NEET-UG EXAMINATION PAPER-2012

(Solved)

Time allowed : 3 hours | Maximum Marks : 477

General Instructions :

Read the following instructions carefully and follow them :

i. This question paper contains **120 questions.** All questions are **compulsory.**

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

iii. **Section A** – questions number **1 to 120** 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.

The dimensions of $(\mu_0\varepsilon_0)^{-1/2}$ are

[4 Marks]

(A) $[L^{-1}\ T]$

(B) $[L^{1/2}\ T^{-1/2}]$

(C) $[L\ T^{-1}]$

(D) $[L^{-1/2}\ T^{1/2}]$

Explanation:

$(\mu_0\varepsilon_0)^{-1/2} = 1/\sqrt{(\mu_0\varepsilon_0)} \Rightarrow c$ = speed of light

where ε_0 = permittivity of free space

μ_0 = permeability of free space

So dimensions of $(\mu_0\varepsilon_0)^{-1/2}$ will be $[LT^{-1}]$

Question 2.

A stone is dropped from a height h. It hits the ground with a certain momentum P. If the same stone is dropped from a height 100% more than the previous height, the momentum when it hits the ground will change by:

[4 Marks]

(A) 68%

(B) 41%

(C) 100%

(D) 200%

Explanation:

Momentum P = mv = m√(2gh)
(∵ $v^2 = u^2 + 2gh$; Here u = 0)
When stone hits the ground momentum,
P = m√(2gh)
when same stone dropped from 2h (100% of initial) then momentum,
P′ = m√(2g(2h)) = √2P
50% change in momentum,
(P′ − P) / P × 100%
⇒ (√2P − P) / P × 100% = (√2 − 1) × 100%
⇒ (1.414 − 1) × 100%
⇒ 414 × 100% = 41.4%
Which is changed by 41% of initial.

Question 3.

A car of mass m is moving on a level circular track of radius R. If μs represents the static friction between the road and tyres of the car, the maximum speed of the car in circular motion is given by:

[4 Marks]

(A) √μsmRg

(B) √(Rg / μs)

(C) √(mRg / μs)

(D) $\sqrt{\mu_s Rg}$

Explanation:

For smooth driving maximum speed of car v then,

$mv^2 / R = \mu_s mg$

$v = \sqrt{\mu_s Rg}$

Question 4.

A car of mass **m** starts from rest and accelerates so that the instantaneous power delivered to the car has a constant magnitude $\mathbf{P_o}$. The instantaneous velocity of this car is proportional to:

[4 Marks]

(A) $t/\sqrt{m}$

(B) $t^{-1/2}$

(C) $t^{1/2}$

(D) $t^2 P_0$

Explanation:

Constant power of car $P_0 = F.V = ma.v$

$P_0 = m(dv / dt).v$

$P_0 dt = mvdv$ Integrating

$P_0 \cdot t = mv^2 / 2$

$v = \sqrt{2P_0 t / m}$

$\because P_0$, m and 2 are constant

$\therefore v \propto \sqrt{t}$

At constant power, P = constant

Question 5.

Three masses are placed on the x-axis: 300 g at origin, 500 g at x = 40 cm and 400 g at x = 70 cm. The distance of the centre of mass from the origin is:

[4 Marks]

(A) 40 cm

(B) 45 cm

(C) 50 cm

(D) 30 cm

Explanation:

$X_cm = m_1x_1 + m_2x_2 + m_3x_3 / m_1 + m_2 + m_3$
$X_cm = 300 \times (0) + 500(40) + 400 \times 70 / 300 + 500 + 400$
$X_cm = 500 \times 40 + 400 \times 70 / 1200$
$X_cm = 50 + 70 / 3 = 120 / 3 = 40$ cm

Question 6.

A circular platform is mounted on a frictionless vertical axle. Its radius R = 2 m and its moment of inertia about the axle is 200 kg m^2. It is initially at rest. A 50 kg man stands on the edge of the platform and begins to walk along the edge at the speed of 1 m s^{-1} relative to the ground. Time taken by the man to complete one revolution is:

[4 Marks]

(A) $(3\pi / 2)$ s

(B) π s

(C) 2π s

(D) $(\pi / 2)$ s

Explanation:

According to the conservation of angular momentum,
When no external torque acts on system, the angular momentum does not change.
$L_system = L_{man} + L_platform = constant$
$L_{man} = -L_platform$
$L_{man} = mvR$

where m is mass of man, v is speed of man relative to ground, R is the radius of platform,
$L_platform = I\omega$
where I is moment of inertia, ω is angular velocity.
$\Rightarrow \omega = L_platform / I = - L_{man} / I = -mvR / I$
Speed of man relative to platform is
$v_platform = v - \omega R = v + (mvR / I)R$
$= v[1 + mR^2 / I]$
Time taken by man to complete one revolution is,

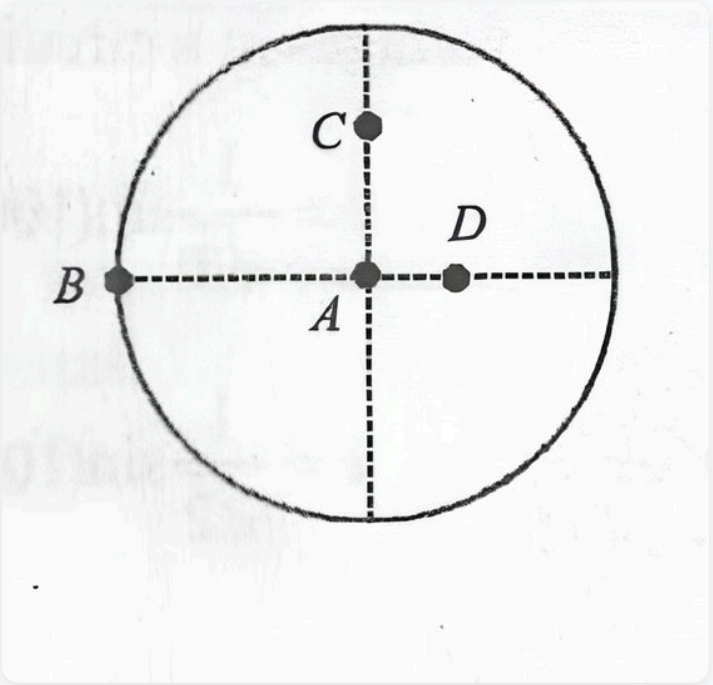
$t = 2\pi R / V_{platform} = 2\pi r / v[1 + mR^2 / I] = 2 \times (2 / 1(1 + 1))\pi$

$\Rightarrow t = 2\pi$ second

Question 7.

The moment of inertia of a uniform circular disc is maximum about an axis perpendicular to the disc and passing through

[4 Marks]



(A) B

(B) C

(C) D

(D) A

Explanation:

According to parallel axis theorem of the moment of Inertia

$I = I_{cm} + md^2$

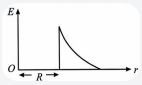
d is maximum for point B so I_{max} about B.

Question 8.

Which one of the following plots represents the variation of gravitational field on a particle with distance r due to a thin spherical shell of radius R? (r is measured from the centre of the spherical shell)

[4 Marks]

(A)



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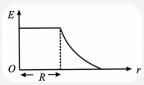

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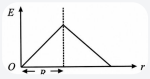
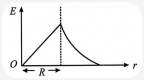


(D)



Explanation:

The Gravitational field due to a thin spherical shell of radius R at distance r.

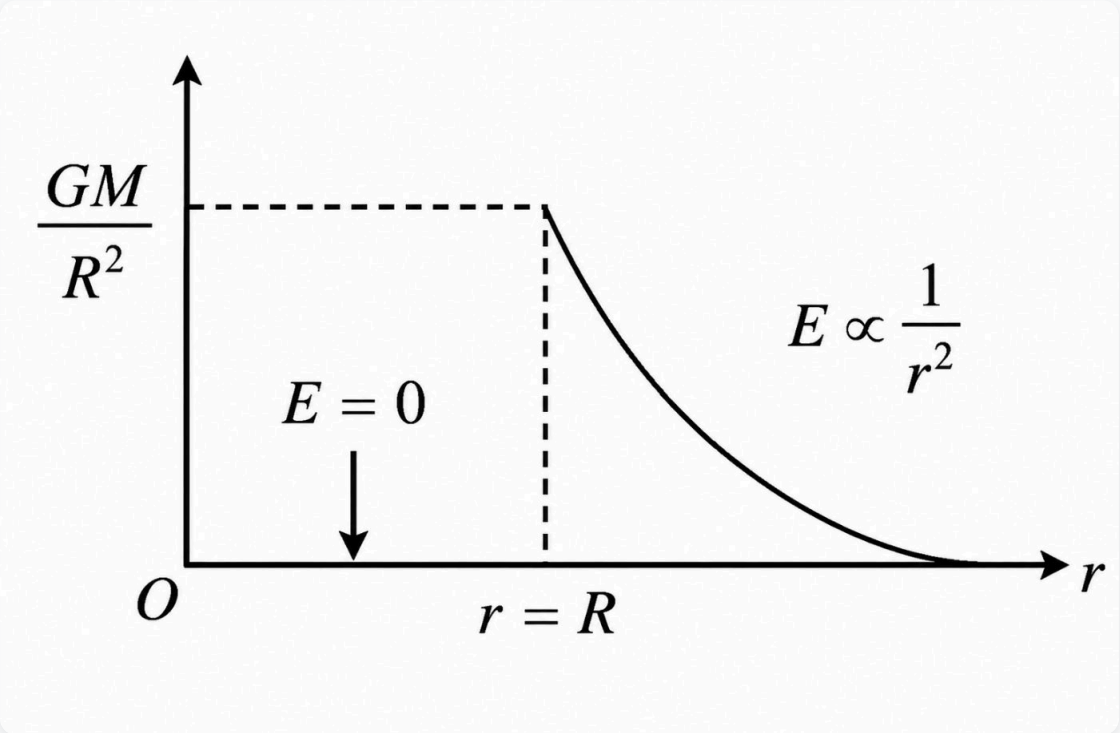
$E = GM / r^2$ (If r > R)

For r = R i.e., on the surface of the shell

$E = GM / R^2$

For r < R i.e., inside the shell

E = 0



Question 9.

If v_e is escape velocity and v_0 is orbital velocity of a satellite for orbit close to the earth's surface, then these are related by :

[4 Marks]

(A) $v_e = \sqrt{2}\, v_0$

(B) $v_e = \sqrt{2} v_0$

(C) $v_0 = v_e$

(D) $v_0 = \sqrt{2}\, v_e$

Explanation:

$v_e = \sqrt{(2GM / R)} \Rightarrow v_0 = \sqrt{(GM / R)}$

$v_e = \sqrt{2}\, v_0$

The orbital velocity of a satellite at a height h above the surface of earth,

$v_0 = \sqrt{(GM / (R + h))} = \sqrt{(gR^2 / (R + h))}$ ($\because GM = gR^2$)

Here, M = mass of earth,

R = radius of earth,

g = acceleration due to If the satellite is very close to the surface of earth gravity earth on surface of then h = 0

$\therefore v_0 = \sqrt{(gR^2 / R)} = \sqrt{gR} = \sqrt{(GM / R)}$

Question 10.

A slab of stone of area 0.36 m^2 and thickness 0.1 m is exposed on the lower surface to steam at 100°C. A block of ice at 0°C rests on the upper surface of the slab. In one hour 4.8 kg of ice is melted. The thermal conductivity of slab is :
(Given latent heat of fusion of ice = 3.36×10^5 J kg^{-1}.)

[4 Marks]

(A) 1.24 J/m/s/°C

(B) 1.29 J/m/s/°C

(C) 2.05 J/m/s/°C

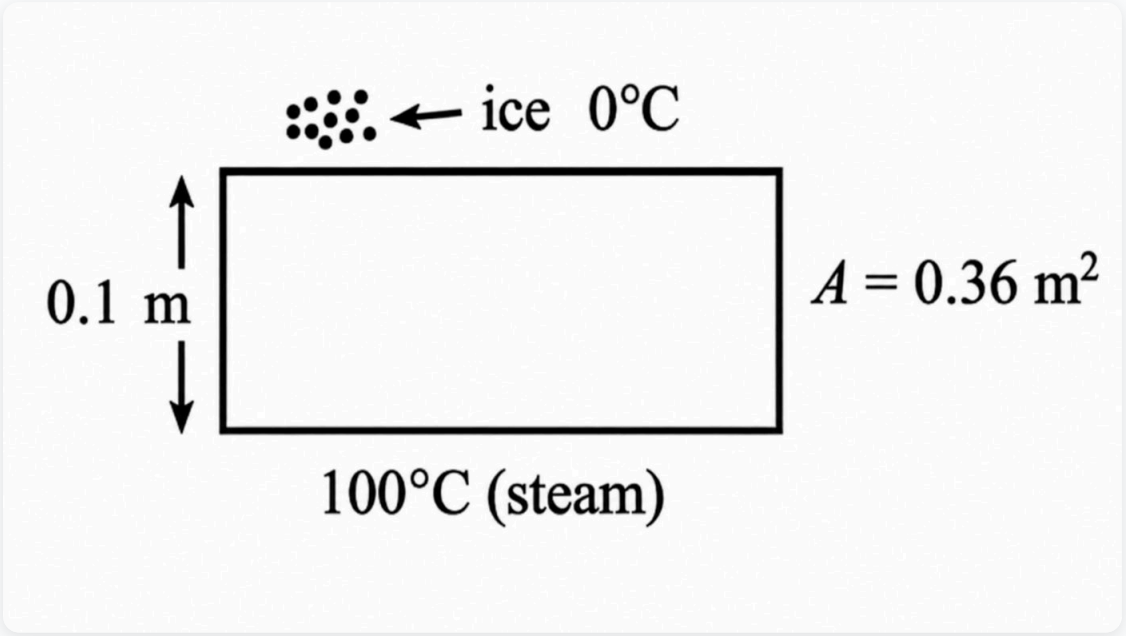
(D) 1.02 J/m/s/°C

Explanation:

According to condition,

Rate of heat given by steam = Rate of heat taken by ice

where K = Thermal conductivity of the slab
m = Mass of the ice
L = Latent heat of melting/fusion
A = Area of the slab
$dQ / dt = KA(100 - 0) / 1 = m(dL / dt)$
$K \times 100 \times 0.36 / 0.1 = 4.8 \times 3.36 \times 10^5 / 60 \times 60$
K = 1.24 J/m/s/°C

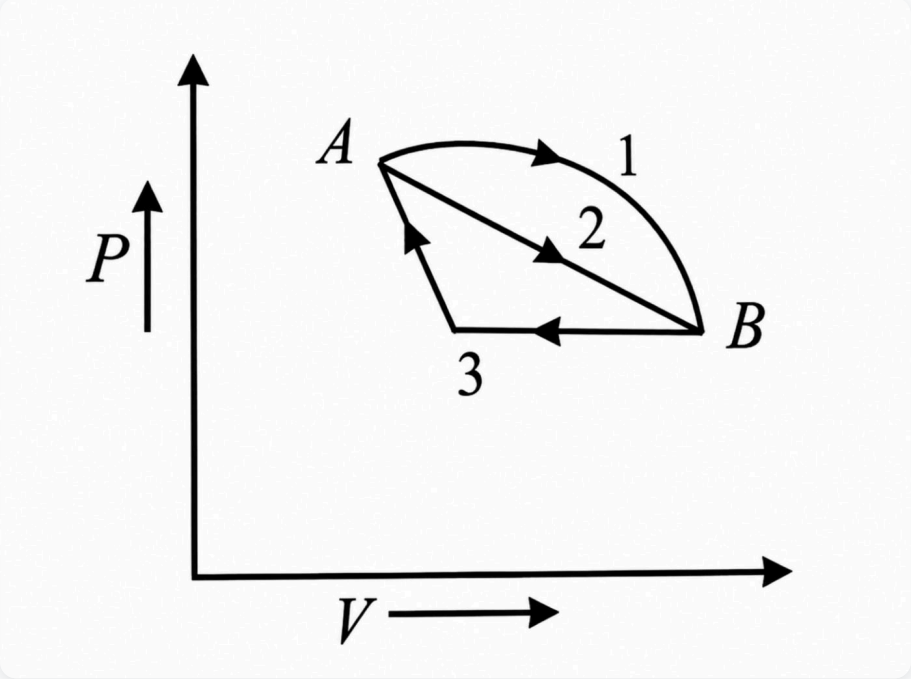


Question 11.

