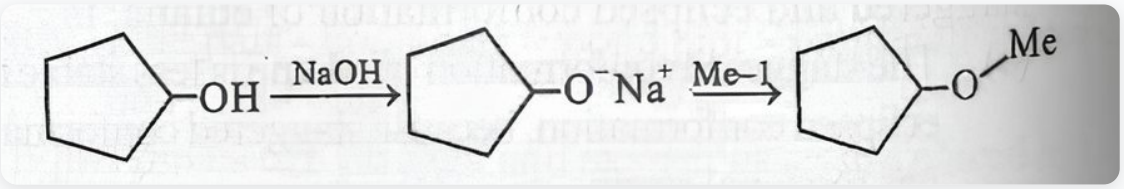


Question 79.

The reaction

Can be classified as:-

[4 Marks]



(A) Dehydration reaction

(B) Williamson alcohol synthesis reaction

(C) Williamson ether synthesis reaction

(D) Alcohol formation reaction

Explanation:

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

Question 80.

The correct statement regarding a carbonyl compound with a hydrogen atom on its alpha-carbon, is:

[4 Marks]

(A) A carbonyl compound with a hydrogen atom on its alpha-carbon never equilibrates with its corresponding enol.

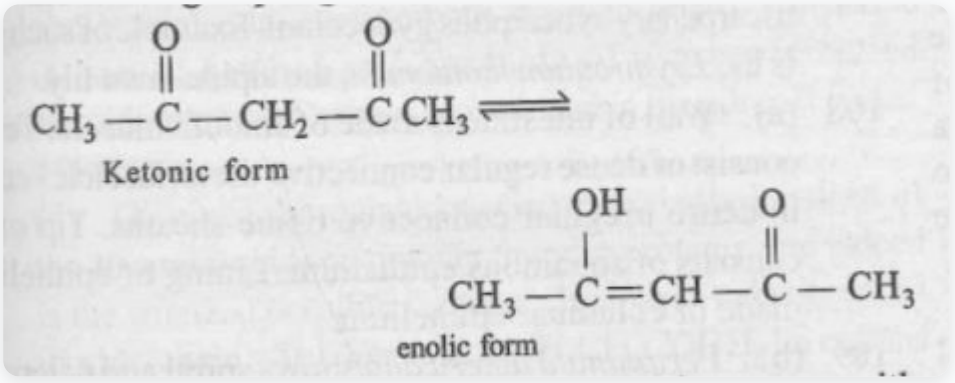
(B) A carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known as aldehyde-ketone equilibration.

(C) 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.

(D) A carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known as enolization.

Explanation:

Keto-enol tautomerism is possible only in those aldehydes and ketones which have at least one α-hydrogen atom, which can convert the ketonic group to the enolic group. *e.g.*



Question 81.

The product formed by the reaction of an aldehyde with a primary amine is

[4 Marks]

(A) Aromatic acid

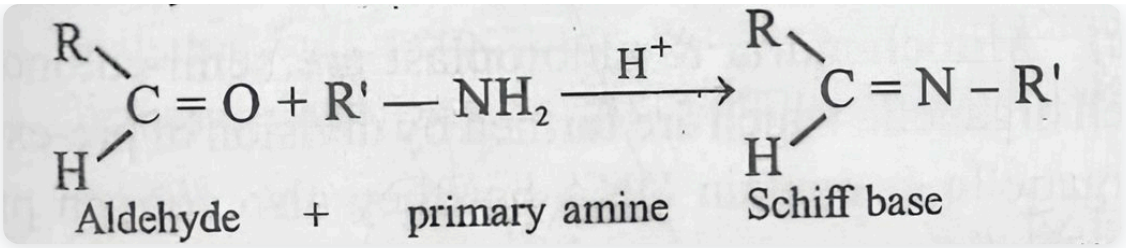
(B) Ketone

(C) Carboxylic acid

(D) Schiff base

Explanation:

Schiff base is formed when 1° amine reacts with aldehydes.



Question 82.

The correct statement regarding the basicity of arylamines is

[4 Marks]

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

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

(C) 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.

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

Explanation:

Arylamines are generally less basic than alkylamines due to following factors: (i) Due to resonance in aromatic amines. (ii) Lower stability of anilinium ion.

Question 83.

Which one given below is a non-reducing sugar?

[4 Marks]

(A) Sucrose

(B) Glucose

(C) Lactose

(D) Maltose

Explanation:

Sucrose is non-reducing disaccharide as the two monosaccharide units are linked through their respective carbonyl groups.

Question 84.

In a protein molecule various amino acids are linked together by

[4 Marks]

(A) dative bond

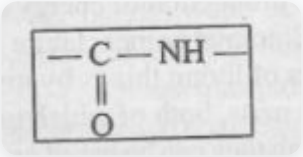
(B) β-glycosidic bond

(C) α-glycosidic bond

(D) peptide bond

Explanation:

Peptide bond



Question 85.

The correct statement regarding RNA and DNA, respectively is

[4 Marks]

(A) The sugar component in RNA is arabinose.

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

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

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

Explanation:

Sugar in DNA is 2-deoxyribose whereas sugar in RNA is ribose.

Question 86.

Natural rubber has

[4 Marks]

(A) all cis-configuration

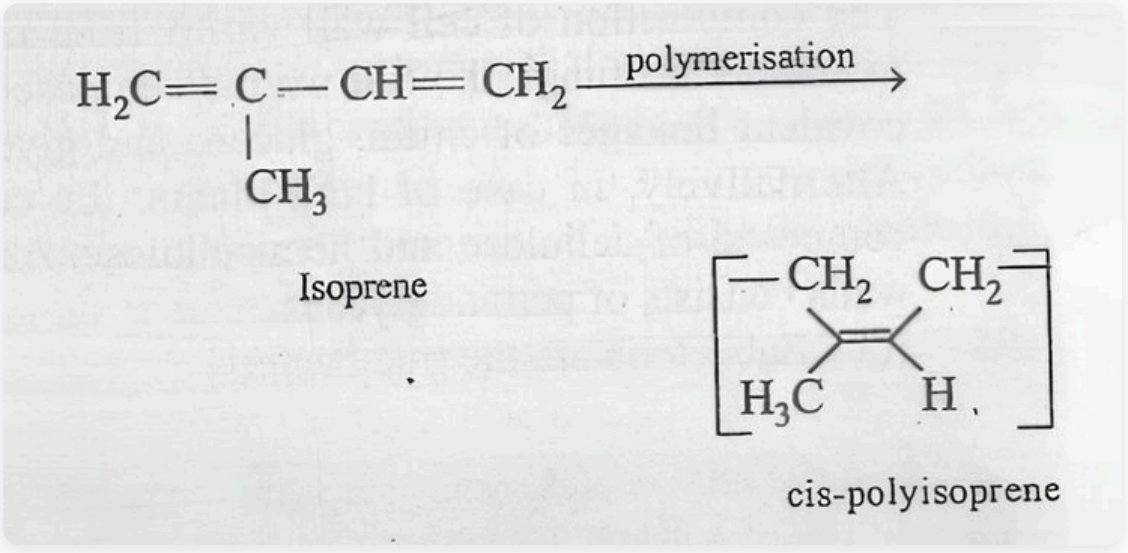
(B) all trans-configuration

(C) random cis- and trans-configuration

(D) alternate cis- and trans-configuration

Explanation:

Natural rubber is found to be a polymer of cis-isoprene i.e. it is cis-polyisoprene



Question 87.

