NEET-UG EXAMINATION PAPER-2018

(Solved)

Time allowed : 3 hours | Maximum Marks : 720

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.

A student measured the diameter of a small steel ball using a screw gauge of least count 0.001 cm. The main scale reading is 5 mm and zero of circular scale division coincides with 25 divisions above the reference level. If screw gauge has a zero error of –0.004 cm, the diameter of ball is

[4 Marks]

(A) 0.529 cm

(B) 0.053 cm

(C) 0.525 cm

(D) 0.521 cm

Explanation:

Diameter of the ball

= MSR + CSR × (least count) – zero error

= 0.5 cm + 25 × 0.001 – (–0.004)

= 0.5 + 0.025 + 0.004

= 0.529 cm

Question 2.

The moment of force on a force, □□ = 4î+ 5ĵ – 6k̂ at (2, 0, –3), about the point

(2, –2, –2), is given by

[4 Marks]

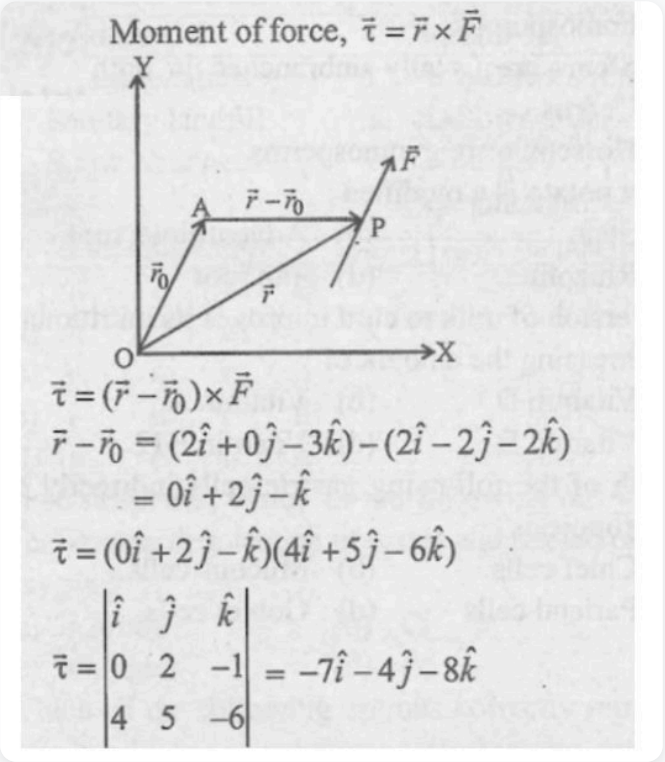
(A) -8î -4ĵ -7k̂

(B) -7î -8ĵ -4k̂

(C) -7î -4ĵ -8k̂

(D) -4î -ĵ -8k̂

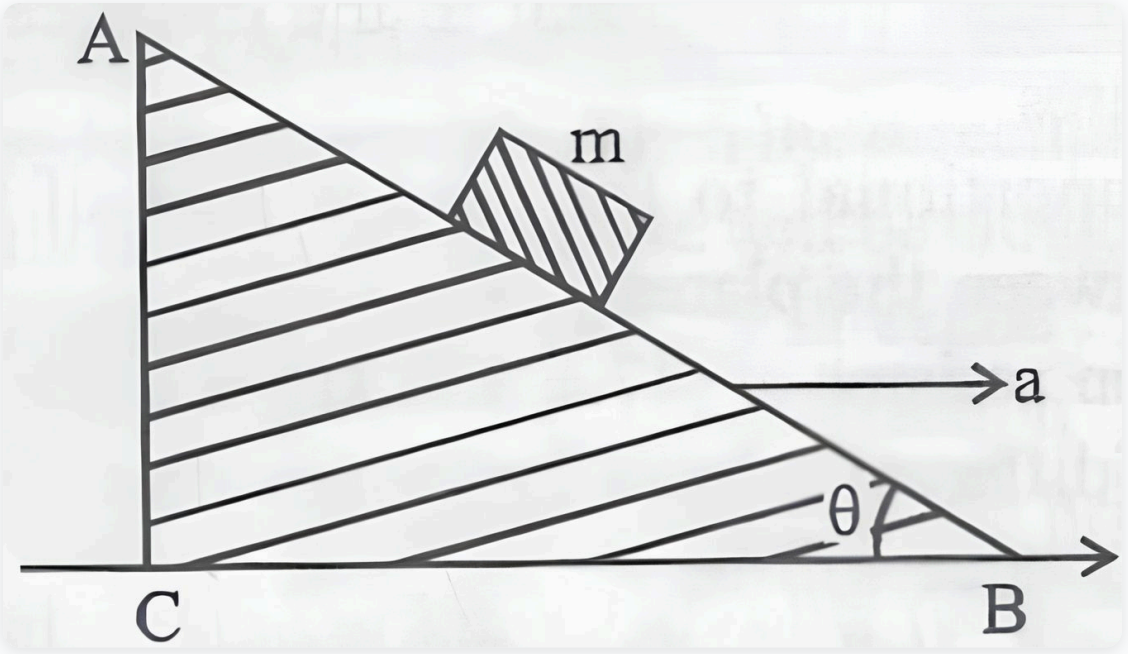
Explanation:



Question 3.

A block of mass m is placed on a smooth inclined wedge ABC of inclination θ as shown in the figure. The wedge is given an acceleration a towards the right. The relation between a and θ for the block to remain stationary on the wedge is

[4 Marks]



(A) a = g tan θ

(B) a = g /cosec θ

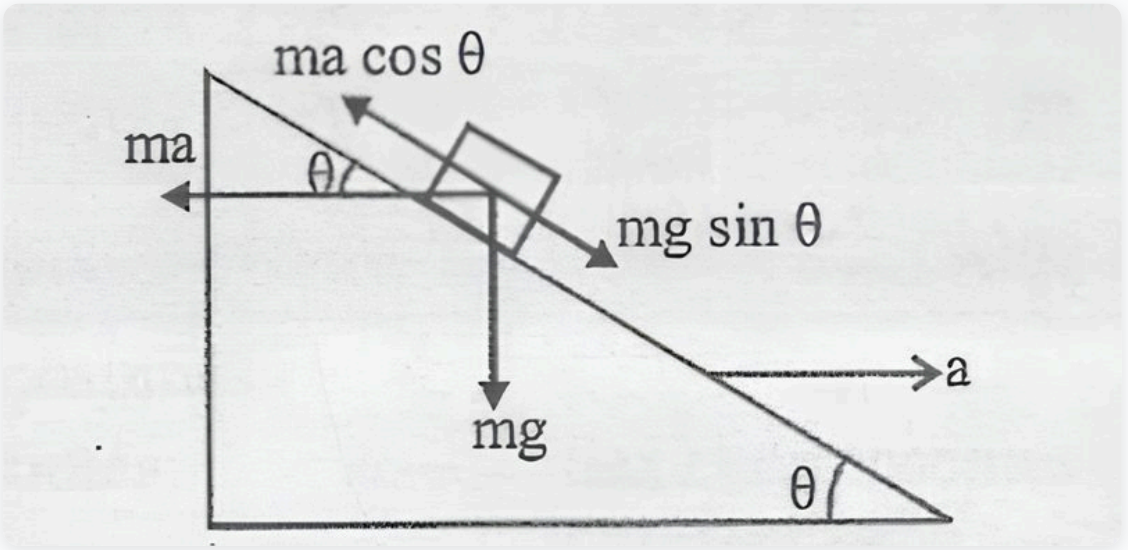
(C) a = g cos θ

(D) a = g/ sin θ

Explanation:

Let the mass of block is m . It will remain stationary if forces acting on it are in equilibrium, i.e. ma cos θ = mg sin θ ⇒ a = g tan θ.