An ideal gas goes from state 4 to state B via three different processes as indicated in the P-V diagram :

If Q_1, Q_2, Q_3 indicate the heat absorbed by the gas along the three processes and ΔU_1, ΔU_2, ΔU_3 indicate the change in internal energy along the three processes respectively, then

[4 Marks]



(A) $Q_1 > Q_2 > Q_3$ and $\Delta U_1 = \Delta U_2 = \Delta U_3$

(B) $Q_3 > Q_2 > Q_1$ and $\Delta U1 > \Delta U_2 > \Delta U_3$

(C) $Q_3 > Q_2 > Q_1$ and $\Delta U_1 = \Delta U_2 = \Delta U_3$

(D) $Q_1 = Q_2 = Q_3$ and $\Delta U_1 > \Delta U_2 > \Delta U_3$

Explanation:

Initial and final condition is same for all process
$\Delta U_1 = \Delta U_2 = \Delta U_3$
from first law of thermodynamics
$\Delta Q = \Delta U + \Delta W$
Work done
$\Delta W_1 > \Delta W_2 > \Delta W_3$ (Area of P.V. graph)
So $\Delta Q_1 > \Delta Q_2 > \Delta Q_3$

Question 12.

The equation of a simple harmonic wave is given by

$y = 3 \sin (\pi/2) (50t - x)$

Where x and y are in meters and t is in seconds. The ratio of maximum particle velocity to the wave velocity is

[4 Marks]

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

(B) (3/2)π

(C) 3π

(D) 2π

Explanation:

$y = 3 \sin (\pi/2) (50t - x)$
$y = 3 \sin (25\pi t - (\pi/2)x)$ on comparing with the standard wave equation
$y = a \sin (\omega t - kx)$
Wave velocity $v = \omega/k = 25\pi/(\pi/2) = 50$ m/sec.
The velocity of particle
$v_p = \partial y/\partial t = 75\pi \cos (25\pi t - (\pi/2)x)$
$v_{p\ max} = 75\pi$
then $v_{p\ max}/v = 75\pi/50 = 3\pi/2$

Question 13.

A train moving at a speed of 220 ms^{-1} towards a stationary object, emits a sound of frequency 1000 Hz. Some of the sound reaching the object gets reflected back to the train as echo. The frequency of the echo as detected by the driver of the train is :
(speed of sound in air is 330 ms^{-1})

[4 Marks]

(A) 3500 Hz

(B) 5000 Hz

(C) 4000 Hz

(D) 3000 Hz

Explanation:

Frequency of the echo detected by the driver of the train is
(According to Doppler effect in sound)
$f' = ((v + u)/(v - u))\ f$
where f = original frequency of source of sound
f′ = Apparent frequency of source because of the relative motion between source and observer.
$f' = ((330 + 220)/(330 - 220))1000 = 5000$ Hz

Question 14.

Two metallic spheres of radii 1 cm and 3 cm are given charges of -1×10^{-2} C and 5×10^{-2} C, respectively. If these are connected by a conducting wire, the final charge on the bigger sphere is :

[4 Marks]

(A) 4×10^{-2} C

(B) 1×10^{-2} C

(C) 3×10^{-2} C

(D) 2×10^{-2} C

Explanation:

At equilibrium potential of both sphere becomes same if charge of sphere one x and other sphere (Q − x) then

where $Q = 4 \times 10^{-2}$ C

$V_1 = V_2$

$kx / 1 \text{ cm} = k(Q - x) / 3 \text{ cm}$

$3x = Q - x \Rightarrow 4x = Q$

$x = Q / 4 = (4 \times 10^{-2} / 4)C = 1 \times 10^{-2}$ C

$Q' = Q - x = 3 \times 10^{-2}$ C

Question 15.

A parallel plate capacitor has a uniform electric field E in the space between the plates. If the distance between the plates is d and area of each plate is A, the energy stored in the capacitor is :

[4 Marks]

(A) (1/2) $\varepsilon_0 E^2 Ad$

(B) $\varepsilon_0 EAd$

(C) $E^2 Ad/\varepsilon_0$

(D) (1/2) $\varepsilon_0 E^2$

Explanation:

The energy stored by a capacitor

$U = (1/2)CV^2$ ...(i)

V is the p.d. between two plates of the capacitor potential difference V = Ed.

The capacitance of the parallel plate capacitor

$C = A\varepsilon_0/d$

Substituting the value of C in equation (i)

$U = (1/2)\ A\varepsilon_0/d\ (Ed)^2 = 1/2\ A\varepsilon_0E^2d$

Question 16.

Cell having an emf ε and internal resistance r is connected across a variable external resistance R. As the resistance R is increased, the plot of potential difference V across R is given by :

[4 Marks]

(A)



(B)



(C)



(D)



Explanation:

The current through the resistance R

$I = (\varepsilon / (R + r))$

The potential difference across R

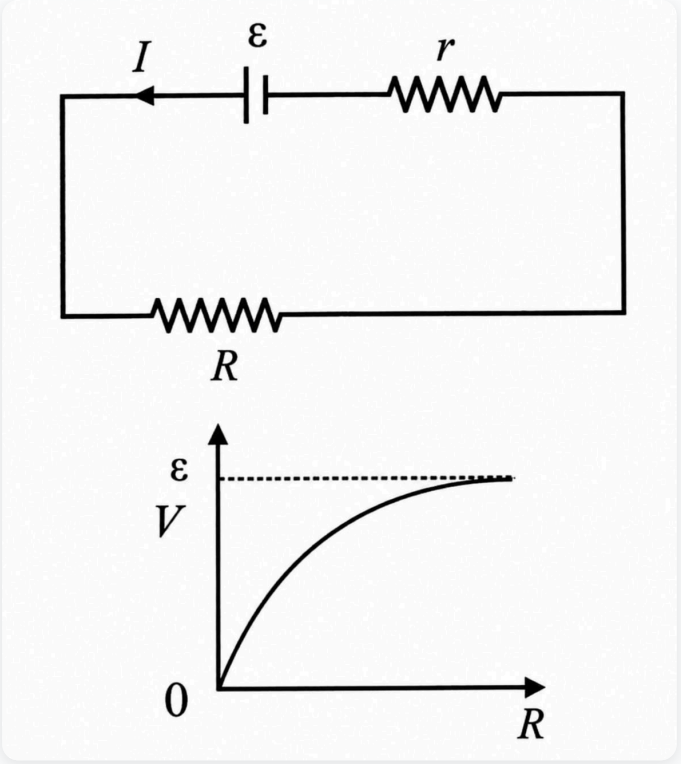
$V = IR = (\varepsilon / (R + r))R$

$V = (\varepsilon / (1 + r / R))$

when R = 0, V = 0,

$R = \infty$, $V = \varepsilon$

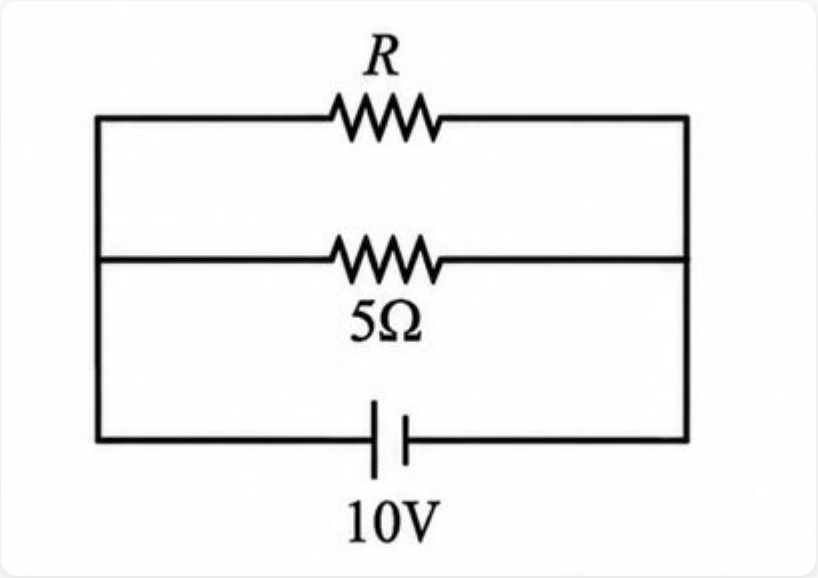
Thus V increases as R increases upto certain limit, but it does not increase further.



Question 17.

The power dissipated in the circuit shown in the figure is 30 Watts. The value of R is:

[4 Marks]



(A) 30 Ω

(B) 10 Ω

(C) 15 Ω

(D) 20 Ω

Explanation:

The power dissipated in the circuit.

$P = V^2 / R_{eq}$ ...(i)

V = 10 volt

$1 / R_{eq} = 1 / R + 1 / 5 = 5 + R / 5R$

$R_{eq} = (5R / 5 + R)$

P = 30 W

Substituting the values in equation (i)

$30 = ((10)^2 / (5R / 5 + R))$

$15R / 5 + R = 10$

$15R = 50 + 10R$

$5R = 50$

$R = 10\ \Omega$

Question 18.

A proton carrying 1 MeV kinetic energy is moving in a circular path of radius R in uniform magnetic field. What should be the energy of an α-particle to describe a circle of same radius in the same field?

[4 Marks]

(A) 4 MeV

(B) 0.5 MeV

(C) 1 MeV

(D) 2 MeV

Explanation:

According to the principal of circular motion in a magnetic field,
$F_c = F_m \Rightarrow mv^2 / R = qVB$
$\Rightarrow R = mv / qB = P / qB = \sqrt{2m.K} / qB$

$R_\alpha = \sqrt{(2(4m)K')} / 2qB$
$R / R_\alpha = \sqrt{(K/K')}$
but $R = R_\alpha$ (given)
Thus $K = K' = 1$ MeV

Question 19.

A magnetic needle suspended parallel to a magnetic field requires √3 J of work to turn it through 60°. The torque needed to maintain the needle in this position will be :

[4 Marks]

(A) (3/2) J

(B) √3 J

(C) 3 J

(D) 2√3 J

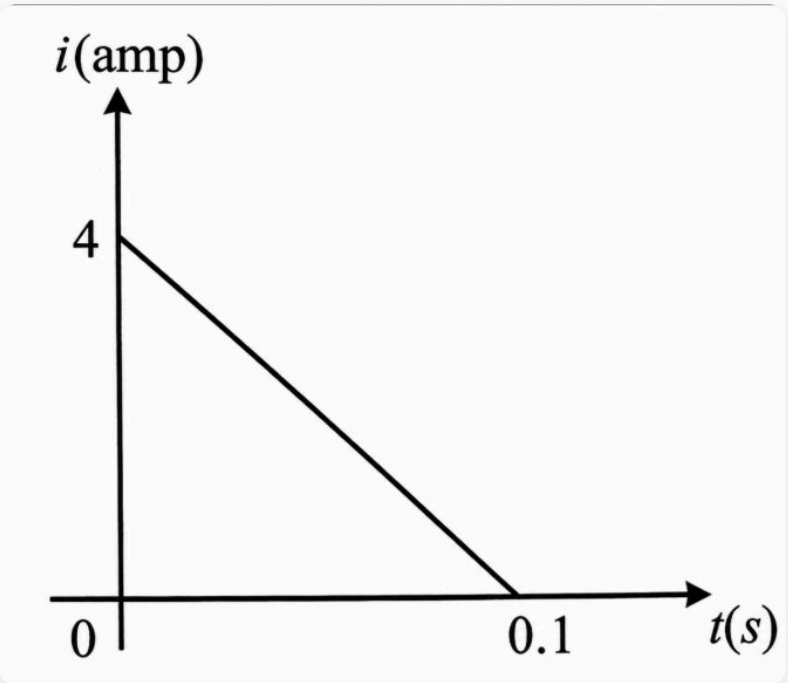
Explanation:

According to work energy theorem
$W = U_{final} - U_{initial} = MB (\cos 0 - \cos 60°)$
$W = MB / 2 = \sqrt{3}J$ ...(i)
τ = □□ × □□ = MB sin 60° =((MB√3) / 2) ...(ii)
From equation (i) and (ii)
$\tau = 2\sqrt{3} \times \sqrt{3} / 2 = 3$ j

Question 20.

In a coil of resistance 10 Ω, the induced current developed by changing magnetic flux through it, is shown in figure as a function of time. The magnitude of change in flux through the coil in Weber is :

[4 Marks]



(A) 6

(B) 2

(C) 4

(D) 8

Explanation:

The charge through the coil = area of current-time (i − t) graph
$q = (1 / 2) \times 0.1 \times 4 = 0.2$ C
$q = \Delta\phi / R \because$ Change in flux $(\Delta\phi) = q \times R$
$q = 0.2 = \Delta\phi / 10$
$\Delta\phi = 2$ Weber

Question 21.

The instantaneous values of alternating current and voltages in a circuit are given as

$i = (1 / \sqrt{2}) \sin(100\pi t)$ ampere

$e = (1 / \sqrt{2}) \sin(100\pi t + \pi / 3)$ Volt

The average power in Watts consumed in the circuit is

[4 Marks]

(A) 1 / 8

(B) √3 / 4

(C) 1 / 4

(D) 1 / 2

Explanation:

The average power in the circuit where cos ϕ = power factory
$\langle P \rangle = V_{rms} \times I_{rms} \cos\phi$
$\phi = \pi / 3$ = phase difference = 180 / 3 = 60
$V_{rms} = (1/\sqrt{2}) / \sqrt{2} = (1 / 2)$ volt
$I_{rms} = (1/\sqrt{2}) / \sqrt{2} = (1 / 2)$ A
$\cos\phi = \cos(\pi / 3) = 1 / 2$
$\langle P \rangle = 1 / 2 \times 1 / 2 \times 1 / 2 = (1 / 8)$W

Question 22.

The ratio of amplitude of magnetic field to the amplitude of electric field for an electromagnetic wave propagating in vacuum is equal to :

[4 Marks]

(A) the ratio of magnetic permeability to the electric susceptibility of vacuum

(B) unity

(C) reciprocal of speed of light in vacuum

(D) the speed of light in vacuum

Explanation:

The average energy stored in the electric field,

$U_E = (1/2)\ \varepsilon_0 E^2$

The average energy stored in the magnetic field = $U_B = (1/2)\ (B^2 / \mu_0)$,

According to conservation of energy $U_E = U_B$

$\varepsilon_0 \mu_0 = B^2 / E^2$

$B / E = \sqrt{(\varepsilon_0 \mu_0)} = 1 / c$

Question 23.