Which of the following is an analgesic?

[4 Marks]

(A) Novalgin

(B) Penicillin

(C) Streptomycin

(D) Chloromycetin

Explanation:

Novalgin is most widely used as analgesic. Analgesics are pain relieving.

Question 88.

Match items of Column I with the items of Column II and assign the correct code:

[4 Marks]

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

(A) a-(iii), b-(iv), c-(v), d -(i)

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

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

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

Explanation:

Highly electropositive metals like Al, K, Na etc. are extracted by the electrolytic reduction.

• Zone refining method is used for obtaining metals of high purity *e.g.* Ge

• Froth flotation process is suitable for sulphide ores

• Cyanide process is used for the extraction of gold.

Question 89.

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 × 10^{23} mol^{-1})

[4 Marks]

(A) 154 pm

(B) 352 pm

(C) 527 pm

(D) 264 pm

Explanation:

density (ρ) = Z×M/N_A × a^3

For bcc structure

Z=2, ρ=530 kg^{-3} = 0.530g cm^{-3}

a^3 =4.348×10^{-23} cm^3

a= 3.52×10^{-8} cm

a= 352 pm

Question 90.

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

[4 Marks]

(A) 6

(B) 4

(C) 2

(D) 8

Explanation:

Radii ratio= r_+/r_- = 0.98×$^{-10}$/ 1.81×10^{-10} = 0.54

Since, the radii ratio is between 0.414 to 0.732 so, coordination number is 6.

Question 91.

It is much easier for a small animal to run uphill than for a large animal, because

[4 Marks]

(A) smaller animals have a higher metabolic rate.

(B) the efficiency of muscles in large animals is less than in the small animals.

(C) it is easier to carry a small body weight.

(D) small animals have a lower O_2 requirement.

Explanation:

Basal metabolic rate is inversely proportional to body size. So, smaller animals have a higher metabolic rate. Hence production of energy is more.

Question 92.

Nomenclature is governed by certain universal rules. Which one of the following is contrary to the rules of nomenclature?

[4 Marks]

(A) When written by hand, the names are to be underlined

(B) The names are written in Latin and are italicised

(C) The first word in a biological name represents the genus name, and the second is a specific epithet

(D) Biological names can be written in any language

Explanation:

Binomial nomenclature is a formal system of naming species of living things by giving each a name composed of two parts, both of which use Latin grammatical forms, although they can be based on words from other languages.

Question 93.

Chrysophytes, Euglenoids, Dinoflagellates and Slime moulds are included in the kingdom

[4 Marks]

(A) Monera

(B) Protista

(C) Fungi

(D) Animalia

Explanation:

All unicellular eukaryotic organism like diatoms, desmids (chrysophytes), euglenoids, dinoflagellates and slime mould are included in Protista.

Question 94.

One of the major components of cell wall of most fungi is

[4 Marks]

(A) Chitin

(B) Cellulose

(C) Peptidoglycan

(D) Hemicellulose

Explanation:

A cell wall is a rigid structural layer, which provides protection and structural support to the cells. The composition of cell wall varies from one species to another. In fungi, the cell wall is composed of strong covalent linkages of chitin, glucans and glycoproteins. Alternatively, in case of land plants, the cell wall is composed of cellulose and hemicellulose. Archean cell walls consists of peptidoglycans.

Question 95.

Which one of the following statements is wrong?

[4 Marks]

(A) Cyanobacteria are also called blue-green algae

(B) Golden algae are also called desmids

(C) Eubacteria are also called false bacteria

(D) Phycomycetes are also called algal fungi

Explanation:

Eubacteria are the true bacteria.

Question 96.

Which of the following statements is wrong for viroids?

[4 Marks]

(A) They lack a protein coat

(B) They are smaller than viruses

(C) They cause infections

(D) Their RNA is of high molecular weight

Explanation:

Viroids, the smallest known pathogens, are naked, circular, single-stranded RNA molecules that do not encode protein but autonomously replicate when introduced into host plants. Viroids only infect

plants; some cause economically important diseases of crop plants, while others appear to be benign.

Question 97.

In bryophytes and pteridophytes, transport of male gametes requires

[4 Marks]

(A) Wind

(B) Insects

(C) Water

(D) Birds

Explanation:

Bryophytes neither have pollen nor flowers and rely on water to carry the male gametes (sperm) to the female gametes (eggs). The antherozoids (male gametes of pteridophytes) are armed with hair-like or whip-like cilia or flagellae and are able to swim through water; they do not travel great distances and are only released when free water is available.

Question 98.

Select the correct statement:

[4 Marks]

(A) Gymnosperms are both homosporous and heterosporous

(B) Salvinia, Ginkgo and Pinus all are gymnosperms

(C) The leaves of gymnosperms are not well adapted to extremes of climate

(D) Sequoia is one of the tallest trees

Explanation:

Sequoia sempervirens is one of the tallest trees.

Question 99.

Which of the following features is not present in the Phylum – Arthropoda?

[4 Marks]

(A) Chitinous exoskeleton

(B) Metameric segmentation

(C) Parapodia

(D) Jointed appendages

Explanation:

All arthropods possess a stiff exoskeleton (external skeleton) composed primarily of chitin. Arthropod bodies are divided into segments. Parapodia are paired, lateral appendages extending from the body segments. Arthropod appendages may be either biramous (branched) or uniramous (unbranched). They possess jointed appendages.

Question 100.

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

[4 Marks]

(A) Cartilaginous — Chondrichthyes

(B) Viviparous — Mammalia

(C) Possess a mouth with an upper and a lower jaw — Chordata

(D) 3- chambered heart divided venticle - Reptilia with one incompletely

Explanation:

Chondrichthyes always have cartilaginous endoskeleton. Most mammals are viviparous, giving birth to young. However, the five species of monotreme, the platypuses and the echidnas, lay eggs. Chondrichthyes have jawless animals (Agnatha) as well. Most reptiles have a 4 chambered heart. Crocodilians have 4 chambered heart. Turtles have 3 chambered heart but with an incomplete wall in the single ventricle, so their hearts are functionally 4 chambered.