Here ma = Pseudo force on block, mg = weight.



Question 4.

A moving block having mass m_1 collides with another stationary block having mass 4m. The lighter block comes to rest after collision. When the initial velocity of lighter block is v, then the value of coefficient of restitution (e) will be

[4 Marks]

(A) 0.4

(B) 0.25

(C) 0.8

(D) 0.5

Explanation:

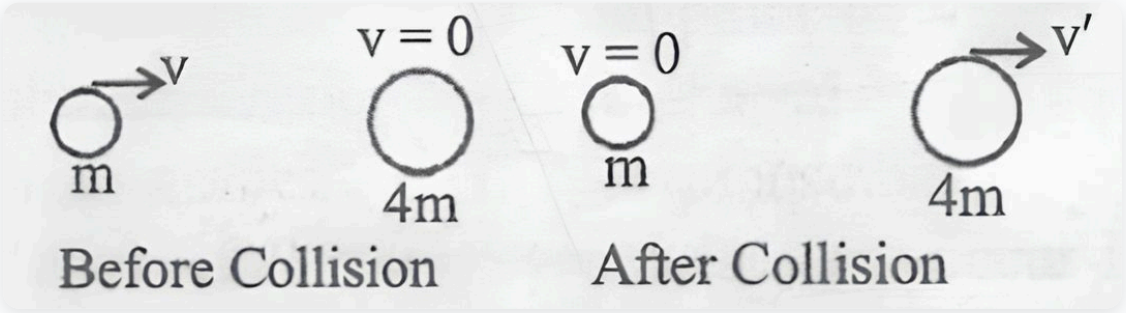
According to law of conservation of linear momentum,

mv+4m x 0 = 4mv' + 0 ⇒ V' = v/4

Coefficient of restitution,

e = Relative velocity of separation / Relative velocity of approach v/4/v

or, e = 1/4 = 0.25



Question 5.

A solid sphere is rotating freely about its symmetry axis in free space. The radius of the sphere is increased keeping its mass same. Which of the following physical quantities would remain constant for the sphere?

[4 Marks]

(A) Rotational kinetic energy

(B) Angular momentum

(C) Angular velocity

(D) Moment of inertia

Explanation:

Angular momentum, remains conserved until the torque acting on sphere remains zero. $\tau_{ex} = 0$

So, $dL/dt = 0$

i.e, angular momentum L = constant.

Question 6.

A solid sphere is in rolling motion. In rolling motion a body possesses translational kinetic energy (K_t) as well as rotational kinetic energy (K_r) simultaneously. The ratio $K_t : (K_t + K_r)$) for the sphere is

[4 Marks]

(A) 5:7

(B) 10:7

(C) 7:10

(D) 2:5

Explanation:

In rolling motion, rotational kinetic energy,

$K_t = 1/2\ Iv^2$

And, $K_t + K_r = 1/2\ mv^2 + 1 / 2\ I\omega^2$

$= 1/2\ mv^2 + 1/2\ (2/5\ mr^2)(v/r^2) = 7 / 10\ mv^2$

$\therefore K_t/(K_t + K_r) = (1/2\ mv^2)/(7/10\ mv^2) = 5/7$

Question 7.