A rod of length 10 cm lies along the principal axis of a concave mirror of focal length 10 cm in such a way that its end closer to the pole is 20 cm away from the mirror. The length of the image is:

[4 Marks]

(A) 2.5 cm

(B) 5 cm

(C) 15 cm

(D) 10 cm

Explanation:

According to the condition,

The focal length of the mirror

$-1 / f = 1 / v + 1 / u$

For A end of the rod the image distance

When $u_1 = -20$ cm

$\Rightarrow -1 / 10 = 1 / v_1 - 1 / 20$

$1 / v_1 = -1 / 10 + 1 / 20 = (-2+1) / 20$

$v_1 = -20$ cm

For when $u_2 = -30$ cm

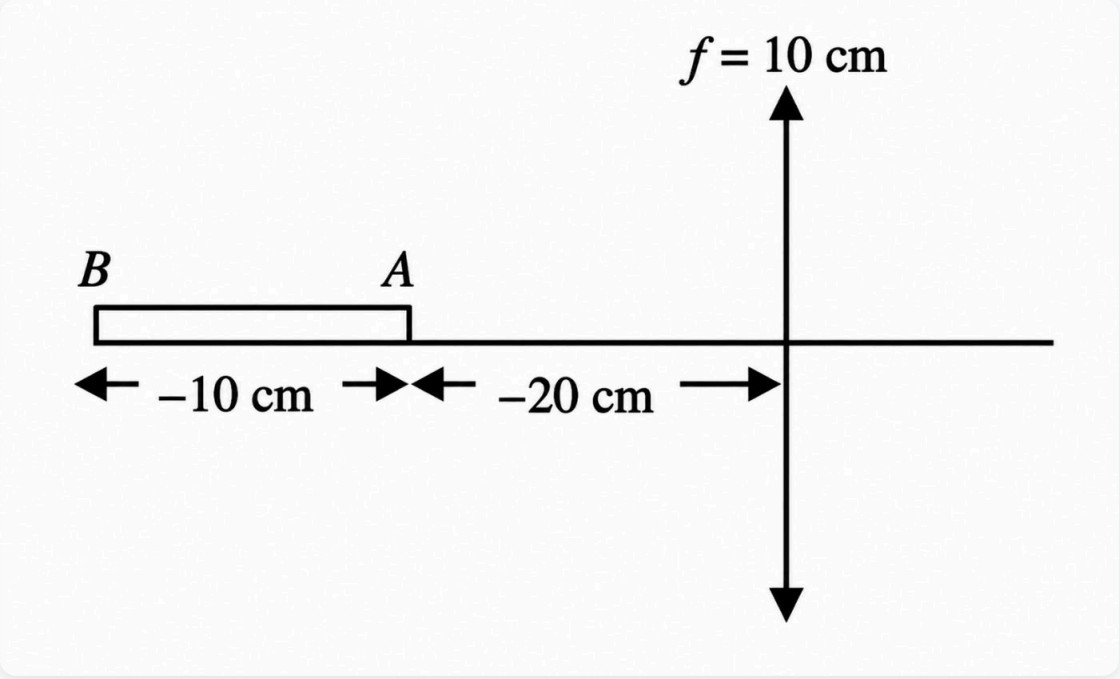
$1 / f = 1 / v_2 - 1 / 30$

$1 / v_2 = -1 / 10 + 1 / 30 = (-30+10) / 300 = -20 / 300$

$v_2 = -15$ cm

$L = v_2 - v_1 = -15 - (-20)$

L = 5 cm



Question 24.

For the angle of minimum deviation of a prism to be equal to its refracting angle, the prism must be made of a material whose refractive index:

[4 Marks]

(A) is greater than 2

(B) lies between √2 and 1

(C) is less than 1

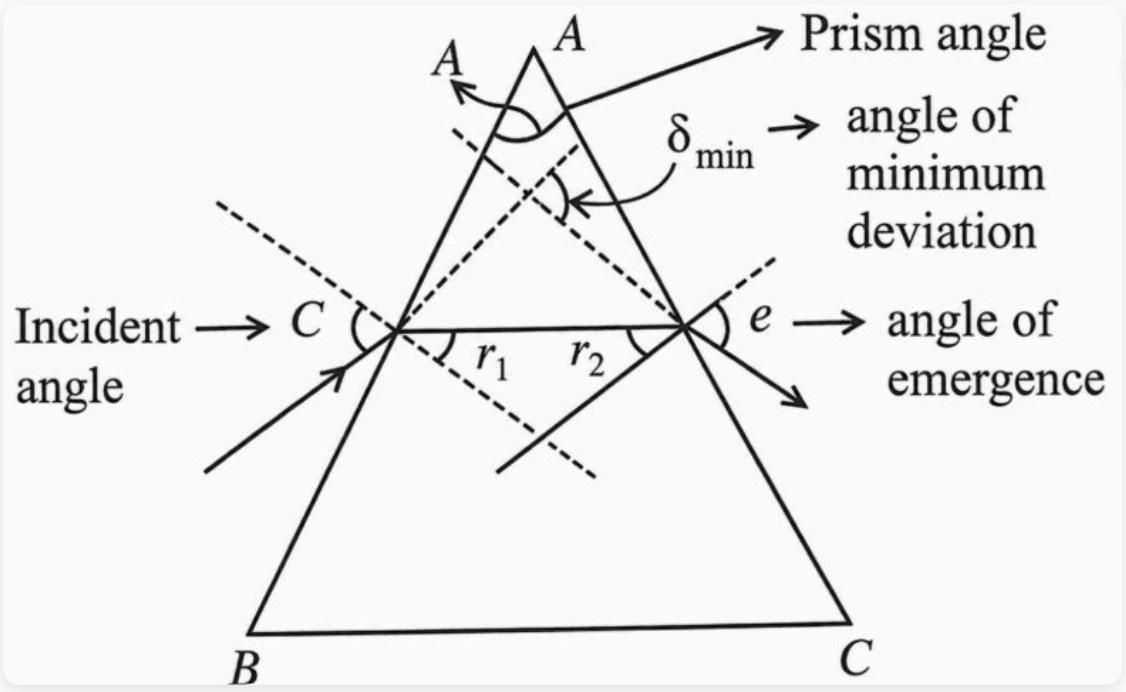
(D) lies between 2 and √2

Explanation:

The angle of minimum deviation is given as

$\delta_{min} = i + e - A$
for minimum deviation

$\delta_{min} = A$ then
$2A = i + e$
in case of δ_{min}, $i = e$
$2A = 2i = r_1 = r_2 = A / 2$
$i = A - 90°$
from Snell's law
$1 \sin i = n \sin r_1$
$\sin A = n \sin (A/2)$
$2 \sin (A / 2)\cos(A / 2) = n \sin (A / 2)$
$2 \cos (A / 2) = n$
when $A = 90° = i_{min}$
then $n_{min} = \sqrt{2}$
$i = A = 0$ $n_{max} = 2$



Question 25.

If the momentum of electron is changed by P, then the de Broglie wavelength associated with it changes by 0.5%. The initial momentum of electron will be:

[4 Marks]

(A) 100 P

(B) P / 200

(C) 400 P

(D) 200 P

Explanation:

The de-Broglie's wavelength associated with the moving electron $\lambda = h / P$
Now, according to problem
$d\lambda / \lambda = -dP / P$
$0.5 / 100 = P / P'$

$P' = 200\ P$

Question 26.

Two radiations of photons energies 1 eV and 2.5 eV, successively illuminate a photosensitive metallic surface of work function 0.5 eV. The ratio of the maximum speeds of the emitted electrons is :

[4 Marks]

(A) 1 : 5

(B) 1 : 4

(C) 1 : 1

(D) 1 : 2

Explanation:

According to Einstein's photoelectric effect, the K.E. of radiated electrons
$K.E_{max} = E - W$
$(1 / 2)mv_1^2 = (1 - 0.5)\ eV = 0.5\ eV$
$(1 / 2)mv_2^2 = (2.5 - 0.5)\ eV = 2\ eV$
$v_1 / v_2 = \sqrt{(0.5 / 2)} = 1 / \sqrt{4} = 1 : 2$

Question 27.

The transition from the state n = 3 to n =1 in a hydrogen like atom results in ultraviolet radiation. Infrared radiation will be obtained in the transition from:

[4 Marks]

(A) 2 → 1

(B) 3 → 2

(C) 4 → 2

(D) 4 → 3

Explanation:

∵ The frequency of the transition $\nu \propto 1 / n^2$, when n = 1, 2, 3.

Question 28.

The half life of a radioactive nucleus is 50 days. The time interval (t_2 - t_1) between the time t_2 when 2 / 3 of it has decayed and the time t_1 when 1 / 3 of it had decayed is :

[4 Marks]

(A) 30 days

(B) 50 days

(C) 60 days

(D) 15 days

Explanation:

$N_1 = N_0 e_{-\lambda t_1}$ $N_1 = (1 / 3) N_0$
$N_0 / 3 = N_0 e_{-\lambda t_2}$
$\Rightarrow 1 / 3 = e_{-\lambda t_2}$ ...(i)
$N_2 = (2 / 3) N_0$
$(2 / 3) N_0 = N_0 e_{-\lambda t_1}$
$\Rightarrow 2 / 3 = e_{-\lambda t_1}$ ...(ii)
Dividing equation (i) by equation (ii)
$1 / 2 = e_{(-\lambda(t_2 - t_1))}$
$\lambda(t_2 - t_1) = \ln 2$
$t_2 - t_1 = \ln 2 / \lambda = T_{1/2} = 50$ days

Question 29.

The input resistance of a silicon transistor is 100 Ω. Base current is changed by 40μA which results in a change in collector current by 2 mA. This transistor is used as a common emitter amplifier with a load resistance of 4 KΩ. The voltage gain of the amplifier is :

[4 Marks]

(A) 1000

(B) 4000

(C) 3000

(D) 2000

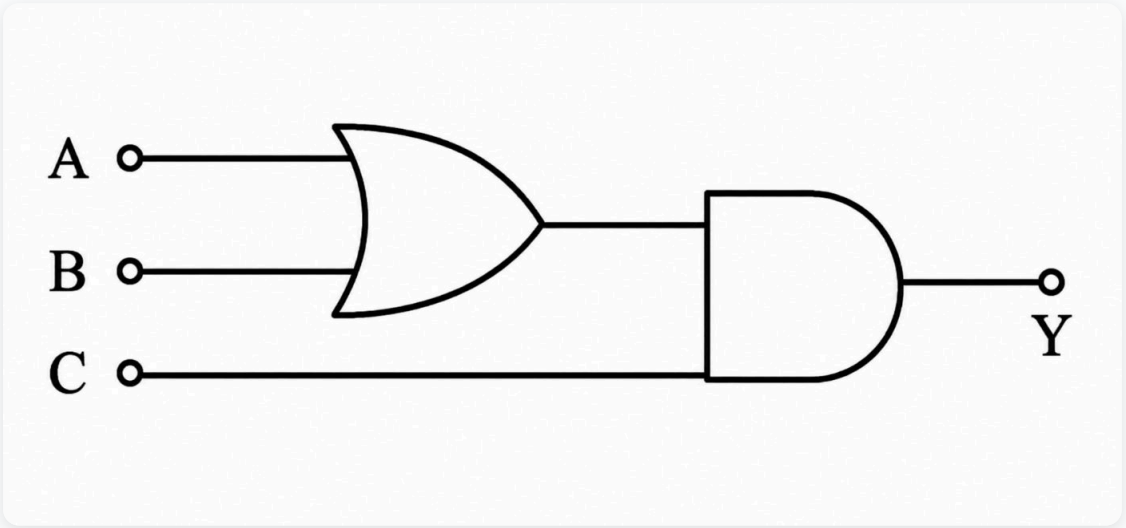
Explanation:

Voltage gain (A_V) = $V_{out} / V_{in} = I_{out} / I_{in} \times R_{out} / R_{in}$
$A_V = (2\times10^{-3} / 40\times10^{-6}) \times (4\times10^{3} / 100) = 2\times100 = 2000$

Question 30.

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

[4 Marks]



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

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

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

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

Explanation:

The Boolean expression for the given combination is output Y = (A + B) · C
Truth table

A B C Y = (A + B) · 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 31.

The orbital angular momentum of p-electron is given as :

[4 Marks]

(A) h / √2 π

(B) √3(h / 2π)

(C) √6 (h / 2π)

(D) √(3/2) (h / π)

Explanation:

Orbital angular momentum

= (h / 2π)√(ℓ(ℓ + 1))

For p orbital ℓ = 1

So, = (h / 2π)√2 = h / √2 π

Question 32.

Four diatomic species are listed below. Identify the correct order in which the bond order is increasing in them:

[4 Marks]

(A) NO < O_2^- < C_2^{2-} < He_2^+

(B) O_2^- < NO < C_2^{2-} < He_2^+

(C) C_2^{2-} < He_2^+ < O_2^- < NO

(D) He_2^+ < O_2^- < NO < C_2^{2-}

Explanation:

Calculating the bond order of various species.

O_2^- : KKσ2s² σ*2s² σ2p²_z

π2p$_x$² π2p²_y π*2p$_x$² π*2p¹_y

B.O. = Number of electrons in bonding − Number of electrons in non-bonding / 2

= 8 − 5 / 2 or 1.5

NO : KK σ2s² σ*2s² π2p$_x$² ≈ π2p²_y σ2p²_z π*2p$_x$¹

B.O. = N_b - N_a / 2 = 8 − 2 / 2 or 2.5

C_2^{2-} : kk σ2s² σ*2s² π2p$_x$² π2p²_y σ2p²_z

B.O. = N_b - N_a / 2 = 8 - 2 / 2 or 3

He_2^+ = σ1s² σ*1s¹

B.O. = N_b - N_a / 2 = 2 - 1 / 2 or 0.5

From these values we find the correct order of increasing

bond order is

$He_2^+ < O_2^- < NO < C_2^{2-}$

Question 33.

During change of O_2 to O_2^- ion, the electron adds on which one of the following orbitals?

[4 Marks]

(A) π* orbital

(B) π orbital

(C) σ* orbital

(D) σ orbital

Explanation:

O_2 = KK(σ2s)² (σ*2s)² (σ2p_z)²
(π2p$_x$)² (π2p_y)² (π*2p$_x$)¹ (π*2p_y)¹
O_2^- = KK(σ2s)² (σ*2s)² (σ2p_z)²
(π2p$_x$)² (π2p_y)² (π*2p$_x$)² (π*2p_y)¹

Question 34.