Question 101.

Which one of the following characteristics is not shared by birds and mammals?

[4 Marks]

(A) Ossified endoskeleton

(B) Breathing using lungs

(C) Viviparity

(D) Warm blooded nature

Explanation:

Giving birth to young that develop within the mother’s body rather than hatching from eggs. All mammals except the monotremes are viviparous.

Question 102.

Stems modified into flat green organs performing the functions of leaves are known as

[4 Marks]

(A) Scales

(B) Cladodes

(C) Phyllodes

(D) Phylloclades

Explanation:

Phylloclade refers to a portion of a flattened leaf-like stem or branch with multiple nodes and internodes, and cladode for a single internode of a phylloclade. In some plants, the petioles are flattened and widened, to become phyllodes or phyllodia.

Question 103.

The standard petal of a papilionaceous corolla is also called

[4 Marks]

(A) Vexillum

(B) Pappus

(C) Carina

(D) Corona

Explanation:

Papilionaceous flowers are flowers with the characteristic irregular and butterfly-like corolla. A single, large upper petal is known as the banner or vexillum and the name has been derived from an ancient military standard.

Question 104.

Proximal end of the filament of stamen is attached to the

[4 Marks]

(A) Anther

(B) Connective

(C) Placenta

(D) Thalamus or petal

Explanation:

The proximal end is attached to the thalamus whereas the distal end bears anther.

Question 105.

The coconut water from tender coconut represents

[4 Marks]

(A) free nuclear proembryo

(B) free nuclear endosperm

(C) fleshy mesocarp

(D) endocarp

Explanation:

Coconut water is the clear liquid inside young green coconuts (fruits of the coconut palm). In early development, it serves as a suspension for the endosperm of the coconut during the nuclear phase of development. As growth continues, the endosperm matures into its cellular phase and deposits into the rind of the coconut meat.

Question 106.

Cotyledon of maize grain is called

[4 Marks]

(A) coleoptile

(B) scutellum

(C) coleorhiza

(D) plumule

Explanation:

The cotyledons are known as seed leaves, they are attached to the embryonic axis. Dicotyledons typically have two cotyledons and monocotyledons have only one cotyledon. The single shield-shaped cotyledon in grains known as scutellum.

Question 107.

Tricarpellary syncarpous gynoecium is found in flowers of

[4 Marks]

(A) Liliaceae

(B) Solanaceae

(C) Fabaceae

(D) Poaceae

Explanation:

The Liliaceae are a huge variety, comprising about 280 genera and 4000 species of perennial herbs mostly. It includes starchy rhizomes, corms or bulbs, characterized by alternate leaves which are whorled. The flowers are often showy, mostly bisexual and actinomorphic. Also, they exhibit tricarpellary syncarpous gynoecium. Example of such a class is the *Erythronium montanum*, the alpine fawn lily.

Question 108.

Which type of tissue correctly matches with its location?

[4 Marks]

(A) Tissue-Smooth muscle, Location- Wall of intestine

(B) Tissue-Areolar tissue, Location -Tendons

(C) Tissue- Cuboidal epithelium, Location -Lining of stomach

(D) Tissue-Transitional epithelium, Location -Tip nose

Explanation:

Wall of intestine is made of smooth muscle. Tendons consist of dense regular connective tissue fascicles encased in dense irregular connective tissue sheaths. Tip of nose consists of squamous

epithelium. Lining of epithelium is made of columnar epithelium.

Question 109.

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

[4 Marks]

(A) Indeterminate and radial cleavage during embryonic development

(B) Schizocoelom as body cavity

(C) Exoskeleton composed of N-acetylglucos-amine

(D) Metamerically segmented body

Explanation:

Periplanata americana shows spiral and determinate types of cleavage during embryonic development which is a feature of Protostomes.

Question 110.

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?

[4 Marks]

(A) (A) is true but (B) is false

(B) Both (A) and (B) are false

(C) (B) is true but (A) is false

(D) Both (A) and (B) are correct

Explanation:

Mitochondria & chloroplast are semi-autonomous cell organelle which are formed by division of pre-existing organelle & contain DNA but they also contain protein synthesizing machinery, thus (a) is true & (b) is false.

Question 111.

Microtubules are the constituents of

[4 Marks]

(A) Centrioles, Spindle fibres and Chromatin

(B) Centrosome, Nucleosome and Centrioles

(C) Spindle fibres, Centrioles and Cilia

(D) Cilia, Flagella and Peroxisomes

Explanation:

Roles of the microtubule cytoskeleton include mechanical support, organization of the cytoplasm, transport, motility and chromosome segregation so they are present in cilia and flagella for cellular movement, centrioles for chromosomal movement and spindle fibres for structural organization as well as chromosomal movement during nuclear division.

Question 112.

Which one of the following cell organelles is enclosed by a single membrane?

[4 Marks]

(A) Lysosomes

(B) Nuclei

(C) Chloroplasts

(D) Mitochondria

Explanation:

Double Membrane bound Organelles: Mitochondria, Chloroplasts, Endoplasmic Reticulum, Golgi Body, and Nucleus. Single Membrane bound Organelles: Lysosomes, Peroxisomes, and Vacuoles. Organelles lacking any membrane: Ribosomes, Centrioles, Nucleolus.

Question 113.

The two polypeptides of human insulin are linked together by

[4 Marks]