Three objects A (a solid sphere), B (a thin circular disk) and C (a circular ring), each have the same mass M and radius R. They all spin with the same angular speed ω about their own symmetry axes. The amount of work (W) required to bring them to rest, would satisfy the relation

[4 Marks]

(A) W_A > W_B > W_C

(B) W_C > W_B > W_A

(C) $W_A > W_C > W_B$

(D) $W_B > W_A > W_C$

Explanation:

Work done required to bring them to rest $\Delta W = \Delta KE$ (work-energy theorem)

$\Delta W = 1/2\ I\omega^2$ ($\Delta KE_{rot} = 1/2\ I\omega^2$)

or, $\Delta W \propto I$ (for same ω)

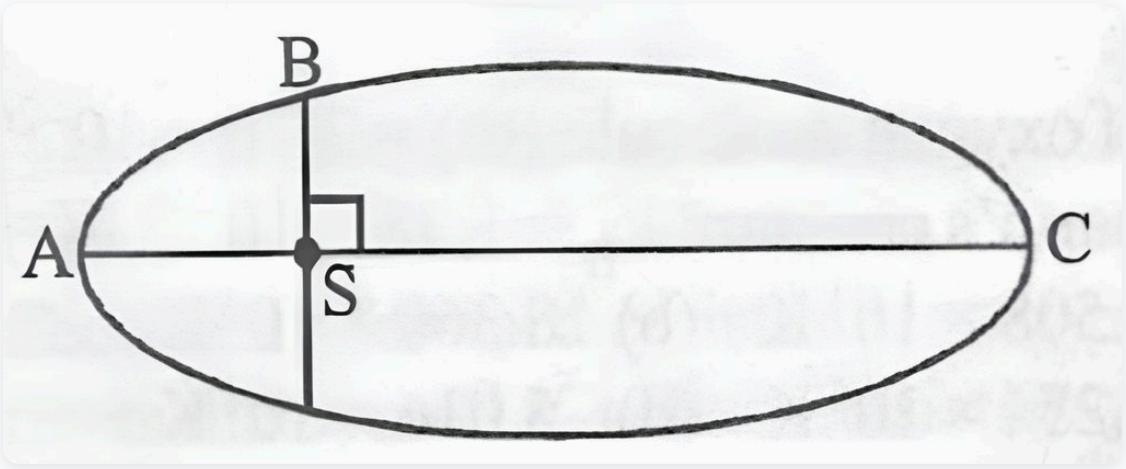
$I_{Solid\ sphere} = 2/5\ MR^2$, $I_{disk} = 1/2\ MR^2$

$I_{(ring)} = MR^2 \therefore W_C > W_B > W_A$

Question 8.

The kinetic energies of a planet in an elliptical orbit about the Sun, at positions A, B and C are K_A , K_B, and K_C respectively. AC is the major axis and SB is perpendicular to AC at the position of the Sun S as shown in the figure. Then

[4 Marks]



(A) $K_B < K_A < K_C$

(B) $K_B > K_A > K_C$

(C) $K_A < K_B < K_C$

(D) $K_A > K_B > K_C$

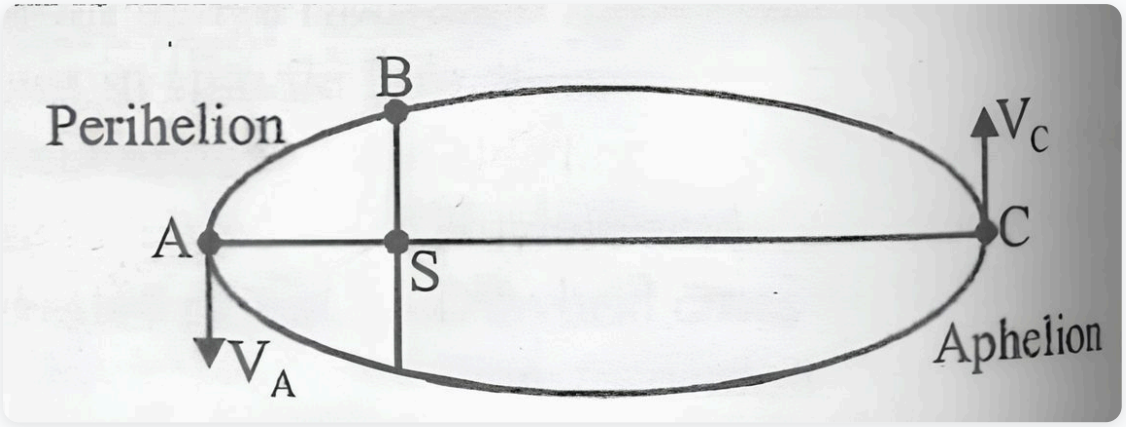
Explanation:

Speed of the planet will be maximum when its distance from the sun is minimum as mvr =constant.