For real gases, van der Waals equation is written as

$(p + an^2 / V^2)(V - nb) = nRT$

where ‘a’ and ‘b’ are van der Waals constants.
Two sets of gases are :
(I) O_2, CO_2, H_2 and He
(II) CH_4, O_2 and H_2
The gases given in set-I in increasing order of ‘b’ and gases given in set-II in decreasing order of ‘a’, are arranged below. Select the correct order from the following :

[4 Marks]

(A) (I) $He < H_2 < CO_2 < O_2$ (II) $CH_4 > H_2 > O_2$

(B) (I) $O_2 < He < H_2 < CO_2$ (II) $H_2 > O_2 > CH_4$

(C) (I) $H_2 < He < O_2 < CO_2$ (II) $CH_4 > O_2 > H_2$

(D) (I) $H_2 < O_2 < He < CO_2$ (II) $O_2 > CH_4 > H_2$

Explanation:

Set-I : O_2, CO_2, H_2, He for 'b' values

Set-II : CH_4, O_2, H_2, for 'a' values

Value of van der Waals constant 'b' increases with increase in molecular volume. Clearly, the increasing order of molecular volume (size of molecule) is:
$He < H_2 < O_2 < CO_2$
Value of 'a' increases with increase in intermolecular attraction. CH_4 is a polar molecule, thus, it will possess highest value of 'a'. O_2 and H_2, both are non-polar molecules. The van der Waals force $\propto$ molecular mass. Hence, the correct order of value of 'b' is :
$CH_4 > O_2 > H_2$.
From the given options, ((I) $H_2 < He < O_2 < CO_2$ (II) $CH_4 > O_2 > H_2$) is most suitable.

Question 35.

Equal volumes of two monoatomic gases, A and B, at same temperature and pressure are mixed. The ratio of specific heats (C_p / C_v) of the mixture will be :

[4 Marks]

(A) 3.3

(B) 1.67

(C) 1.50

(D) 0.83

Explanation:

For a monoatomic gas
$C_v = (3 / 2)R$
$\therefore C_p = (3 / 2)R + R = (5 / 2)R$
$C_p / C_v = ((5 / 2)R / (3 / 2)R) = 5 / 3 = 1.67$

Question 36.

Given that the equilibrium constant for the reaction $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$ has a value of 278 at a particular temperature. What is the value of the equilibrium constant for the following reaction at the same temperature ?
$SO_3(g) \rightleftharpoons SO_2(g) + (1 / 2)\ O_2(g)$

[4 Marks]

(A) 1.8×10^{-3}

(B) 3.6×10^{-3}

(C) 1.3×10^{-5}

(D) 6.0×10^{-2}

Explanation:

$2SO_2 + O_2 \rightleftharpoons 2SO_3$ K = 278 (given)
$SO_3 \rightleftharpoons SO_2 + (1 / 2)\ O_2$ K' = $\sqrt{(1 / K)}$
$= \sqrt{(1 / 278)} = 6 \times 10^{-2}$

Question 37.

Given the reaction between 2 gases represented by A_2 and B_2 to give the compound AB(g).
$A_2(g) + B_2(g) \rightleftharpoons 2AB(g)$
At equilibrium, the concentration
of $A_2 = 3.0 \times 10^{-3}$ M
of $B_2 = 4.2 \times 10^{-3}$ M
of AB = 2.8×10^{-3} M
If the reaction takes place in a sealed vessel at 527°C, then the value of K_c will be :

[4 Marks]

(A) 1.9

(B) 2.0

(C) 0.62

(D) 4.5

Explanation:

$A_2 + B_2 \rightleftharpoons 2AB$; $K_c = [AB]^2 / [A_2][B_2]$
$K_c = (2.8 \times 10^{-3})^2 / 3 \times 10^{-3} \times 4.2 \times 10^{-3}$
$= (2.8)^2 / 3 \times 4.2$
$= 0.62$

Question 38.

Standard reduction potentials of the half reactions are given below :
$F_2(g) + 2e^- \rightarrow 2F^-(aq)$; $E° = +2.85$ V
$Cl_2(g) + 2e^- \rightarrow 2Cl^-(aq)$; $E° = +1.36$ V
$Br_2(l) + 2e^- \rightarrow 2Br^-(aq)$; $E° = +1.06$ V
$I_2(s) + 2e^- \rightarrow 2I^-(aq)$; $E° = +0.53$ V
The strongest oxidising and reducing agents respectively are :

[4 Marks]

(A) F_2 and I^-

(B) Br_2 and Cl^-

(C) Cl_2 and Br^-

(D) Cl_2 and I_2

Explanation:

F_2 is the strongest oxidising agent as it has highest reduction potential while I^- is the strongest reducing agent since it has lowest reduction potential.

Question 39.

Which of the following reagents will be able to distinguish between 1-butyne and 2-butyne?

[1 Marks]

(A) $NaNH_2$

(B) Br_2

(C) O_2

(D) HCl

Explanation:

1-Butyne and 2-butyne are distinguished by $NaNH_2$ because 1-Butyne react with $NaNH_2$ due to presence of terminal hydrogen.

$CH_3—CH_2—C≡CH + NaNH_2$

1–Butyne

$\rightarrow CH_3CH_2—C≡CNa + NH_3$

Question 40.

Structure of a mixed oxide is cubic close-packed (c.c.p).The cubic unit cell of mixed oxide is composed of oxide ions. One fourth of the tetrahedral voids are occupied by divalent metal A and the octahedral voids are occupied by a monovalent metal B. The formula of the oxide is:

[4 Marks]

(A) ABO_2

(B) A_2BO_2

(C) $A_2B_3O_4$

(D) AB_2O_2

Explanation:

No. of A^{2+} ions = 1 / 4 × 8 = 2

No. of B^+ ions = 4 × 1 = 4

No. of atoms in ccp,

O^{2-} = 8 × 1 / 8 + 6 × 1 / 2 = 4

Hence the formula of the oxide will be $A_2B_4O_4$ or AB_2O_2.

Question 41.

Vapour pressure of chloroform ($CHCl_3$) and dichloromethane (CH_2Cl_2) at 25°C are 200 mm Hg and 41.5 mm Hg respectively. Vapour pressure of the solution obtained by mixing 25.5 g of $CHCl_3$ and 40 g of CH_2Cl_2 at the same temperature will be : (Molecular mass of $CHCl_3$ = 119.5 u and molecular mass of CH_2Cl_2 = 85 u).

[4 Marks]

(A) 347.9 mmHg

(B) 90.92 mmHg

(C) 173.9 mmHg

(D) 615.0 mmHg

Explanation:

$n_CHCl_3 = 25.5 / 119.5 = 0.213$
$n_CH_2Cl_2 = 40 / 85 = 0.47$
$P_T = P°_A\ X_A + P°_B\ X_B$
$= 200 \times (0.213 / 0.683) + 41.5 \times (0.47 / 0.683)$
$= 62.37 + 28.55 = 90.92$

Question 42.

Molar conductivities ($\Lambda_m°$) at infinite dilution of NaCl, HCl and CH_3COONa are 126.4, 425.9 and 91.0 S $cm^2\ mol^{-1}$ respectively. $\Lambda_m°$ for CH_3COOH will be:

[4 Marks]

(A) 425.5 S $cm^2\ mol^{-1}$

(B) 180.5 S $cm^2\ mol^{-1}$

(C) 290.8 S $cm^2\ mol^{-1}$

(D) 390.5 S $cm^2\ mol^{-1}$

Explanation:

$\Lambda°_CH_3COOH = \Lambda°_CH_3COONa + \Lambda°_HCl - \Lambda°_NaCl$

$= 91 + 425.9 - 126.4 = 390.5$

Question 43.

In which of the following arrangements the given sequence is not strictly according to the property indicated against it?

[4 Marks]

(A) $NH_3 < PH_3 < AsH_3 < SbH_3$: increasing acidic character

(B) $CO_2 < SiO_2 < SnO_2 < PbO_2$: increasing oxidising power

(C) $H_2O < H_2S < H_2Se < H_2Te$: increasing pKa values

(D) HF < HCl < HBr < HI : increasing acidic strength

Explanation:

If acidic nature is high, K_a is high and pK_a is low

	H_2O	H_2S
K_a	1.8×10^{-6}	1.3×10^{-7}
	H_2Se	H_2Te
K_a	1.3×10^{-4}	2.3×10^{-3}

since $pK_a = -\log K_a$

Hence the order of pK_a will be

$H_2O > H_2S > H_2Se > H_2Te$

Question 44.

Which one of the following does not correctly represent the correct order of the property indicated against it?

[4 Marks]

(A) Ti < V < Cr < Mn : increasing number of oxidation states

(B) Ti < V < Cr < Mn : increasing melting points

(C) Ti < V < Mn < Cr : increasing 2nd ionization enthalpy

(D) $Ti^{3+} < V^{3+} < Cr^{3+} < Mn^{3+}$: increasing magnetic moment

Explanation:

The melting points of the transition elements first rise to a maximum and then fall as the atomic number increases, manganese have abnormally low melting points.

Question 45.

Four successive members of the first series of the transition metals are listed below. For which one of them the standard reduction potential ($E°_M^{2+}/M$) value has a positive sign?

[4 Marks]

(A) Co (Z = 27)

(B) Ni (Z = 28)

(C) Fe (Z = 26)

(D) Cu (Z = 29)

Explanation:

$E°_{Cu^{2+}/Cu} = 0.34$ volt,
Other has −ve E°_R.P.
$E°_{Co^{2+}/Co} = -0.28$
$E°_{Ni^{2+}/Ni} = -0.25$
$E°_{Fe^{2+}/Fe} = -0.44$

Question 46.

The catalytic activity of transition metals and their compounds is ascribed mainly to :

[4 Marks]

(A) their unfilled d-orbitals

(B) their magnetic behaviour

(C) their chemical reactivity

(D) their ability to adopt variable oxidation state

Explanation:

The transition metals and their compounds are used as catalysts because of the variable oxidation states. Due to this, they easily absorb and re-emit wide range of energy to provide the necessary activation energy.

Question 47.

Which of the following exhibit only +3 oxidation state ?

[4 Marks]

(A) Th

(B) U

(C) Ac

(D) Pa

Explanation:

Ac (89) = [Rn] [$6d^1$] [$7s^2$]

Question 48.

Red precipitate is obtained when ethanol solution of dimethylglyoxime is added to ammoniacal Ni(II). Which of following statements is not true?

[4 Marks]

(A)

Red complex has a square planar geometry.

(B)

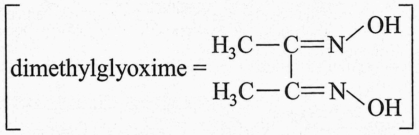
Complex has symmetrical H-bonding

(C)

Red complex has a tetrahedral geometry.

(D)

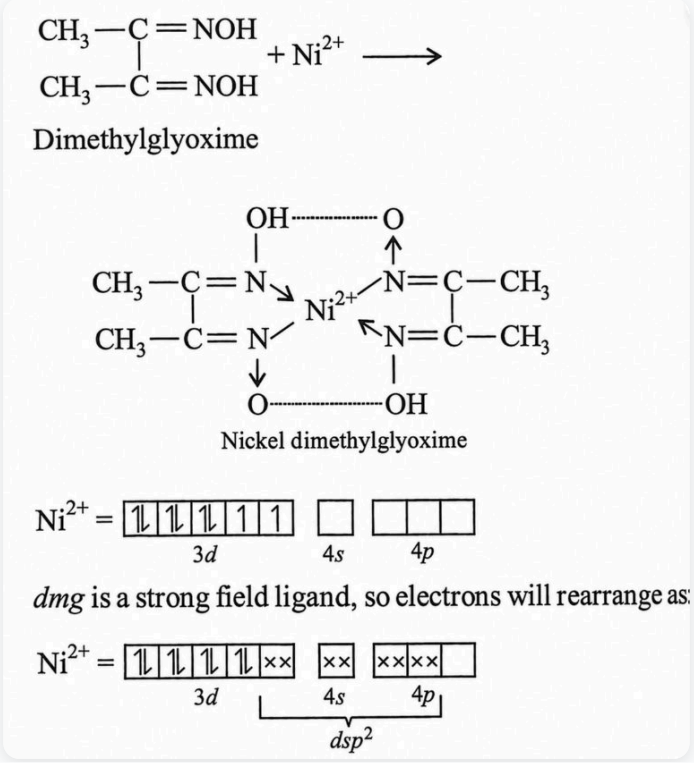
Dimethylglyoxime functions as bidentate ligand.



Explanation:

Nickel ions are frequently detected by the formation of red precipitate of the complex of nickel dimethylglyoxime, when heated with dimethylglyoxime.

Thus, the complex is square plan ar geometry.



Question 49.

Low spin complex of d^6-cation in an octahedral field will have the following pairing energy :

(Δ_0 = Crystal Field Splitting Energy in an octahedral field, P = Electron pairing energy)

[4 Marks]

(A) $(-2/5)\ \Delta_0 + P$

(B) $(-2/5)\ \Delta_0 + 2P$

(C) $(-12/5)\ \Delta_0 + P$

(D) $(-12/5)\ \Delta_0 + 3P$

Explanation:

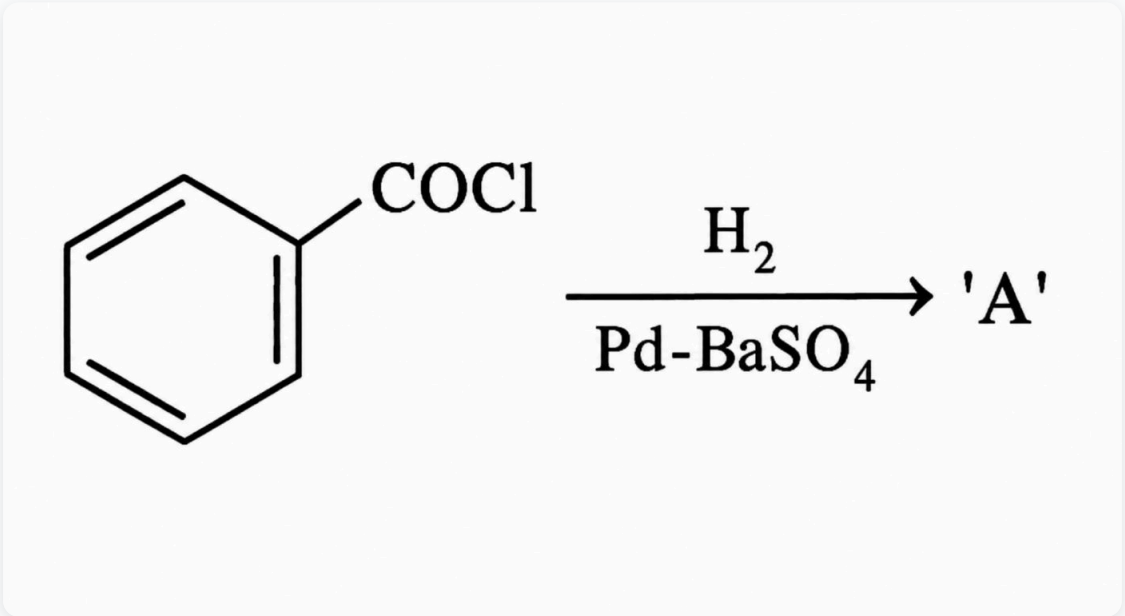
for d^6, $t_{2g}^6\ e_g^0$ (in low spin)
C.F.S.E = $-0.4 \times 6\Delta_0 + 3P = (-12/5)\ \Delta_0 + 3P$
[P is pairing energy for one electron]

Question 50.