(A) phosphodiester bond

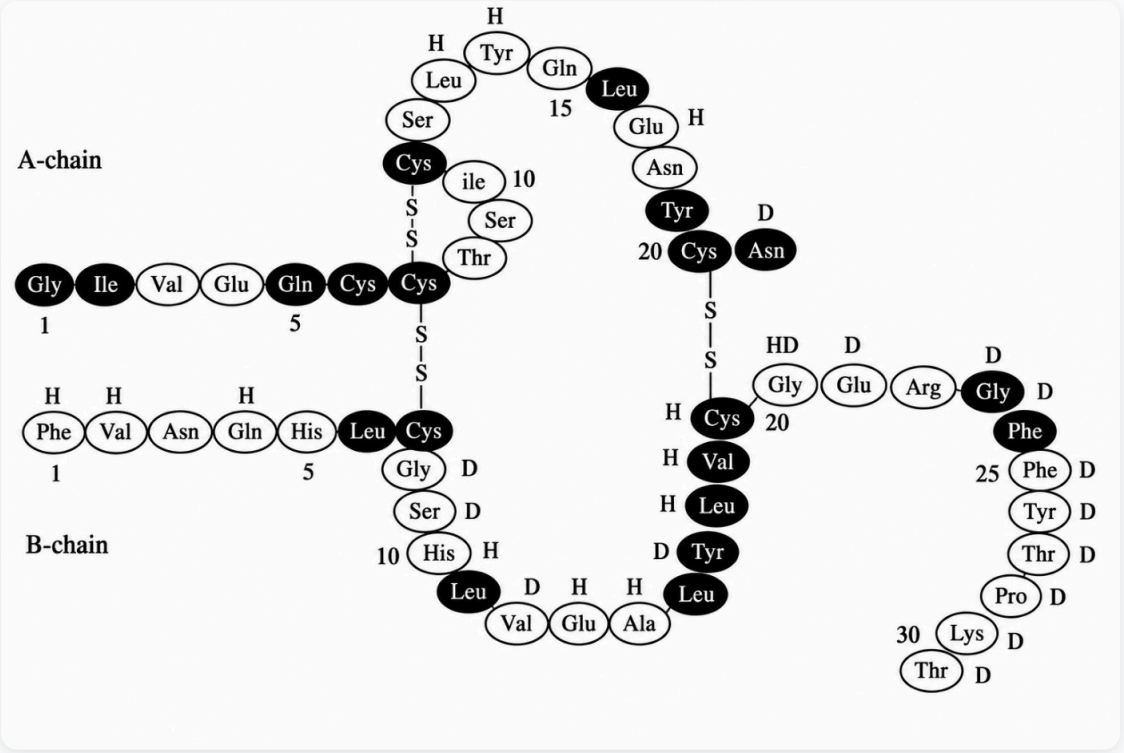
(B) hydrogen bonds

(C) covalent bond

(D) disulphide bridges

Explanation:

Insulin is a hormone consisting of 2 polypeptide chains. Each chain is composed of a specific sequence of amino acid residues connected by peptide bonds. In humans, chain A has 21 amino acids, and chain B has 30. Post translational modifications result in the connection of these two chains by disulfide bridges.



Question 114.

The amino acid Tryptophan is the precursor for the synthesis of

[4 Marks]

(A) Melatonin and Serotonin

(B) Thyroxine and Triiodothyronine

(C) Cortisol and Cortisone

(D) Estrogen and Progesterone

Explanation:

Tryptophan is a precursor to neurotransmitters serotonin and melatonin. Thyroxine (3,5,3',5'-tetraiodothyronine) is produced by follicular cells of the thyroid gland. It is produced as the precursor thyroglobulin. Estrogen is biosynthesized from progesterone (in two steps from cholesterol, via intermediate pregnenolone). Cortisone is one of several end-products of a process called steroidogenesis. Cortisol is produced in the adrenal cortex of kidney.

Question 115.

Which one of the following statements is wrong?

[4 Marks]

(A) Sucrose is a disaccharide.

(B) Uracil is a pyrimidine.

(C) Cellulose is a polysaccharide.

(D) Glycine is a sulphur containing amino acid.

Explanation:

Glycine (abbreviated as Gly or G) is the smallest of the 20 amino acids commonly found in proteins, and indeed is the smallest possible (having a hydrogen substituent as its side-chain). The formula is NH_2CH_2COOH. Its codons are GGU, GGC, GGA, GGG of the genetic code.

Question 116.

Spindle fibres attach on to

[4 Marks]

(A) Telomere of the chromosome

(B) Kinetochore of the chromosome

(C) Kinetosome of the chromosome

(D) Centromere of the chromosome

Explanation:

Attachment of microtubules to chromosomes is mediated by kinetochores, which actively monitor spindle formation and prevent premature anaphase onset during mitosis.

Question 117.

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

[4 Marks]

(A) Spindle fibres

(B) Chromosome movement

(C) Disappearance of nucleolus

(D) Synapsis

Explanation:

Synapsis is the pairing of two homologous chromosomes that occurs during meiosis. It allows matching-up of homologous pairs prior to their segregation, and possible chromosomal crossover between them. Synapsis takes place during prophase I, of zygotene of meiosis.

Question 118.

In meiosis crossing over is initiated at

[4 Marks]

(A) Pachytene

(B) Zygotene

(C) Leptotene

(D) Diplotene

Explanation:

Meiosis is a process (discovered by German biologist, Oscar Hertwig) where a single cell divides twice to produce four cells containing half the original amount of genetic information. These cells are our sex cells – sperm in males, eggs in females. Crossing over is the process by which two chromosomes exchange some distal part of their DNA. This process occurs in the Pachytene stage of Prophase I of meiosis.

Question 119.

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

[4 Marks]

(A) Both processes cannot happen simultaneously.

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

(C) The above processes happen only during night time.

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

Explanation:

In actively growing plants, water is continuously evaporating from the surface of leaf cells through stomatal opening exposed to air. This is called transpiration. Through the same stomatal opening carbon dioxide diffuses into the plant during photosynthesis simultaneously, as both are processes of simple diffusion occurring in order of diffusion pressure gradient or diffusion coefficient.

Question 120.

In which of the following, all three are macronutrients?

[4 Marks]

(A) Boron, zinc, manganese

(B) Molybdenum, magnesium, manganese

(C) Iron, copper, molybdenum

(D) Nitrogen, calcium, phosphorus

Explanation:

Nitrogen, phosphorus, potassium, calcium, sulfur, and magnesium are the macronutrients. The essential elements can be divided into macronutrients and micronutrients. Nutrients that plants require in larger amounts are called macronutrients. About half of the essential elements are considered macronutrients: carbon, hydrogen, oxygen, nitrogen, phosphorus, potassium, calcium, magnesium, and sulfur.

Question 121.

In a chloroplast the highest number of protons are found in

[4 Marks]

(A) lumen of thylakoids

(B) stroma

(C) antennae complex

(D) inter membrane space

Explanation:

Proton concentration is higher in the lumen of thylakoid due to photolysis of water, H^+ pumping and NADP reductase activity in stroma. During the light-dependent reaction, protons are pumped across the thylakoid membrane into the lumen making it acidic down to pH 4.

Question 122.

Water soluble pigments found in plant cell vacuoles are

[4 Marks]

(A) Anthocyanins

(B) Carotenoids

(C) Chlorophylls

(D) Xanthophylls

Explanation:

Many leaves produce water-soluble vacuolar pigments, which are stored within cell vacuoles (microscopic water sacs within each cell). Two major classes of leaf vacuolar pigments are anthocyanins and betalains.

Question 123.

Emerson’s enhancement effect and Red drop have been instrumental in the discovery of

[4 Marks]

(A) oxidative phosphorylation

(B) two photosystems operating simultaneously

(C) photophosphorylation and non-cyclic electron transport

(D) photophosphorylation and cyclic electron transport

Explanation:

Emerson performed photosynthetic experiment. On *Chlorella*, he provided monochromatic light of more than 680 nm and observed decrease in rate of photosynthesis known as red drop. Later, he provides synchronised light of 680 nm and 700 nm and observed increase in rate of photosynthesis known as enhancement effect. This experiment led to discovery of two photosystems—PS-I and PS-II operating in photosynthesis.