Point A is perihelion and C is aphelion.

Clearly, V_A > V_B > V_C

So, K_A > K_B > K_C



Question 9.

Two wires are made of the same material and have the same volume. The first wire has cross-sectional area A and the second wire has cross-sectional area 3A. If the length of the first wire is increased by Δl on applying a force F, how much force is needed to stretch the second 'wire by the same amount?

[4 Marks]

(A) F

(B) 4F

(C) 9F

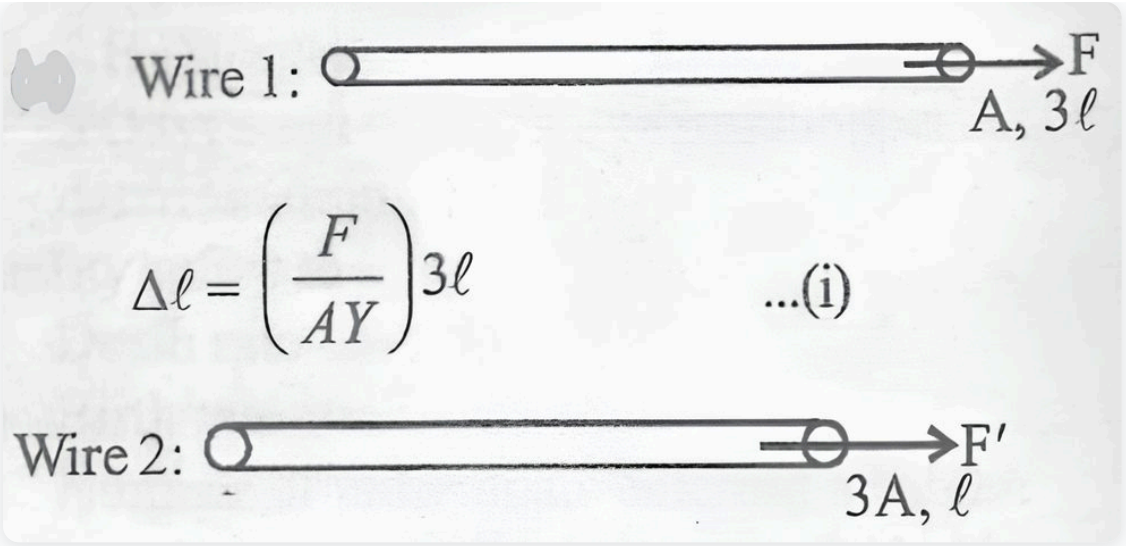
(D) 6F

Explanation:

Δl = (F'/3AY)l ....(ii)

From equation (i) & (ii),

Δl =(F/AY)3l = (F' /3AY)l or, F'=9F



Question 10.

A small sphere of radius ‘r’ falls from rest in a viscous liquid. As a result, heat is produced due to viscous force. The rate of production of heat when the sphere attains its terminal velocity, is proportional to

[4 Marks]

(A) r^3

(B) r^5

(C) r^2

(D) r^4

Explanation:

Power = rate of production of heat F.V

= $6\pi\eta r V_T \cdot V_T = 6\pi\eta r V_T^2$

(∵F = $6\pi\eta r V_T$ r Stoke’s formula)

$V_T \propto r^2$

∵ $V_T = 2/9 (r^2(\rho - \sigma) / \eta(g)$

∴ Power ∝ r^5

Question 11.