Consider the following reaction :

The product 'A' is :

[4 Marks]



(A) C_6H_5OH

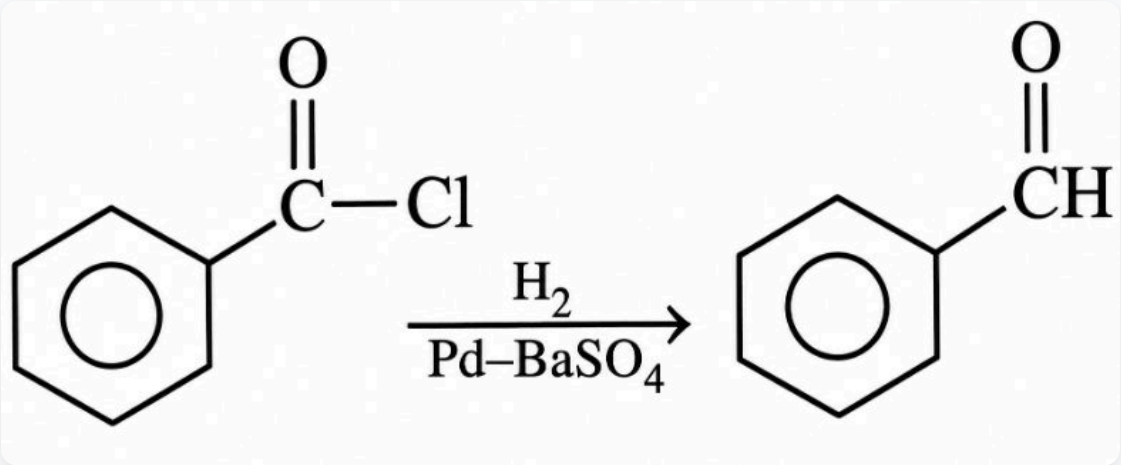
(B) C_6H_5CHO

(C) $C_6H_5COCH_3$

(D) C_6H_5Cl

Explanation:

It is Rosenmund reaction.



Question 51.

Consider the reaction :
$RCHO + NH_2NH_2 \rightarrow RCH = N — NH_2$
What sort of reaction is it ?

[4 Marks]

(A) Electrophilic addition – elimination reaction

(B) Nucleophilic addition – elimination reaction

(C) Electrophilic substitution – elimination reaction

(D) Free radical addition – elimination reaction

Explanation:

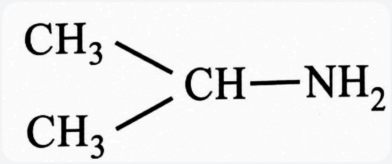
$R — CH = O + H_2N — NH_2 \rightarrow R —CH = N — NH_2$
Such reactions take place in slightly acidic medium and involve nucleophilic addition of the ammonia derivative.

Question 52.

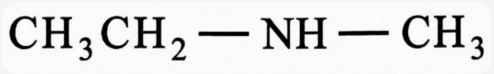
An organic compound (C_3H_9N) (A), when treated with nitrous acid, gave an alcohol and N_2 gas evolved. (A) on warming with $CHCl_3$ and caustic potash gave (C) which on reduction gave isopropylmethylamine. Predict the structure of (A).

[4 Marks]

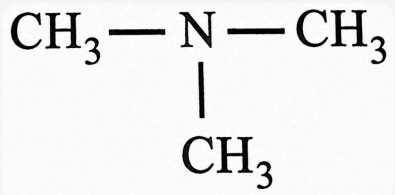
(A)



(B)



(C)



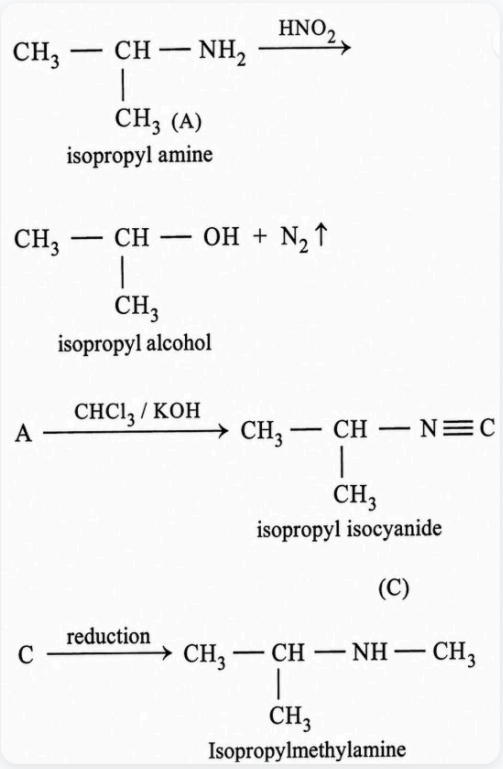
(D)



Explanation:

$R — CH = O + H_2N — NH_2 \rightarrow R — CH = N — NH_2$

Such reactions take place in slightly acidic medium and involve nucleophilic addition of the ammonia derivative.



Question 53.

Which one of the following sets forms the biodegradable polymer?

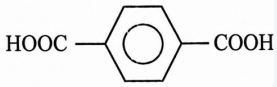
[4 Marks]

(A)

$CH_2=CH-CN$ and $CH_2=CH-CH=CH_2$

(B)

$HO-CH_2-CH_2-OH$ and



(C)



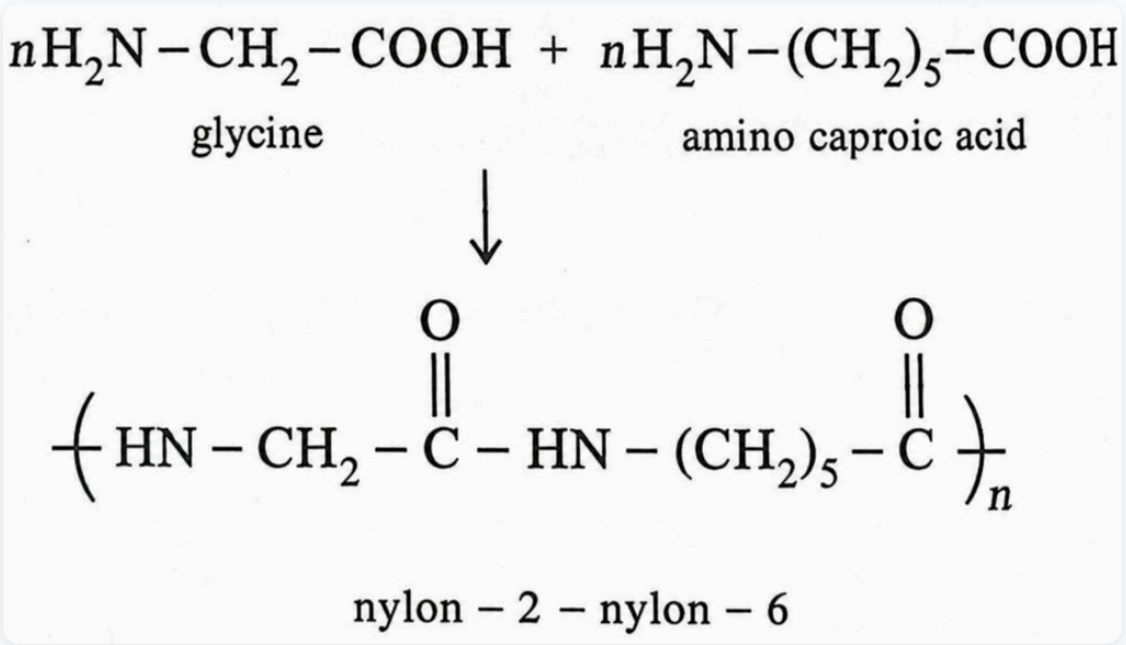
$CH_2=CH-CH=CH_2$

(D)

H_2N-CH_2-COOH and $H_2N-(CH_2)_5-COOH$

Explanation:

Biodegradable polymer is Nylon-2-
Nylon-6 which is copolymer of glycine (H_2N — CH_2 — COOH) and amino caproic acid (H_2N —$(CH_2)_5$ — COOH).



Question 54.

Chloroamphenicol is an :

[4 Marks]

(A) antihistaminic

(B) antifertility drug

(C) antibiotic-broad spectrum

(D) antiseptic and disinfectant

Explanation:

Chloroamphenicol is a broad spectrum antibiotic.

Question 55.

A certain gas takes three times as long to effuse out as helium. Its molecular mass will be :

[4 Marks]

(A) 27u

(B) 36u

(C) 64u

(D) 9u

Explanation:

$r \propto \sqrt{(1 / M)}$

$r_1 / r_2 = \sqrt{(M_2 / M_1)}$

$3r_1 / r_1 = \sqrt{(M_2 / 4)}$

$9 = M_2 / 4$

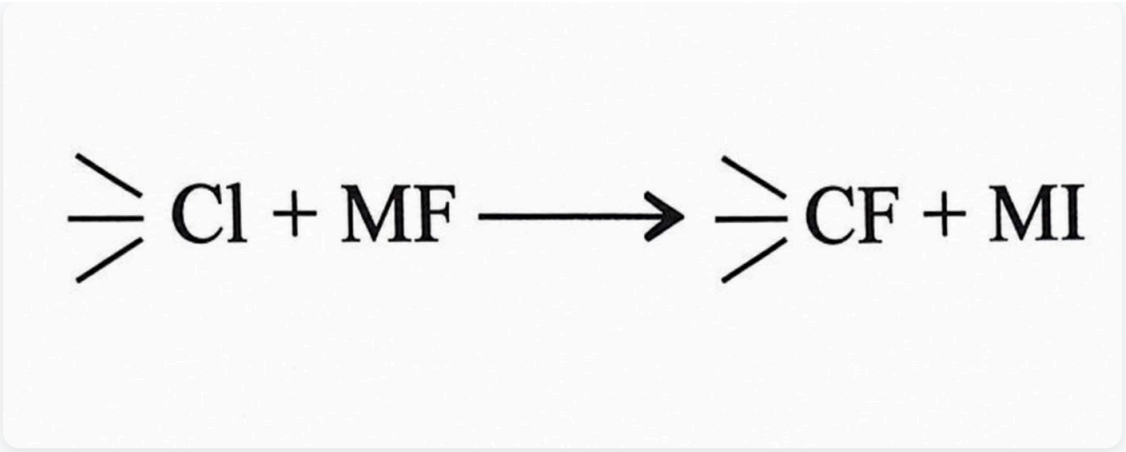
$M_2 = 36$ g/mole

Question 56.

In the replacement reaction

The reaction will be most favourable if M happens to be:

[4 Marks]



(A) Rb

(B) Li

(C) Na

(D) K

Explanation:

Tertiary halide can show ionic reaction with MF so, MF should be most ionic for reaction to proceed forward.
Hence 'M' should be of 'Rb'.

Question 57.

The Gibbs' energy for the decomposition of Al_2O_3 at 500°C is as follows:

$(2 / 3)Al_2O_3 \rightarrow (4 / 3)Al + O_2$; $\Delta_rG = + 960$ kJ mol^{-1}

The potential difference needed for the electrolytic reduction of aluminium oxide (Al_2O_3) at 500°C is at least:

[4 Marks]

(A) 3.0 V

(B) 4.5 V

(C) 5.0 V

(D) 2.5 V

Explanation:

$\Delta G = -nFE°$
for the reaction $n = 2 / 3 \times 2 \times 3 = 4$

$960 \times 10^3 = -4 \times 96500 \times E°$

$E° = -2.5$ volt

So, it needed 2.5 volt for reduction.

Question 58.

Which of the following compounds can be used as antifreeze in automobile radiators?

[4 Marks]

(A) Methyl alcohol

(B) Glycol

(C) Ethyl alcohol

(D) Nitrophenol

Explanation:

Glycol is used as an antifreeze in automobiles.

Question 59.

Which one of the following organisms is scientifically correctly named, according to the International Rules of Nomenclature and correctly described?

[4 Marks]

(A) Musca domestica - The common house lizard, a reptile.

(B) Plasmodium falciparum - A protozoan pathogen causing the most serious type of malaria.

(C) Felis tigris - The Indian tiger, well protected in Gir forests.

(D) E. coli - Full name Entamoeba coli, a commonly occurring bacterium in human intestine.

Explanation:

Plasmodium falciparum—A protozoan pathogen causes the most serious type of malaria that is falciparum malaria.

Musca domestica— House fly, an insect belongs to phylum arthropoda.

Felis tigris — The Bengal tiger, is well protected in Sundarbans (tiger reserve)

E.coli — Escherichia coli, a commonly occurring bacterium in human intestine.

Question 60.

How many organisms in the list given below are autotrophs?
Lactobacillus, Nostoc, Chara, Nitrosomonas, Nitrobacter, Streptomyces, Saccharomyces, Trypanosomes, Porphyra, Wolffia

[4 Marks]

(A) Four

(B) Five

(C) Three

(D) Six

Explanation:

Autotrophs are those organisms that are able to make energy-containing organic molecules from inorganic raw material by using basic sunlight. Nostoc, Chara, Porphyra and Wolffia are photoautotrophs while Nitrosomonas and Nitrobacter are chemoautotrophs.

Question 61.

In the five-kingdom classification, Chlamydomonas and Chlorella have been included in

[4 Marks]

(A) protista

(B) algae

(C) plantae

(D) monera

Explanation:

Chlamydomonas & Chlorella have been included in algae. Algae are chlorophylus, thalloid avascular plants with no cellular differentiation. Algae belong to thallophyta of plant kingdom.

Question 62.

Read the following statements (A-E) and answer the question.

(A) In Equisetum the female gametophyte is retained on the parent sporophyte.
(B) In Ginkgo male gametophyte is not independent.
(C) The sporophyte in Riccia is more developed than that in Polytrichum.
(D) Sexual reproduction in Volvox is isogamous.

(E) The spores of slime molds lack cell walls.

How many of the above statements are correct?

[4 Marks]

(A) Two

(B) Three

(C) Four

(D) One

Explanation:

Statement (a) and (B) are correct

Riccia s a liverwort in which simplest sporophyte consists

of capsule only while Polytrichum is a moss in which sporophyte consists of foot, seta & capsule. Volvox is a fresh water green colonial alga. Reproduction is both sexual and asexual.. Sexual reproduction is oogamous.

Question 63.

Which one of the following pair is wrongly matched?

[4 Marks]

(A) Ginkgo – Archaegonia

(B) Salvinia – Prothallus

(C) Viroids – RNA

(D) Mustard – Synergids

Explanation:

Archegonia are not formed in Ginkgo.

Question 64.

Which one of the following pairs of animals are similar to each other pertaining to the features stated against them?

[4 Marks]

(A) Pteropus and Ornithorhynchus - Viviparity

(B) Garden lizard and Crocodile - Three chambered heart

(C) Ascaris and Ancylostoma - Metameric segmentation

(D) Sea horse and Flying fish - Cold blooded (poikilothermal)

Explanation:

Sea horse and flying fish are cold blooded animals. Ornithorhyncus is oviparous. Crocodile has four chambered heart. Ascaris and Ancylostoma are segmented roundworms.

Question 65.

Which one of the following categories of animals, is correctly described with no signle exception in it?

[4 Marks]

(A) All reptiles possess scales, have a three chambered heart and are cold blooded (poikilothermal).

(B) All bony fishes have four pairs of gills and an operculum on each side.

(C) All sponges are marine and have collared cells.

(D) All mammals are viviparous and possess diaphragm for breathing.

Explanation:

All sponges are marine and have collared cells without any exception. Sponges are animals of the phylum Porifera. They are multicellular organisms which have bodies full of pores and channels allowing water to circulate through them, consisting of jelly-like mesohyl sandwiched between two thin layers of cells.

Question 66.