Question 124.

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?

[4 Marks]

(A) CAM

(B) Nitrogen fixer

(C) C_4

(D) C_3

Explanation:

C_4 plants are adapted to hot and dry climate and lack photorespiration due to Kranz anatomy and have greater productivity of biomass.

Question 125.

The *Avena* curvature is used for bioassay of

[4 Marks]

(A) ABA

(B) GA_3

(C) IAA

(D) Ethylene

Explanation:

Auxin has been clearly demonstrated in the leaf sheath or coleoptile of oat plant (*Avena sativa*). This plant coleoptile has been used for the test of hormone Auxin (IAA) participating in the growth of the plant.

Question 126.

Which of the following guards the opening of hepatopancreatic duct into the duodenum?

[4 Marks]

(A) Sphincter of Oddi

(B) Ileoceacal valve

(C) Pyloric sphincter

(D) Semilunar valve

Explanation:

The sphincter of Oddi (or hepatopancreatic sphmcler)

is a muscular valve that controls the flow of digestive juices (bile and pancreatic juice) through the ampulla of Vater into the second part of the duodenum.

Question 127.

In the stomach, gastric acid is secreted by the

[4 Marks]

(A) acid cells

(B) peptic cells

(C) parietal cells

(D) gastrin secreting cells

Explanation:

The main constituent of gastric acid is hydrochloric acid which is produced by parietal cells (also called oxyntic cells) in the gastric glands in the stomach.

Question 128.

Name the chronic respiratory disorder caused mainly by cigarette smoking

[4 Marks]

(A) asthma

(B) respiratory acidosis

(C) emphysema

(D) respiratory alkalosis

Explanation:

Emphysema results when the delicate linings of the air sacs in the lungs become damaged beyond repair. Most commonly, the toxins in cigarette smoke create the damage. Emphysema is called smoker’s disease.

Question 129.

Reduction in pH of blood will

[4 Marks]

(A) reduce the blood supply to the brain.

(B) reduce the rate of heart beat.

(C) decrease the affinity of haemoglobin with oxygen.

(D) release bicarbonate ions by the liver.

Explanation:

Reduction of pH of blood will decrease the affinity of haemoglobin with oxygen which in turn causes acidosis.

Question 130.

Blood pressure in the pulmonary artery is

[4 Marks]

(A) less than that in the venae cavae.

(B) more than that in the carotid.

(C) more than that in the pulmonary vein.

(D) same as that in the aorta.

Explanation:

Arteries have higher blood pressure than veins because blood is forced inside them from heart and also their lumen is narrow.

Question 131.

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

[4 Marks]

(A) Hepatic Vein

(B) Dorsal Aorta

(C) Hepatic Portal Vein

(D) Renal Vein

Explanation:

Hepatic Vein, because the liver produces urea and other waste materials and then pours it all in the right ventricle of the heart for oxygenation. The heart distributes the blood to various parts of the body from here. So the impure blood brought by the Hepatic Vein and other blood vessels get distributed through the aorta. This will automatically imply that the Renal Artery will contain lesser impure blood than the Hepatic Vein.

Question 132.

Lack of relaxation between successive stimuli in sustained muscle contraction is known as

[4 Marks]

(A) Fatigue

(B) Tetanus

(C) Tonus

(D) Spasm

Explanation:

Sustained contraction with no relaxation phase is called muscle tetanus.

Question 133.

Photosensitive compound in human eye is made up of

[4 Marks]

(A) Guanosine and Retinol

(B) Opsin and Retinal

(C) Transducin and Retinene

(D) Opsin and Retinol

Explanation:

Retinal is also known as retinaldehyde. It was originally called retinene, and renamed afterwards it was discovered to be vitamin A aldehyde. Retinal is one of the many forms of vitamin A (the number of which varies from species to species). Retinal is a polyene chromophore, bound to proteins called opsins, and is the chemical basis of animal vision.

Question 134.

Which of the following pairs of hormones are not antagonistic (having opposite effects) to each other?

[4 Marks]

(A) Parathormone – Calcitonin

(B) Insulin – Glucagon

(C) Aldosterone – Atrial Natriuretic Factor

(D) Relaxin – Inhibin

Explanation:

Calcitonin exerts its effects by interacting with target cells, primarily in bone and kidney. The actions of PTH and calcitonin are antagonistic on bone resorption but synergistic on decreasing the renal tubular reabsorption of phosphorus. Insulin and glucagon work synergistically to keep blood glucose concentrations normal. An elevated blood glucose concentration results in the secretion of insulin and glucose is transported into body cells. Aldosterone secretion may be inhibited by potassium depletion, inhibitors of the renin-angiotensin system, dopamine and atrial natriuretic factor. The latter appears to be an important physiological regulator of aldosterone secretion. ANF inhibits basal, ACTH, Angiotensin II and potassium-stimulated aldosterone production in vitro by a direct action on the adrenal gland. Inhibin is a hormone secreted by granulosa cells of the ovary which inhibit the secretion of FSH (Follicle Stimulating Hormone) whereas relaxin produced by ovary and placenta and the childbirth to softens the ligament in the pelvis and widens the cervix.

Question 135.

Changes in GnRH pulse frequency in females is controlled by circulating levels of

[4 Marks]

(A) estrogen and inhibin

(B) estrogen and progesterone

(C) progesterone only

(D) progesterone and inhibin

Explanation:

At the pituitary, GnRH stimulates the synthesis and secretion of the gonadotropins, follicle-stimulating hormone (FSH), and luteinizing hormone (LH). These processes are controlled by the size and frequency of GnRH pulses, as well as by feedback from progesterone and estrogens. Low-frequency GnRH pulses are required for FSH release, whereas high-frequency GnRH pulses stimulate LH pulses in a one-to-one manner.

Question 136.

Identify the correct statement on ‘inhibin’

[4 Marks]

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

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

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

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

Explanation:

In both females and males, inhibin inhibits FSH production. In females, FSH stimulates the secretion of inhibin from the granulosa cells of the ovarian follicles in the ovaries. In turn, inhibin suppresses FSH. In males, androgens stimulate inhibin production. It is secreted from the Sertoli cells, located in the seminiferous tubules inside the testes.

Question 137.

Seed formation without fertilization in flowering plants involves the process of:

[4 Marks]

(A) Sporulation

(B) Budding

(C) Somatic hybridisation

(D) Apomixis

Explanation:

Apomixis is defined as the asexual formation of seed from the maternal tissues of the ovule, avoiding the process of meiosis and fertilisation, leading to the development of the embryo.

Question 138.

Which one of the following statements is not true?