The power radiated by a black body is P and it radiates maximum energy at wavelength,λ_0 If the temperature of the black body is now changed so that it radiates maximum energy at wavelength 3/4 λ_0 ,the power radiated by it becomes nP. The value of n is

[4 Marks]

(A) 3/4

(B) 4/3

(C) 256/81

(D) 81/256

Explanation:

From Wien's law

λ_{max} T = constant

i.e., $\lambda_{max1}T_1 = \lambda_{max2}T_2$

$\Rightarrow \lambda_0$ T = 3 λ_0/4 T

$\Rightarrow$ T' =4/3 T

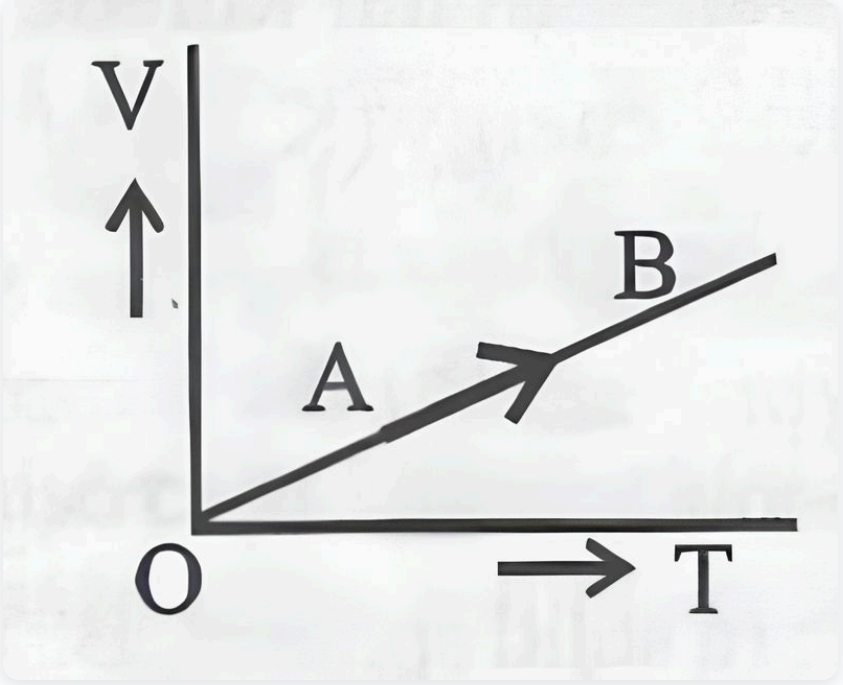
Power radiated P $\propto T^4$

So, $P_2/P_1 = n = (T'/T)^4 = (4/3)^4 = 256/81$

Question 12.

The volume (V) of a monatomic gas varies with its temperature (T), as shown in the graph. The ratio of work done by the gas, to the heat absorbed by it, when it undergoes a change from state A to state B, is

[4 Marks]



(A) 2/7

(B) 2/5

(C) 2/3

(D) 1/3

Explanation:

Gas is monatomic, so $C_p = 5/2\ R$

Given process isobaric

$\therefore dQ = nC_p\ dT$

$\Rightarrow dQ = (5/2\ R)\ dT$

$dW = PdV = nRdT$

$\therefore$ Required ratio $= dW/dQ = nRdT / n(5/2\ R)dT = 2/5$

Question 13.

The efficiency of an ideal heat engine working between the freezing point and boiling point of water, is

[4 Marks]

(A) 12.5%

(B) 26.8%

(C) 6.25%

(D) 20%

Explanation:

Efficiency of ideal heat engine, $\eta = (1 - T_2/T_1)$

Sink temperature, $T_2 = 100°C = 100 + 273 = 373\ K$

Source temperature, $T_1 = 0°C + 0° + 273 = 273\ K$

Percentage efficiency, $\% \eta = (1 - T_2/T_1) \times 100$

$=(1- 273/373)x100 = (100/373) \times 100 = 26.8\%$

Question 14.