How many plants in the list given below have marginal placentation?
Mustard, Gram, Tulip, Asparagus, Arhar, Sun hemp, Chilli, Colchicine, Onion, Moong, Pea, Tobacco, Lupin

[4 Marks]

(A) Four

(B) Three

(C) Five

(D) Six

Explanation:

Marginal placentation is a placentation with ovules borne on the wall along the ventral suture of a simple ovary. Gram, Arhar, Sun hemp, Moong, Pea & Lupin belong to fabaceae family that bear marginal placentation.

Question 67.

Which one of the following organisms is correctly matched with its three characteristics?

[4 Marks]

(A) Onion: Bulb, Imbricate aestivation, Axile placentation

(B) Pea: C_3 pathway, Endospermic seed, Vexillary aestivation

(C) Tomato: Twisted aestivation, Axile placentation, Berry

(D) Maize: C_3 pathway, Closed vascular bundles, Scutellum

Explanation:

Onion - Bulb - Underground stems -Imbricate aestivation -Axile placentation - Member of Liliaceae.

Question 68.

As compared to a dicot root, a monocot root has

[4 Marks]

(A) more abundant secondary xylem.

(B) many xylem bundles.

(C) inconspicuous annual rings.

(D) relatively thicker periderm.

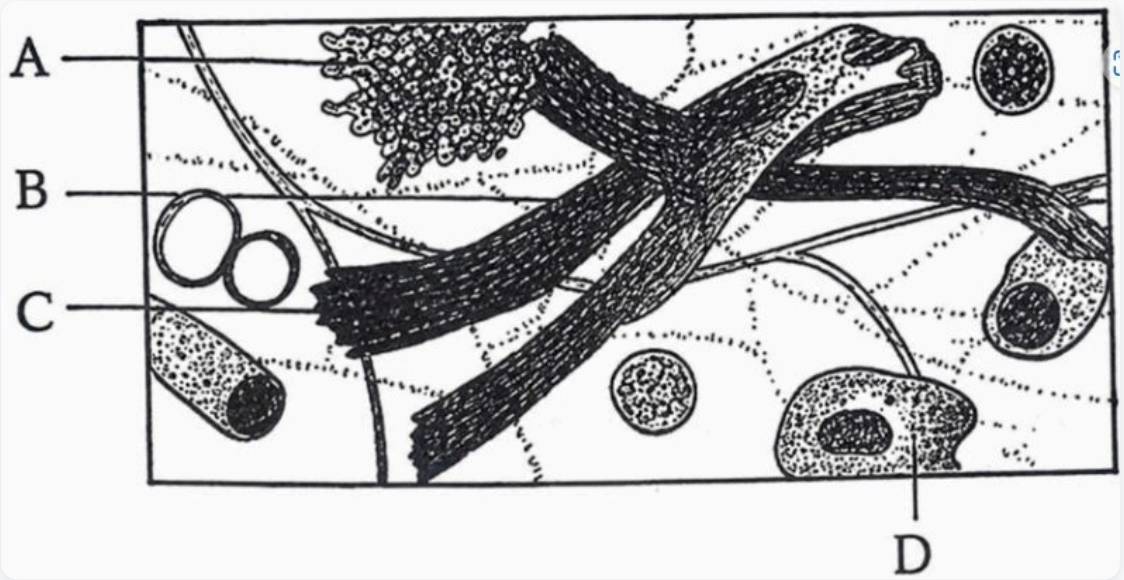
Explanation:

The vascular bundles are arranged in a loose circle inside the endodermis of a monocot root. In a monocot root, more than six vascular bundles are present. It shows polyarch condition.

Question 69.

Given below is the diagrammatic sketch of a certain type of connective tissue. Identify the parts labeled A, B, C and D, and select the correct answer from the given option.

[4 Marks]



(A) Part - A → Macro phage, Part- B → Fibro blast, Part - C → Collagen fibres, Part - D → Mast cells

(B) Part - A → Mast cell, Part- B → Macro phage, Part - C → Fibroblast, Part - D → Collagen fibres

(C) Part - A → Macro phage, Part- B → Collagen fibres, Part - C → Fibroblast, Part - D → Mast cell

(D) Part - A → Mast cell, Part- B → Collagen fibres, Part - C → Fibroblast, Part - D → Macrophage

Explanation:

Connective tissue is the most diverse of the four tissue types with a wide variety of functions. Connective tissue is made up of cells and fibers in a “jelly-like” ground substance.

Question 70.

The supportive skeletal structures in the human external ears and in the nose tip are examples of

[4 Marks]

(A) ligament

(B) bone

(C) cartilage

(D) areolar tissue

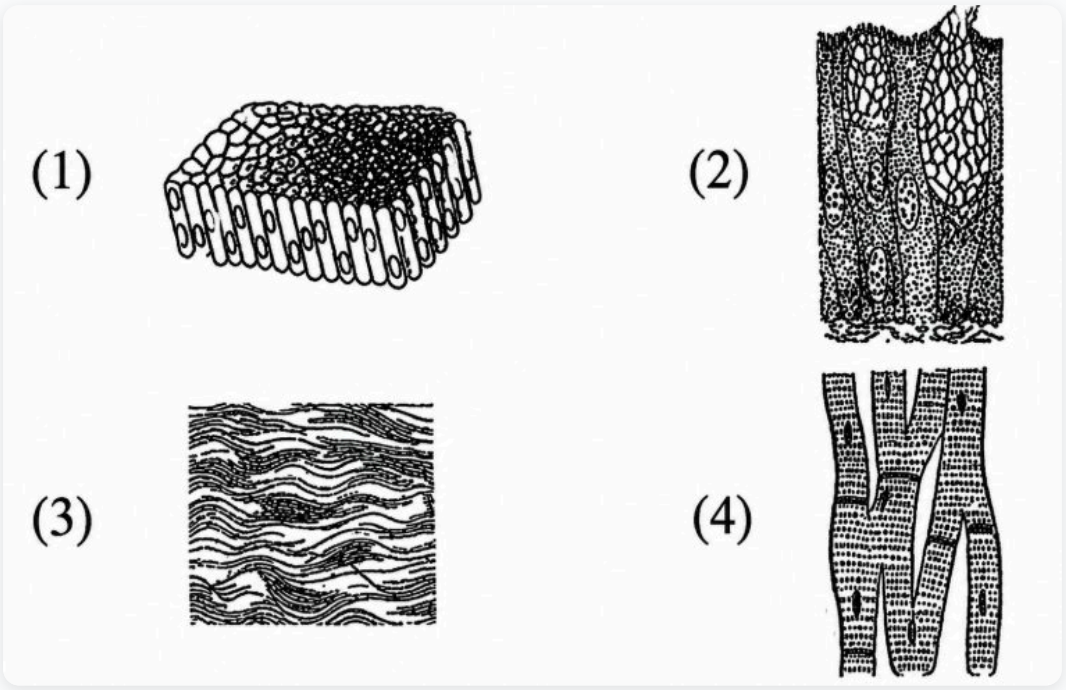
Explanation:

Cartilage is a type of connective tissue which is present in external ears and in the nose tip of humans.

Question 71.

The four sketches (1, 2, 3 and 4) given below, represent four different types of animal tissues. Which one of these is correctly identified in the options given, along with its correct location and function?

[4 Marks]



(A) (2) Tissue → Glandular epithelium, Location → Intestine, Function → Secretion

(B) (3) Tissue → Collagen fibres , Location → Cartilage, Function → Attach skeletal muscles to bones

(C) (1) Tissue → Columnar epithelium, Location → Nephron, Function → Secretion and absorption

(D) (4) Tissue → Smooth muscle tissue, Location → Heart, Function → Heart contraction

Explanation:

Glandular epithelium invaginates epithelia into connective tissue which differentiate into secretory units. Examples include sebaceous glands of the skin and glands in the intestinal lining (exocrine glands), and many endocrine glands releasing hormones, such as the thyroid follicle.

Question 72.

Which one of the following structures is an Organelle within an organelle?

[4 Marks]

(A) Ribosome

(B) ER

(C) Peroxisome

(D) Mesosome

Explanation:

Ribosome are small naked (non membrane bound) particles made of r-RNA and proteins. Ribosomes are also seen in the organelles like mitochondria and chloroplasts. They are the cell's protein factories and are found on RER and scattered in the cytoplasm as polyribosomes. Ribosomes are the sites at which information carried in the genetic code is converted into protein molecules.

Question 73.

Which one of the following cellular parts is correctly described?

[4 Marks]

(A) Lysosomes - Optimally active at a pH of about 8.5.

(B) Centrioles - Sites for active RNA synthesis.

(C) Thylakoids - Flattened membranous sacs forming the grana of chloroplasts.

(D) Ribosomes - Those on chloroplasts are larger (80s) while those in the cytoplasm are smaller (70s).

Explanation:

Centrioles serve as basal bodies for cilia and flagella. They are concerned with spindle formation during cell division. Lysosomes are membrane-bound organelles containing many hydrolytic enzymes, which are optimally active at an acid pH (near pH 5). Thylakoids are membrane-bound organelles found within chloroplasts. The thylakoid membrane, forms many flattened, fluid-filled tubules that enclose a single convoluted compartment. These tubules tend to stack on top of each other to form a structure called a granum.

Question 74.

Which one of the following biomolecules is correctly characterized?

[4 Marks]

(A) Lecithin - A phosphorylated glyceride found in cell membrane.

(B) Palmitic acid - An unsaturated fatty acid with 18 carbon atoms.

(C) Adenylic acid - Adenosine with a glucose phosphate molecule.

(D) Alanine amino acid - Contains an amino group and an acidic group anywhere in the molecule.

Explanation:

Palmitic acid is one of the most common, saturated fatty acids found in animals and plants. It has 16 carbons including the carboxyl carbon. Adenylic acid is a nucleotide consisting of adenine, ribose or deoxyribose, and a phosphate group. It is a constituent of DNA or RNA. It is also called adenosine monophosphate. Amino acids are organic acids (with carboxylic group COOH) having amino group ($–NH_2$) generally attached to Carbon or carbon next to carboxylic group. The carbon also bears a variable alkyl group (R) or hydrogen or hydrocarbon. In alanine (R) is represented by methyl group.

Question 75.

Identify the meiotic stage in which the homologous chromosomes separate while the sister chromatids remain associated at their centromeres?

[4 Marks]

(A) Metaphase I

(B) Metaphase II

(C) Anaphase I

(D) Anaphase II

Explanation:

Anaphase I begins when the two chromosomes of each bivalent (tetrad) separate and start moving toward opposite poles of the cell as a result of the action of the spindle. In anaphase I, the sister chromatids remain attached at their centromeres and move together toward the poles.

Question 76.

For its activity, carboxypeptidase requires

[4 Marks]

(A) zinc

(B) iron

(C) copper

(D) niacin

Explanation:

Carboxypeptidase is an exopeptidase enzyme secreted by the pancreas that acts only on the peptide linkage of a terminal amino acid containing a free carboxyl group. Zinc is a cofactor for carboxypeptidase. In Digestion of carboxypeptidase, requires zinc for its protein degrading action.

Question 77.

Read the following four statements (A-D).

(A) Both, photophosphorylation and oxidative phosphorylation involve uphill transport of protons across the membrane.

(B) In dicot stems, a new cambium originates from cells of pericycle at the time of secondary growth.

(C) Stamens in flowers of Gloriosa and Petunia are polyandrous.

(D) Symbiotic nitrogen-fixers occur in free-living state also in soil.

How many of the above statements are correct?

[4 Marks]

(A) Two

(B) Three

(C) Four

(D) One

Explanation:

All the four statements are correct.

Question 78.

For its action, nitrogenase requires

[4 Marks]

(A) Mn^{2+}

(B) light

(C) high input of energy

(D) super oxygen radicals

Explanation:

Nitrogenases are the enzymes used by some organisms to fix atmospheric nitrogen gas. It is the only known family of enzymes that accomplish this process. Nitrogenase requires high input of energy & anaerobic condition.

Question 79.

Which one of the following generally acts as an antagonist to gibberellins?

[4 Marks]

(A) Ethylene

(B) IAA

(C) ABA

(D) Zeatin

Explanation:

Gibberellins & ABA are antagonistic to each other. ABA counteracts many effects of gibberellins like induction of hydrolases and alpha-amylases in barley seedlings.

Question 80.

Through their effect on plant growth regulators, what do the temperature and light control in the plants?

[4 Marks]

(A) Flowering

(B) Closure of stomata

(C) Apical dominance

(D) Fruit elongation

Explanation:

Flowering is induced by light and temperature.

Question 81.

Vernalization stimulates flowering in

[4 Marks]

(A) turmeric

(B) zamikand

(C) carrot

(D) ginger

Explanation:

Carrot is a biennial plant which flowers in the second season. Vernalization is the subjection of seeds or seedlings to low temperature in order to hasten plant development and flowering. Vernalization is commonly used for crop plants such as winter rye and is possible because the seeds and buds of many plants require cold in order to break dormancy. Winter cereals are therefore sown in the autumn for flowering the following year. However, if germinating seeds are artificially vernalized they can be sown in the spring for flowering the same year. Biennial plants, such as carrot (*Daucus carota*), will remain in their non-flowering rosette form until subjected to cold treatment.

Question 82.

Where do certain symbiotic micro-organisms normally occur in human body?

[4 Marks]

(A) Oral lining and tongue surface

(B) Vermiform appendix and rectum

(C) Duodenum

(D) Caecum

Explanation:

The caecum is a pouch-like portion of the large intestine which hosts some symbiotic micro-organisms. The caecum absorbs water and salts from undigested foods before they continue on to the large intestine.

Question 83.

Which one of the following options gives the correct categorization of six animals according to the type of nitrogenous wastes (A, B, C), they give out?

[4 Marks]

(A) A-Ammo notelic → Frog, Lizards , B-Ureotelic → Aquatic Amphibia, Humans, C-Urico telic → Cockroach, Pigeon

(B) A-Ammo notelic → Aquatic Amphibia , B-Ureotelic → Cockroach, Humans, C-Urico telic → Frog, Pigeon, Lizards

(C) A-Ammo notelic → Aquatic Amphibia , B-Ureotelic → Frog, Humans, C-Urico telic → Pigeon, Lizards, Cockroach

(D) A-Ammo notelic → Pigeon, Humans, B-Ureotelic → Aquatic Amphibia, Lizards, C-Urico telic → Cockroach, Frog

Explanation:

Those animals that excrete ammonia are called as ammonotelic, eg. aquatic amphibia. Those animals that excrete urea are called as ureotelic, eg. frog, humans.

Those animals that excrete uric acid are called as uricotelic, eg. pigeon, lizards, and cockroach.

Question 84.

Which one of the following characteristics is common to both in humans and adult frogs?

[4 Marks]

(A) Four - chambered heart

(B) Internal fertilization

(C) Nucleated RBCs

(D) Ureotelic mode of excretion

Explanation:

Adult frog and human exhibit ureotelism because there excretory waste product is urea.

Question 85.

Which one of the following pairs of chemical substances is correctly categorized?

[4 Marks]

(A) Pepsin and prolactin - Two digestive enzymes secreted in stomach

(B) Calcitonin and thymosin - Thyroid hormones

(C) Troponin and myosin - Complex proteins in striated muscles

(D) Secretin and rhodopsin - Polypeptide hormones

Explanation:

Troponin is a protein which is found on actin filament and myosin protein is found in the myosin filament. Both actin and myosin are complex proteins in striated muscles.