[4 Marks]

(A) Stored pollen in liquid nitrogen can be used in the crop breeding programmes

(B) Exine of pollen grains is made up of sporopollenin

(C) Pollen grains of many species cause severe allergies

(D) Tapetum helps in the dehiscence of anther

Explanation:

Tapetum is important for the nutrition and development of pollen grains, as well as a source of precursors for the pollen coat.

Question 139.

Which of the following statements is not correct?

[4 Marks]

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

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

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

(D) 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.

Explanation:

Pollen grains of different species are incomplete so they fail to germinate. If the pollen-stigma interaction is compatible, the pollen grain hydrates and germinate shortly following landing on the stigma.

Question 140.

Fertilization in humans is practically feasible only if

[4 Marks]

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

(B) the ovum and sperms are transported simultaneously to ampullary-isthmic junction of the cervix

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

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

Explanation:

The word *ampulla* is derived from the Latin word ‘flask’. Being the second portion of the fallopian tube, it is the intermediate dilated portion which immediately overlays the ovary. This is the common site of human fertilization as both the ovum and sperm are simultaneously transported here.

Question 141.

Select the incorrect statement:

[4 Marks]

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

(B) LH triggers ovulation in ovary

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

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

Explanation:

Ovulation is the process of the monthly release of the viable oocyte from the ovary between the time of menarche and menopause. During this time, there is a surge in the production of LH and FSH, termed as gonadotropins, thereby initiating estradiol and progesterone secretion from the ovary. Both the hormones are play an important in the menstrual cycle.

Question 142.

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

[4 Marks]

(A) It can be used for detection of Cleft palate

(B) It can be used for detection of Down syndrome

(C) It is used for prenatal sex determination

(D) It is usually done when a woman is between 14–16 weeks pregnant.

Explanation:

Amniocentesis (also referred to as amniotic fluid test or AFT) is a medical procedure used in prenatal diagnosis of chromosomal abnormalities and fetal infections, and also used for sex determination in which a small amount of amniotic fluid, which contains fetal tissues, is sampled from the amniotic sac. Cleft palate is a developmental abnormality which can only be detected by sonography.

Question 143.

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

[4 Marks]

(A) Hormonal contraceptives — Prevent/retard entry of sperms, prevent ovulation and fertilization

(B) Vasectomy — Prevents spermatogenesis

(C) Barrier methods — prevent fertilization

(D) Intra uterine devices — Increase phagocytosis of sperms, suppress sperm motility and fertilizing capacity of sperms

Explanation:

Vasectomy is a surgical procedure for male sterilization or permanent contraception. During the procedure, the male vas deferens are severed and then tied or sealed in a manner so as to prevent sperm from entering into the seminal stream (ejaculate) and thereby prevent fertilization.

Question 144.

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

[4 Marks]

(A) 3 : 1 :: Tall : Dwarf

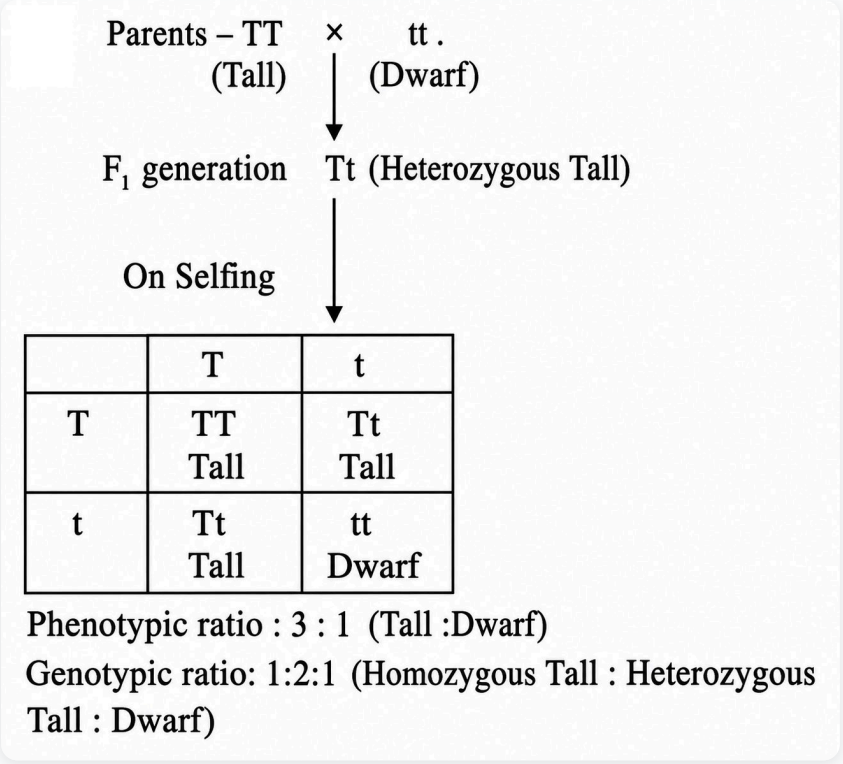
(B) 3 : 1 :: Dwarf : Tall

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

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

Explanation:

.



	T	t
T	TT Tall	Tt Tall
t	Tt Tall	tt Dwarf

Phenotypic ratio : 3 : 1 (Tall :Dwarf)
Genotypic ratio: 1:2:1 (Homozygous Tall : Heterozygous Tall : Dwarf)

Question 145.

In a testcross involving F, dihybrid flies, more parental type offspring were produced than the recombinant type offspring.

This indicates

[4 Marks]

(A) the two genes are linked and present on the same chromosome.

(B) chromosomes failed to separate during meiosis.

(C) the two genes are located on two different chromosomes.

(D) both of the characters are controlled by more than one gene.

Explanation:

When two genes in a dihybrid cross are situated on the same chromosome, the proportion of parental gene combinations are much higher than the non-parental or recombinant type. This is also called incomplete linkage.

Question 146.

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

[4 Marks]

(A) Polyteny

(B) Somaclonal variation

(C) Polyploidy

(D) Aneuploidy

Explanation:

This phenomenon is known as polyploidy, wherein the cells contain more than two paired (homologous) sets of chromosomes. Polyploidy is often seen in the case of plants. The major cause of polyploidy is the non-disjunction of sister chromatids during meiotic recombination. This condition is actually useful in development of new crop varieties.

Question 147.

Which of the following most appropriately describes haemophilia?

[4 Marks]

(A) Chromosomal disorder

(B) X-linked recessive gene disorder

(C) Dominant gene disorder

(D) Recessive gene disorder

Explanation:

Haemophilia A and haemophilia B are inherited in an X-linked recessive pattern. The genes associated with these conditions are located on the X chromosome, which is one of the two sex chromosomes. In males (who have only one X chromosome), one altered copy of the gene in each cell is sufficient to cause the condition. In females (who have two X chromosomes), a mutation would have to occur in both copies of the gene to cause the disorder. Because it is unlikely that females will have two altered copies of this gene, it is very rare for females to have haemophilia. A characteristic of X-linked inheritance is that fathers cannot pass X-linked traits to their sons.