At what temperature will the rms speed of oxygen molecules become just sufficient for escaping from the Earth's atmosphere?

(Given:

Mass of oxygen molecule (m)=2.76 x 10^{-26}kg

Boltzmann's constant k_B = 1.38 x 10^{-23} JK^{-1})

[4 Marks]

(A) 1.254x10^4K

(B) 5.016x 10^4K

(C) 2.508x10^4K

(D) 8.360x 10^4 K

Explanation:

Let at temperature T rms speed of oxygen molecules become just sufficient for escaping from the Earth's atmosphere.

V_escape =11200m/s

Also, V_{rms} = V_ escape = $\sqrt{(3k_BT/m_{O2})}$ = 11200 m/s

Putting value of k_B and mO_2, we get,

T = 8.360 × 10^4 K

Question 15.

A pendulum is hung from the roof of a sufficiently high building and is moving freely to and fro like a simple harmonic oscillator. The acceleration of the bob of the pendulum is 20 m/s^2 at a distance of 5 m from the mean position. The time period of oscillation is

[4 Marks]

(A) 1s

(B) 2s

(C) πs

(D) 2πs

Explanation:

From equation, acceleration, $a = 20\ m/s^2$, and displacement, $y = 5m$ $|a| = \omega^2 y$

$\Rightarrow 20 = \omega^2(5)$

$\Rightarrow \omega = 2\ rad / s$

Time period of pendulum,

$T = 2\pi/\omega = 2\pi/2 = \pi s$

Question 16.

A tuning fork is used to produce resonance in a glass tube. The length of the air column in this tube can be adjusted by a variable piston. At room temperature of 27°C two successive resonances are produced at 20 cm and 73 cm of column length. If the frequency of the tuning fork 320 Hz, the velocity of sound in air at 27°C is

[4 Marks]

(A) 350 m/s

(B) 300 m/s

(C) 330 m/s

(D) 339 m/s

Explanation:

Two successive resonance are produced at 20 cm and 73 cm of column length

$\therefore \lambda/2 = (73 - 20) \times 10^{-2}\ m$

$\Rightarrow \lambda = 2 \times (73 - 20) \times 10^{-2}$

Velocity of sound, $\nu = n\lambda$

$= 2 \times 320\ [73 - 20] \times 10^{-2} = 339.2\ m/s^{-1}$

Question 17.

The fundamental frequency in an open organ pipe is equal to the third harmonic of a closed organ pipe. If the length of the closed organ pipe is 20 cm, the length of the open organ pipe is

[4 Marks]

(A) 12.5 cm

(B) 16 cm

(C) 13.2 cm

(D) 8 cm

Explanation:

For closed organ pipe, third harmonic

$n = (2N - 1)V / 4\ell = 3V/4\ell$ ($\because N = 2$)

For open organ pipe, fundamental frequency

$n = NV / 2\ell' = V/2\ell$ ($\because N = 1$)

According to question, $3V/4\ell = V/2\ell'$

$\Rightarrow \ell = 4\ell'/3 \times 2 = 2\ell /3 = 2 \times 20 / 3 = 13.33cm$

Question 18.

An electron falls from rest through a vertical distance h in a uniform and vertically upward directed electric field E. 'The direction of electric field is now reversed, keeping its magnitude the same. A proton is allowed to fall from rest in it through the same vertical distance h. The time of fall of the electron, in comparison to the time of fall of the proton is

[4 Marks]

(A) 10 times greater

(B) smaller

(C) 5 times greater

(D) equal

Explanation:

As we know, $F = qE = ma$

$\Rightarrow a = qE/m$

$h = 1qE/2m (t^2)$

$\therefore t = \sqrt{(2hm/qE)}$

i.e., time $t \propto \sqrt{m}$ as 'q' is same for electron and proton. Since, electron has smaller mass so it will take smaller time.

Question 19.