Thymosin is a hormone secreted by the thymus that stimulates development of T cells. Prolactin is a hormone released by the pituitary gland that stimulates breast development and milk production in women. Rhodopsin, also known as visual purple, is not a hormone. It is a biological pigment in photoreceptor cells of the retina that is responsible for the first events in the perception of light.

Question 86.

What is the function of germ pore?

[4 Marks]

(A) Absorption of water for seed germination

(B) Emergence of radicle

(C) Release of male gametes

(D) Initiation of pollen tube

Explanation:

The germ pores are apertures in the exine layer of the pollen grain where the sporopollenin is absent. The germ pore helps in the formation of the germ tube or pollen tube and which makes its exit on germination.

Question 87.

Which one of the following statements is wrong?

[4 Marks]

(A) When pollen is shed at two-celled stage, double fertilization does not take place.

(B) Vegetative cell is larger than generative cell.

(C) Intine is made up of cellulose and - pectin.

(D) Pollen grains in some plants remain viable for months.

Explanation:

In over 60 per cent of angiosperms, pollen grains are shed at cell 2-celled stage. In the remaining species the generative cell divides mitotically to give rise to the two male gametes before pollen grains are shed (3-celled stage).

Question 88.

Plants with ovaries having only one or a few ovules, are generally pollinated by

[4 Marks]

(A) butterflies

(B) bees

(C) wind

(D) birds

Explanation:

Wind pollinated flowers have generally single ovule in each ovary.

Question 89.

The secretory phase in the human menstrual cycle is also called

[4 Marks]

(A) luteal phase and lasts for about 6 days

(B) follicular phase lasting for about 6 days

(C) luteal phase and lasts for about 13 days

(D) follicular phase and lasts for about 13 days.

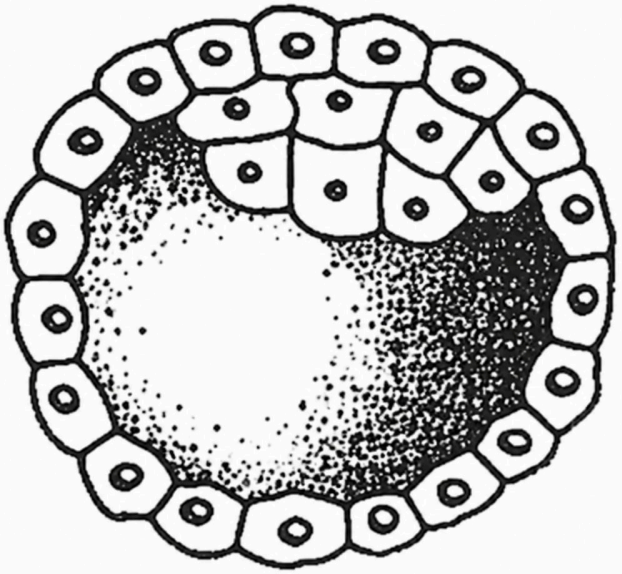
Explanation:

The menstrual cycle is the scientific term for the physiological changes that can occur in fertile women for the purposes of sexual reproduction and fertilization. The secretory phase in the human menstrual cycle is also called luteal phase and lasts for about 13 days. During secretory phase, the endometrium prepares for the implantation of an embryo and the corpus luteum is active and secretes progesterone hormone.

Question 90.

Identify the human developmental stage shown below as well as the related right place of its occurrence in a normal pregnant woman,and select the right option for the two together.

[4 Marks]



(A) Developmental stage → Blastula, Site of occurrence →End part of fallopian tube

(B) Developmental stage → Late morula, Site of occurrence → Middle part of fallopian tube

(C) Developmental stage → 8 celled morula, Site of occurrence →Starting point of fallopian tube

(D) Developmental stage → Blastocyst, Site of occurrence →Uterine wall

Explanation:

Blastocyst is a thin-walled hollow structure in early embryonic development that contains a cluster of cells called the inner cell mass from which the embryo arises. The outer layer of cells gives rise to the placenta and other supporting tissues needed for fetal development within the uterus while the inner cell mass cells give rise to the tissues of the body. The blastocyst reaches the womb (uterus) around day 5, and implants into the uterine wall on about day 6.

Question 91.

A Test cross is carried out to

[4 Marks]

(A) determine the genotype of a plant at F2.

(B) predict whether two traits are linked.

(C) assess the number of alleles of a gene.

(D) determine whether two species or varieties will breed successfully.

Explanation:

A test cross, first introduced by Gregor Mendel, is used to determine if an individual exhibiting a dominant trait is homozygous or heterozygous for that trait. It takes place between an individual with unknown genotype and recessive parent.

Question 92.

Which one of the following is a wrong statement regarding mutations?

[4 Marks]

(A) Deletion and insertion of base pairs cause frameshift mutations.

(B) UV and Gamma rays are mutagens.

(C) Cancer cells commonly show chromosomal aberrations.

(D) Change in a single base pair of DNA does not cause mutation.

Explanation:

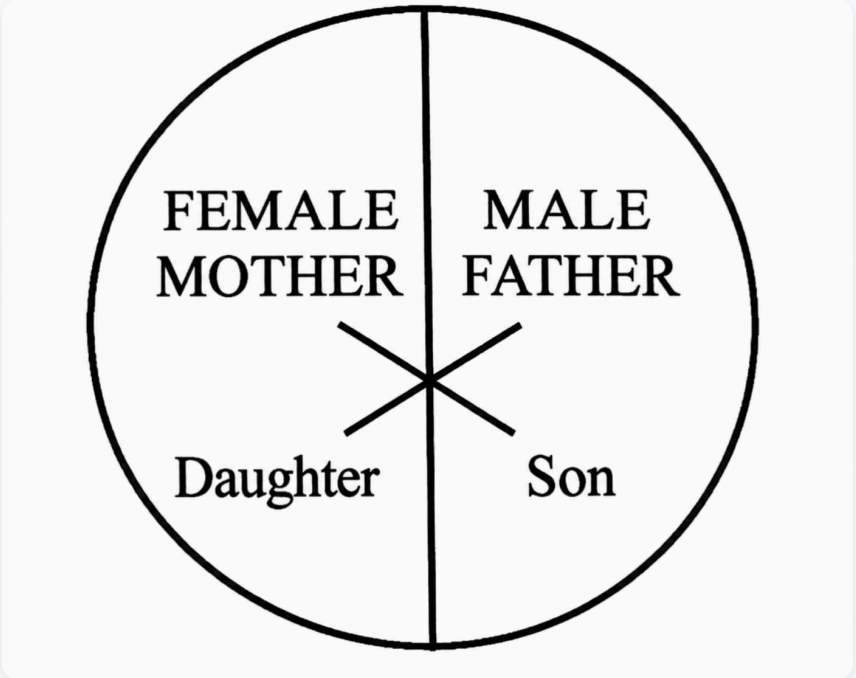
Change in single base pair of DNA is also a type of mutation called point mutation. It is a type of mutation that causes the replacement of a single nucleotide with another nucleotide of the genetic material, DNA or RNA. For example, a point mutation is the cause of sickle cell disease.

Question 93.

Represented below is the inheritance pattern of a certain type of traits in humans.

Which one of the following conditions could be an example of this pattern?

[4 Marks]



(A) Thalassemia

(B) Phenylketonuria

(C) Sickle cell anaemia

(D) Haemophilia

Explanation:

The inheritance pattern of a particular trait shown in the picture results in haemophilia. Haemophilia is a group of inherited blood disorders in which the blood does not clot properly. It is caused by a fault in one of the genes that determine how the body makes blood clotting factor VIII or IX. These genes are located on the X chromosome.

Question 94.

Read the following four statements (A–D).

(A) In transcription, adenosine pairs with uracil.
(B) Regulation of lac operon by repressor is referred to as positive regulation.
(C) The human genome has approximately 50,000 genes.
(D) Haemophilia is a sex-linked recessive disease.

How many of the above statements are correct?

[4 Marks]

(A) Four

(B) One

(C) Three

(D) Two

Explanation:

Statement A & D is correct
Regulation if lac operon by repressor is referred as negative regulation. In negative regulation, a repressor molecule binds to the operator of an operon and terminates transcription. In positive regulation, an activator interacts with the RNA polymerase in the promoter region to initiate transcription. Human genome contains some 20,000–25,000 genes billion bases.

Question 95.

Which of the following forms the basis of DNA Finger printing?

[4 Marks]

(A) The relative proportions of purines and pyrimidines in DNA.

(B) Satellite DNA occurring as highly repeated short DNA segments.

(C) The relative difference in the DNA occurrence in blood, skin and saliva.

(D) The relative amount of DNA in the ridges and grooves of the fingerprints.

Explanation:

DNA fingerprinting is a test to identify and evaluate the genetic information called DNA (deoxyribonucleic acid) in a person's cells. DNA fingerprinting is a form of identification based on sequencing specific non-coding portions of DNA that are known to have a high degree of variability from person to person. These sections are known as Tandem repeats. The test is used to determine whether a family relationship exists between two people, to identify organisms causing a disease, and to solve crimes.

Question 96.

The idea of mutations was brought forth by

[4 Marks]

(A) Hardy Weinberg, who worked on allele frequencies in a population.

(B) Charles Darwin, who observed a wide variety of organisms during sea voyages.

(C) Hugo de Vries, who worked on evening primrose.

(D) Gregor Mendel, who worked on Pisum sativum.

Explanation:

Mutations are alterations of genetic material. They occur frequently during DNA duplication in cell division. The idea of mutations was brought forth by Hugo de Vries. The plant on which de Vries had experimented was Oenothera lamarckiana (Evening primrose). The mutation observed by de Vries in Oenothera lamarckiana was chromosomal number variant.

Question 97.

Read the following four statements (A–D).

(A) Colostrum is recommended for the new born because it is rich in antigens.
(B) Chikungunya is caused by a Gram negative bacterium.
(C) Tissue culture has proved useful in obtaining virus-free plants.
(D) Beer is manufactured by distillation of fermented grape juice.

How many of the above statements are wrong?

[4 Marks]

(A) Two

(B) Three

(C) Four

(D) One

Explanation:

(a) Statement (A) and (B) are wrong.
Colostrum is the first lacteal secretion (thin yellowish fluid) produced by the mammary gland of a mother prior to the production of milk. It is recommended for the new born because it is rich in IgA antibodies and minerals.
Chikungunya fever is a viral disease transmitted to humans by the bite of infected *Aedes aegypti* mosquitoes.

Question 98.

Which one of the following statements is correct with respect to immunity?

[4 Marks]

(A) The antibodies against small pox pathogen are produced by T-lymphocytes.

(B) Preformed antibodies need to be injected to treat the bite by a viper snake.

(C) Antibodies are protein molecules, each of which has four light chains.

(D) Rejection of a kidney graft is the function of B-lymphocytes.

Explanation:

Performed antibodies need to be injected to treat the bite by a viper snake. It is also a type of immunization which is called as passive immunization.
Antibodies, produced by B-cells, are typically made of basic structural units—each with two large heavy chains and two small light chains. B cells differentiate into plasma cells that secrete antibodies. Antibodies are proteins that bind to specific antigens and mark them for destruction by, for example, natural killer cells or the more recognizable to phagocytic cells. Rejection of a kidney graft is not a function of B lymphocyte.

Question 99.

Which one of the following sets of items in the options 1–4 are correctly categorized with one exception in it?

[4 Marks]

(A) Items → UAA, UAG, UGA, Category → Stop codons, Exception → UAG

(B) Items → Kangaroo, Koala, Wombat, Category → Australian, marsupials Exception → Wombat

(C) Items → Typhoid, Preumonia, Diphtheria, Category → Bacterial, diseases, Exception → Diphtheria

(D) Items → Plasmodium, Cuscuta, Trypanosoma, Category → Protozoan, parasites, Exception → Cuscuta

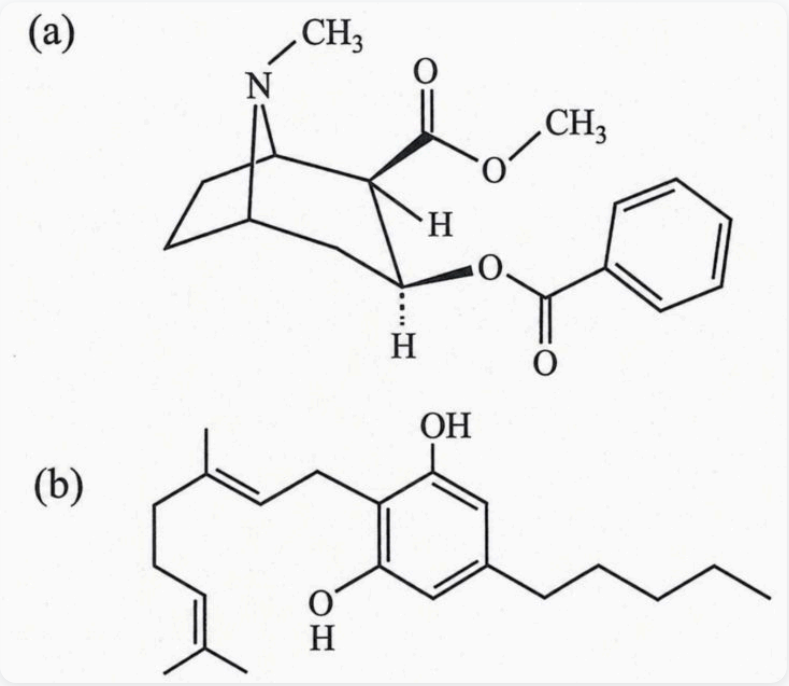
Explanation:

UAG is also a stop codon. Wombats are also Australian marsupials. They are short-legged, muscular quadrupeds, approximately 1 metre (40 in) in length with a short, stubby tail. Diphtheria is an acute infectious disease caused by the bacteria Corynebacterium diphtheriae.
Cuscuta Dodder plant, is not a protozoan. It is a parasitic vine that wraps around other plants for nourishment.

Question 100.

Identify the molecules (a) and (b) shown below and select the right option giving their source and use.

[4 Marks]



(A) Molecule → Cocaine, Source → Erythroxylum coca, Use → Accelerates the transport of dopamine

(B) Molecule → Heroin, Source → Cannabis sativa, Use → "Depressant and slows down body functions"

(C) Molecule → Cannabinoid, Source → Atropa, belladona, Use → Produces hallucinations

(D) Molecule → Morphine, Source →Papaver, somniferum, Use → Sedative and pain killer

Explanation:

Molecule (a) represents structure of morphine. Morphine is the most abundant alkaloid found in opium,

the dried sap (latex) derived from shallowly slicing the unripe seedpods of the opium, or common and/or edible, poppy-Papaver somniferum. Morphine is a potent opiate analgesic drug that is used to relieve severe pain.

Question 101.

Green revolution in India occurred during

[4 Marks]

(A) 1960.s

(B) 1980.s

(C) 1950.s

(D) 1970.s

Explanation:

Green revolution is the introduction of high-yielding varieties of seeds and the increased use of fertilizers and irrigation, which provided the increase in production needed to make India self-sufficient in food grains, thus improving agriculture in India.Green revolution in India occurred in 1960.

Question 102.

Consider the following four statements (A–D) and select the option which includes all the correct ones only.

(1) Single cell Spirulina can produce large quantities of food rich in protein, minerals, vitamins etc.

(2) Body weight-wise the micro-organism Methylophilus methylotrophus may be able to produce several times more proteins than the cows per day.

(3) Common button mushrooms are a very rich source of vitamin C.

(4) A rice variety has been developed which is very rich in calcium.