Question 148.

Pick out the correct statements:

(1) Haemophilia is a sex-linked recessive disease

(2) Down’s syndrome is due to aneuploidy

(3) Phenylketonuria is an autosomal recessive gene disorder

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

[4 Marks]

(A) (1) and (4) are correct

(B) (2) and (4) are correct

(C) (1), (3) and (4) are correct

(D) (1), (2) and (3) are correct

Explanation:

Sickle cell disease is inherited in an autosomal recessive pattern.

Question 149.

A complex of ribosomes attached to a single strand of RNA is known as

[4 Marks]

(A) Polysome

(B) Polymer

(C) Polypeptide

(D) Okazaki fragment

Explanation:

A polysome or polyribosome is a complex of an mRNA molecule and two or more ribosomes, which is formed during the active translation process. They were initially named as ergosomes in 1963. However, further research by Jonathan Warner and Alex Rich characterized polysomes.

Question 150.

Which one of the following is the starter codon?

[4 Marks]

(A) AUG

(B) UGA

(C) UAA

(D) UAG

Explanation:

The startcodon is the first codon of a messenger RNA (mRNA) transcript translated by a ribosome. The start codon always codes for methionine in eukaryotes and a modified Met (fMet) in prokaryotes. The most common start codon is AUG.

Question 151.

Which of the following is required as inducer(s) for the expression of Lac operon?

[4 Marks]

(A) Lactose and galactose

(B) Lactose

(C) Glucose

(D) Galactose

Explanation:

Lac operon is an inducible operon. Lactose is the substrate for the enzyme beta-galactosidase and it also regulates switching on and off of the operon. Hence, it is termed as inducer. Inducer functions by disabling repressors. The gene is expressed because an inducer binds to the repressor. The binding of the inducer to the repressor prevents the repressor from binding to the operator. RNA polymerase can then begin to transcribe structural genes.

Question 152.

Which of the following is not required for any of the techniques of DNA fingerprinting available at present ?

[4 Marks]

(A) Zinc finger analysis

(B) Polymerase chain reaction

(C) Restriction enzymes

(D) DNA-DNA hybridization

Explanation:

Zinc-finger analysis is used for protein analysis. The zinc finger proteins are a super family of proteins involved in numerous activities of plant growth and development.

Question 153.

Which of the following structures is homologus to the wing of a bird?

[4 Marks]

(A) Flipper of Whale

(B) Hind limb of Rabbit

(C) Dorsal fin of a Shark

(D) Wing of a Moth

Explanation:

Wings of a bird and flippers of a whale are modified forelimbs.

Question 154.

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?

[4 Marks]

(A) (B) is correct but (A) is false.

(B) (A) is correct but (B) is false.

(C) Both (A) and (B) are correct.

(D) Both (A) and (B) are false.

Explanation:

Both statements are correct because primitive atmosphere was reducing and chlorophyll appeared later on. Chemoautotrophs were the first autotrophic organisms unable to perform photolysis of water and never released oxygen.

Question 155.

Analogous structures are a result of

[4 Marks]

(A) Stabilizing selection

(B) Shared ancestry

(C) Convergent evolution

(D) Divergent evolution

Explanation:

Analogous structures are those that have the same function, but they are not derived from a common ancestor and have undergone different patterns of development i.e., Convergent evolution which is natural selection that favors the same type of structure in different ancestors.

Question 156.

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

[4 Marks]

(A) auto-immune disease

(B) active immunity

(C) graft rejection

(D) allergic response

Explanation:

An autoimmune disease is a pathological state arising from an abnormal immune response of the body to substances and tissues that are normally present in the body.

Question 157.

Antivenom injection contains preformed antibodies while polio drops that are administered into the body contain

[4 Marks]

(A) Gamma globulin

(B) Attenuated pathogens

(C) Harvested antibodies

(D) Activated pathogens

Explanation:

Oral Polio Vaccine consists of a mixture of attenuated (weakened) poliovirus strains of all three poliovirus types.

Question 158.

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

[4 Marks]

(A) Mutations inactivate the cell control.

(B) Mutations inhibit production of telomerase.

(C) Mutations destroy telomerase inhibitor.

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

Explanation:

Telomerase production is increased in cancer. Telomerase has been examined in hundreds of studies as a potentially sensitive biomarker for screening, early cancer detection, prognosis or in monitoring as an indication of residual disease.

The enzyme telomerase adds TTAGGG repeats onto mammalian telomeres, which prevents their shortening. The activation of telomerase in malignant cancers seems to be an important step in tumorigenesis, whereby the cell gains the ability of indefinite proliferation to become immortal.

Question 159.

A system of rotating crops with legume or grass pasture to improve soil structure and fertility is called

[4 Marks]

(A) Strip farming

(B) Shifting agriculture

(C) Contour farming

(D) Ley farming

Explanation:

The growing of grass or legumes in rotation with grain or tilled crops as a soil conservation measure is called Ley farming.

Question 160.

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

[4 Marks]

(A) Flower

(B) Leaf

(C) Stem

(D) Root

Explanation:

Meloidogyne incognita is a nematode (roundworm) in the family Heteroderidae. It is commonly called the “southern root-knot nematode” or the “cotton root-knot nematode”.

Question 161.

Which of the following is wrongly matched in the given table?

[4 Marks]

(A) Microbe-Trichoderma polysporum; Product- Cyclosporin A; Application- immuno-suppressive drug

(B) Microbe-Monascus purpureus; Product- Statins; Application- lowering of blood cholesterol

(C) Microbe-Streptococcus; Product- Streptokinase; Application- removal of clot from blood vessel

(D) Microbe-Clostridium butylicum; Product-Lipase; Application- removal of oil stains

Explanation:

Clostridium butylicum is used for butyric acid production.

Question 162.

The primitive prokaryotes responsible for the production of biogas from the dung of ruminant animals, include the

[4 Marks]

(A) Thermoacidophiles

(B) Halophiles

(C) Eubacteria

(D) Methanogens

Explanation:

Methanogens are microorganisms that produce methane as a metabolic byproduct in anoxic conditions. They are obligate anaerobic ancient and primitive bacteria. They are involved in methanogenesis.

Question 163.

Which of the following is not a feature of the plasmids?

[4 Marks]

(A) Independent replication

(B) Circular structure

(C) Transferable

(D) Single-stranded

Explanation:

Plasmid is an extra chromosomal, double-stranded circular DNA.

Question 164.

The taq polymerase enzyme is obtained from

[4 Marks]

(A) Pseudomonas putida

(B) Thermus aquaticus

(C) Bacillus subtilis

(D) Thiobacillus ferroxidans

Explanation:

The *Taq* polymerase enzyme is obtained from *Thermus aquaticus* which lives in hot springs.

Question 165.

Which of the following is a restriction endonuclease?

[4 Marks]

(A) DNase I

(B) Hind II

(C) Protease

(D) RNase

Explanation:

A restriction enzyme or restriction endonuclease is an enzyme that cuts DNA at or near specific recognition nucleotide sequences known as restriction sites. Hind II among these is a type of restriction endonuclease.

Question 166.

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

[4 Marks]

(A) Stem

(B) Root

(C) Flower

(D) Leaf

Explanation:

Meloidogyne incognita is a nematode (roundworm) in the family Heteroderidae. It is commonly called the “southern root-knot nematode” or the “cotton root-knot nematode”.

Question 167.

Gause’s principle of competitive exclusion states that:

[4 Marks]

(A) larger organisms exclude smaller ones through competition.

(B) no two species can occupy the same niche indefinitely for the same limiting resources.

(C) competition for the same resources excludes species having different food preferences.

(D) more abundant species will exclude the less abundant species through competition.

Explanation:

Gause's principle of competitive exclusion can be restated to say that no two species can occupy the same niche indefinitely when resources are limiting. Certainly species can and do coexist while competing for some of the same resources. Nevertheless, Gause's theory predicts that when two species coexist on a long-term basis, their niches must not be limited or their niches will always differ in one or more features; otherwise, one species will outcompete the other and the extinction of the second species will inevitably result, a process referred to as competitive exclusion.

Question 168.

When does the growth rate of a population following the logistic model equal zero? The logistic model is given as $dN/dt=rN(1-N/K)$

[4 Marks]

(A) when N/K equals zero.

(B) when death rate is greater than birth rate.

(C) when N nears the carrying capacity of the habitat.

(D) when N/K is exactly one.

Explanation:

In logistic growth model population growth equation is described as $dN/dt=rN[1-N/K]$

N = population density at time t;

r = intrinsic rate of natural increase;

K = carrying capacity When $N/K = 1$; $1 - N/K = 0$

Therefore, $dN/dt=0$

Question 169.

The term ecosystem was coined by

[4 Marks]

(A) E. Haeckel

(B) E. Warming

(C) E.P. Odum

(D) A.G. Tansley

Explanation:

Sir Arthur George Tansley was an English botanist and a pioneer in the science of ecology who coined the term *ecosystem*.

Question 170.

Which of the following is a characteristic feature of cropland ecosystem?

[4 Marks]

(A) Least genetic diversity

(B) Absence of soil organisms

(C) Absence of weeds

(D) Ecological succession

Explanation:

Cropland ecosystem is the largest anthropogenic ecosystem characterized by less diversity and high productivity.

Question 171.

Which of the following would appear as the pioneer organisms on bare rocks?

[4 Marks]

(A) Liverworts

(B) Lichens

(C) Mosses

(D) Green algae

Explanation:

Lichens produce small amounts of carbonic acids from their “roots” and these slowly dissolve the rock, releasing nutrients. Other nutrients are obtained from water-borne or air-borne particles of both organic and inorganic materials. The body of a lichen contains an alga; this is able to photosynthesize sugars, some of which are passed on to the fungal component of the lichen. In return, the alga gets a tiny but significant amount of shelter within the tissues of the lichen.

Question 172.

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

[4 Marks]

(A) Over-exploitation

(B) Alien species invasion

(C) Habitat loss and fragmentation

(D) Co-extinctions

Explanation:

The primary cause of human-induced extinction events is simply human overpopulation of planet Earth. The most important causal anthropogenic activities are habitat destruction and fragmentation.

Question 173.

Which is the National Aquatic Animal of India?

[4 Marks]

(A) Sea-horse

(B) Blue whale

(C) River dolphin

(D) Gangetic shark

Explanation:

River Dolphin is the National Aquatic Animal of India. This mammal is also said to represent the purity of the holy Ganga as it can only survive in pure and fresh water. *Platanista gangetica* has a long pointed snout and also visible teeth in both the upper and lower jaws.

Question 174.

A river with an inflow of domestic sewage rich in organic waste may result in

[4 Marks]

(A) increased population of aquatic food web organisms.

(B) dying of the river very soon due to algal bloom.

(C) an increased production of fish due to biodegradable nutrients.

(D) death of fish due to lack of oxygen.

Explanation:

Domestic sewage rich in organic waste leads to increase in Biological Oxygen Demand, which leads to decrease in D.O. (dissolved oxygen) which leads to death of fishes.

Question 175.

Joint Forest Management Concept was introduced in India during

[4 Marks]

(A) 1960s

(B) 1970s

(C) 1990s

(D) 1980s

Explanation:

Joint Forest Management originated in West Bengal accidentally at the Arabari Forest Range in West Midnapore, near Midnapore town in 1971. After the initial successes in West Bengal and Haryana, the JFM scheme received national importance in the legislation of 1988.

Question 176.

Depletion of which gas in the atmosphere can lead to an increased incidence of skin cancers

[4 Marks]

(A) Ammonia

(B) Methane

(C) Ozone

(D) Nitrous oxide

Explanation:

The ozone layer or ozone shield refers to a region of Earth's stratosphere that absorbs most of the Sun's ultraviolet (UV) radiation. It contains high concentrations of ozone (O_3) relative to other parts of the atmosphere.

Question 177.

Which of the following is not a stem modification?

[4 Marks]

(A) Tendrils of cucumber

(B) Pitcher of Nepenthes

(C) Thorns of citrus

(D) Flattened structure of Opuntia

Explanation:

Pitcher of *Nepenthes* is modified leaf. It helps to trap insects, in insectivorous plants.

Question 178.

A typical fat molecule is made up of:

[4 Marks]

(A) One glycerol and three fatty acid molecules.

(B) One glycerol and one fatty acid molecules

(C) Three glycerol and three fatty acid molecules

(D) Three glycerol molecules and one fatty acid molecule

Explanation:

A typical fat molecule is triglyceride formed by esterification of one glycerol and three fatty acid molecules. The three fatty acids can be of same type or different depending on the type of the fat molecules.

Question 179.

Asthma may be attributed to

[4 Marks]

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

(B) inflammation of the trachea

(C) accumulation of fluid in the lungs

(D) bacterial infection of the lungs

Explanation:

Asthma is an allergic reaction characterised by spasm of bronchial muscles because of effect of histamine by mast cells.

Question 180.

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

[4 Marks]

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

(A) A - (ii) B-(iii) C-(iv) D(i)

(B) A - (iv) B-(iii) C-(i) D(ii)

(C) A - (iv) B-(i) C-(ii) D(iii)

(D) A - (ii) B-(i) C-(iv) D(iii)

Explanation:

A - (ii) B-(iii) C-(iv) D(i)