[4 Marks]

(A) Statements (3), (4)

(B) Statements (1), (3) and (4)

(C) Statements (1), (2)

(D) Statements (2), (3) and (4)

Explanation:

Spirulina is rich in protein, vitamins and minerals. 250 gram biomass of Methylophilus methylotrophus produces 25 tonne protein/day while cow of 250 Kg produces only 200 gm. protein/day.

Question 103.

The domestic sewage in large cities

[4 Marks]

(A) has a high BOD as it contains both aerobic and anaerobic bacteria.

(B) is processed by aerobic and then anaerobic bacteria in the secondary treatment in Sewage Treatment Plants (STPs).

(C) when treated in STPs does not really require the aeration step as the sewage contains adequate oxygen.

(D) has very high amounts of suspended solids and dissolved salts.

Explanation:

Sewage treatment is the process of removing contaminants from wastewater and household sewage, both runoff (effluents) and domestic. It includes physical, chemical, and biological processes to remove physical, chemical and biological contaminants. Sewage treatment generally involves three stages, called primary, secondary and tertiary treatment. It is processed by aerobic and then anaerobic bacteria in the secondary treatment in Sewage Treatment Plants (STPs).

Question 104.

In gobar gas, the maximum amount is that of

[4 Marks]

(A) methane

(B) butane

(C) propane

(D) carbon dioxide

Explanation:

In gobar gas the maximum amount of methane which is produced by methanogenic bacteria. Gobar gas is a gas mixture which is generated when organic compounds are fermented in the absence of air (anaerobic fermentation). Biogas contains 50%–70% methane, 30%–40% carbon dioxide, and traces of hydrogen, hydrogen sulphide and nitrogen.

Question 105.

Which one of the following represents a palindromic sequence in DNA?

[4 Marks]

(A) 5′ - GAATTC - 3′ 3′ - CTTAAG - 5′

(B) 5′ - CCAATG - 3′ 3′ - GAATCC - 5′

(C) 5′ - CATTAG - 3′ 3′ - GATAAC - 5′

(D) 5′ - GATACC - 3′ 3′ - CCTAAG - 5′

Explanation:

A palindromic sequence is a nucleic acid sequence (DNA or RNA) that is the same whether read 5′ to 3′ (five-prime) to 3′ (three prime) on one strand or 5′ to 3′ on the complementary strand with which it forms a double helix.
5′ - GAATTC - 3′
3′ - CTTAAG - 5′
It is a palindromic sequence of DNA cut by restriction enzyme EcoRI.

Question 106.

Biolistics (gene-gun) is suitable for

[4 Marks]

(A) DNA finger printing

(B) Disarming pathogen vectors.

(C) Transformation of plant cells.

(D) Constructing recombinant DNA by joining with vectors.

Explanation:

Biolistic it is direct gene transferred method for constructing recombinant DNA. The gene gun was invented by John C. Sanford with Edward Wolf. A gene gun can be used to genetically infect cells or whole organisms with foreign DNA by aiming the barrel of the gun and firing. The microshot projectiles in the biolistic gene gun are made of microscopic (or nano) sized gold or platinum powders. These expensive powders are soaked in DNA or RNA (in raw or plasmid form) that are engineered for insertion into the genome of the cells or organisms under the gun.

Question 107.

In genetic engineering, the antibiotics are used

[4 Marks]

(A) as sequences from where replication starts.

(B) to keep the cultures free of infection.

(C) as selectable markers.

(D) to select healthy vectors.

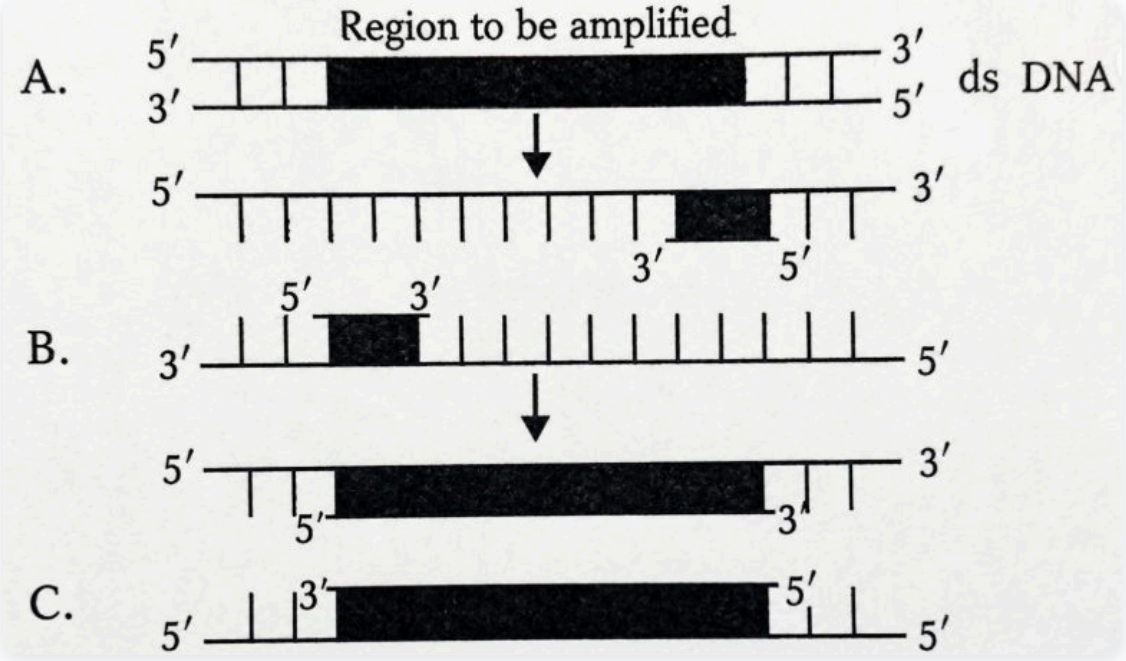
Explanation:

Antibiotics are powerful medicines that fight bacterial infections. They either kill bacteria or keep them from reproducing. In genetic engineering, the antibiotics are used as selectable markers.

Question 108.

The figure below shows three steps (A, B, C) of Polymerase Chain Reaction (PCR). Select the option giving correct identification together with what it represents?

[4 Marks]



(A) B - Denaturation at a temperature of about 98°C separating the two DNA strands.

(B) A - Denaturation at a temperature of about 50°C.

(C) A - Annealing with two sets of primers.

(D) C - Extension in the presence of heat stable DNA Polymerase.

Explanation:

PCR is a technique for enzymatically replicating DNA without using a living organism such as *E. coli* or yeast. The correct steps shown in the above figure are:

A – Denaturation at a temperature of about **94° to 98°C**. During the denaturation, the double stranded DNA open to single stranded DNA, and all enzymatic reactions stop.

B – Annealing (binding of DNA primer to the separated strands). Occurs at **50° to 65°C**, which is lower than the optimal temperature of the DNA polymerases.

C – Extension or elongation of the strands using the DNA primer with heat-stable DNA polymerases, most frequently Taq (Thermus aquaticus) at 72°C.

Question 109.

Tobacco plants resistant to a nematode have been developed by the introduction of DNA that produced (in the host cells)

[4 Marks]

(A) both sense and anti-sense RNA

(B) a particular hormone

(C) an antifeedant

(D) a toxic protein

Explanation:

In RNA interference technique, sense and antisense RNA are complimentary to each other which form dsRNA that silent the expression of mRNA of nematode. RNA interference is a novel strategy adopted to prevent infestation of nematode by Meloidogyne incognita in roots of tobacco plants.

Question 110.

The first clinical gene therapy was given for treating

[4 Marks]

(A) chicken pox

(B) diabetes mellitus

(C) rheumatoid arthritis

(D) adenosine deaminase deficiency

Explanation:

Gene therapy is an experimental technique that uses genes to treat or prevent disease. Adenosine deaminase deficiency, also called ADA deficiency or ADA-SCID is an autosomal recessive metabolic disorder that causes immunodeficiency. ADA deficiency is due to a lack of the enzyme adenosine deaminase.

Question 111.

Cuscuta is an example of

[4 Marks]

(A) ectoparasitism

(B) brood parasitism

(C) predation

(D) endoparasitism

Explanation:

Cuscuta, or Dodderplant, is a parasitic plant that wraps around other plants for nourishment. Cuscuta is found on outer side of host and its total stem parasite. Cuscuta a parasite of Acacia.

Question 112.

The rate of formation of new organic matter by rabbit in a grassland, is called

[4 Marks]

(A) net productivity

(B) secondary productivity

(C) gross primary productivity

(D) net primary productivity

Explanation:

At the trophic level of consumers the rate at which food energy is assimilated is called secondary productivity. Rabbit is a consumer.

Question 113.

The second stage of hydrosere is occupied by plants like

[4 Marks]

(A) Typha

(B) Azolla

(C) Salix

(D) Vallisneria

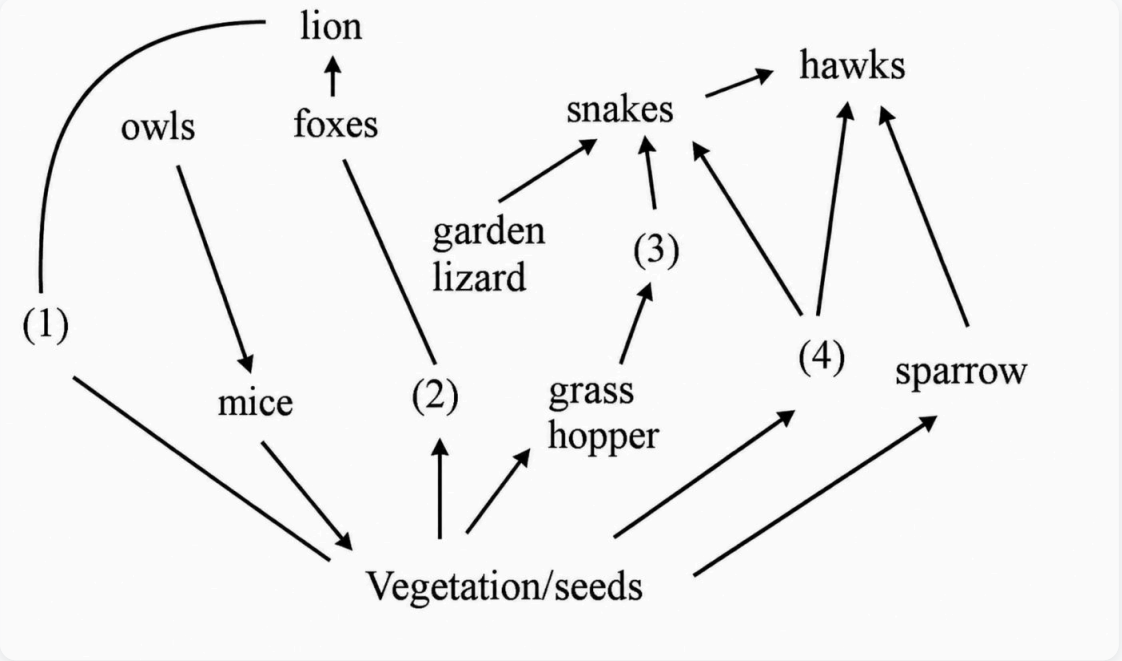
Explanation:

A Hydrosere is a plant succession which occurs in a fresh-water lake. Second stage of hydrosere is submerged stage that is represented by Vallisneria, Hydrilla, Elodea, Utricularia etc.

Question 114.

Identify the likely organisms (1), (2), (3) and (4) in the food web shown below.

[4 Marks]



(A) (1) → Squirrel, (2) → Cat, (3) →Rat, (4) → Pigeon

(B) (1) → Rat, (2) → Dog, (3) → Tortoise, (4) → Crow

(C) (1) → Deer, (2) → Rabbit, (3) → Frog, (4) → Rat

(D) (1) → Dog, (2) → Squirrel, (3) → Bat, (4) → Deer

Explanation:

Food web is a network of food chains or feeding relationships by which energy and nutrients are passed on from one species of living organisms to another.

Question 115.

Sacred groves are specially useful in

[4 Marks]

(A) preventing soil erosion.

(B) year-round flow of water in rivers.

(C) generating environmental awareness.

(D) conserving rare and threatened species.

Explanation:

An area with particular types of trees dedicated to local deities or ancestral spirits that are protected by local communities through social traditions and taboos incorporating spiritual and ecological values are called as sacred groves. Sacred groves act as an ideal centre for biodiversity conservation. Several plants and animals that are threatened in the forest are still well conserved in some of the

sacred groves. It has been observed that several medicinal plants that are not to be found in the forest are abundant in the sacred groves. Further, rare endangered, threatened and endemic species are often concentrated in sacred groves.

Question 116.

Select the correct statement about bio-diversity.

[4 Marks]

(A) Large scale planting of Bt cotton has no adverse effect on biodiversity.

(B) Western Ghats have a very high degree of species richness and endemism.

(C) The desert areas of Rajasthan and Gujarat have a very high level of desert animal species as well as numerous rare animals.

(D) Conservation of biodiversity is just a fad pursued by the developed countries.

Explanation:

Western ghats biodiversity rich zone along with endemism. The forests of the western ghats are some of the best representatives of non-equatorial tropical evergreen forests in the world. The Western Ghats have evolved into one of the richest centers of endemism owing to their isolation from other moist areas.

Question 117.

Which one of the following is a wrong statement regarding mutations?

[4 Marks]

(A) Cancer cells commonly show chromosomal aberrations.

(B) Deletion and insertion of base pairs cause frame-shift mutations.

(C) UV and gamma rays are mutagen.

(D) Change in a single bp of DNA does not cause mutation.

Explanation:

Change in single base pair of DNA cause mutation as if it mutated to termination codon or other amino acid codon specific. Cancer is the uncontrolled process of cell division. The causal agents are certain chemicals, radiation, viruses that behave as mutagen by acting at DNA. It is believed that cancer is a genetic disease caused by multiple mutation within the DNA.

Question 118.

A test cross is carried out to

[4 Marks]

(A) assess the number of alleles of a gene

(B) determine whether two species or varieties will breed successfully

(C) predict whether two traits are linked

(D) determine the genotype of a plant at F2

Explanation:

When F, hybrid is crossed with its recessive P it is called test cross. By test cross heterozygosity_ ‘homozygosity of the organism can be tested. It gives1:1 ratio in monohybrid and 1:1:1:1 ratio in dihybrid condift

In presence of linkage the ratio varies from this.

Question 119.

A particle has initial velocity (2î + 3ĵ) and acceleration (0.3î + 0.2ĵ). The magnitude of velocity after 10 seconds will be:

[4 Marks]

(A) 9 units

(B) 5 units

(C) 5√2 units

(D) 9√2 units

Explanation:

□□ = □□ + □□t
v = (2î + 3ĵ) + (0.3î + 0.2ĵ) × 10 = 5î + 5ĵ
|□□| = √(5² + 5²)
|□□| = 5√2

Question 120.

A car of mass 1000 kg negotiates a banked curve of radius 90 m on a frictionless road. If the banking angle is 45°, the speed of the car is:

[4 Marks]

(A) 10 ms^{-1}

(B) 5 ms^{-1}

(C) 30 ms^{-1}

(D) 20 ms^{-1}

Explanation:

For banking $\tan \theta = V^2 / Rg$

$\tan 45° = V^2 / 90 \times 10 = 1$

$V = 30$ m/s