A toy car with charge q moves on a frictionless horizontal plane surface under the influence of a uniform electric field □□ . Due to the force q □□ , its velocity increases from 0 to 6 m/s in one second duration. At that instant the direction of the field is reversed. The car continues to move for two more seconds under the influence of this field. The average velocity and the average speed of the toy car between 0 to 3 seconds are respectively

[4 Marks]

(A) 1.5m/s,3m/s

(B) 1m/s,3.5m/s

(C) 2m/ss,4m/s

(D) 1m/s,3m/s

Explanation:

Acceleration, a = v-u /t = 6-0/1

= 6 ms^{-2}

For t = 0 to t = 1s,

s_1 = 1/2 x 6 $(1)^2$ = -3m ...(i)

For t=1s=tot=2s,

S_2 6.1 -1/2 x 6$(l)^2$ = -3 ...(ii)

For t = 2s to t = 3s,

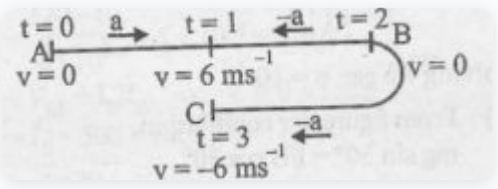
S_3 = 0-1/2 x 6$(l)^2$ = -3 (iii)

Total displacement S = S_1 + S_2 +S_3 = 3 m

Average velocity = 3/3 = 1 ms^{-1}

Total distance travelled =9 m

Average speed = 9/3 = 3 ms^{-1}



Question 20.

The electrostatic force between the metal plates of an isolated parallel plate capacitor C having a charge Q and area A, is

[4 Marks]

(A) proportional to the square root of the dist between the plates

(B) independent of the distance between the plates

(C) linearly proportional to the distance between plates

(D) inversely proportional to the distance between plates

Explanation:

Electrostatic force between the metal plates

$F_plate = Q^2/ 2A\varepsilon_0$

For isolated capacitor Q = constant

Clearly, F is independent of the distance between plates.

Question 21.

A carbon resistor of (47 ±4.7) kΩ is to be marked With rings of different colours for its identification. The colour code sequence will be

[4 Marks]

(A) Yellow—Green —Violet—Gold

(B) Green—Orange—Violet—Gold

(C) Violet—Yellow— Orange— Silver

(D) Yellow— Violet—Orange — Silver

Explanation:

Colour code for carbon resistor

0 Black

1 Brown Tolerance: ±5% Gold

2 Red ±10% Silver

3 Orange ±20% No colour

4Yellow

5 Green

6 Blue

7 Violet

8 Grey

9 White

(47 ± 4.7)KΩ= 47 × 10^3 ± 10%

Yellow -Violet - Orange - Silver

Question 22.

A set of 'n' equal resistors, of value 'R' each, are connect in series to a battery of emf 'E' and internal resistance 'R' The current drawn is I. Now, the 'n' resistors are connected in parallel to the same battery. Then the current d from battery becomes 10 1. The value of 'n' is

[4 Marks]

(A) 10

(B) 9

(C) 11

(D) 20

Explanation:

In series grouping equivalent resistance R_{series} = nR

In parallel grouping equivalent resistance $R_{parallel}$ = R/n

I = E/nR + R ...(i)

10I = E/R/n+R ...(ii)

Dividing eq. (ii) by (i),

10 = (n+1)R/(1/n +1)R

Solving we get, n = 10

Question 23.

A metallic rod of mass per unit length 0.5 kg m^{-1} is horizontally on a smooth inclined plane which makes an angle of 30^0 with the horizontal. The rod is not allowed to ide down by flowing a current through it when a magnetic field of induction 0.25 T is acting on it in the vertical direction. The current flowing in the rod to keep it stationary is

[4 Marks]

(A) 7.14A

(B) 14.76A

(C) 5.98A

(D) 11.32 A

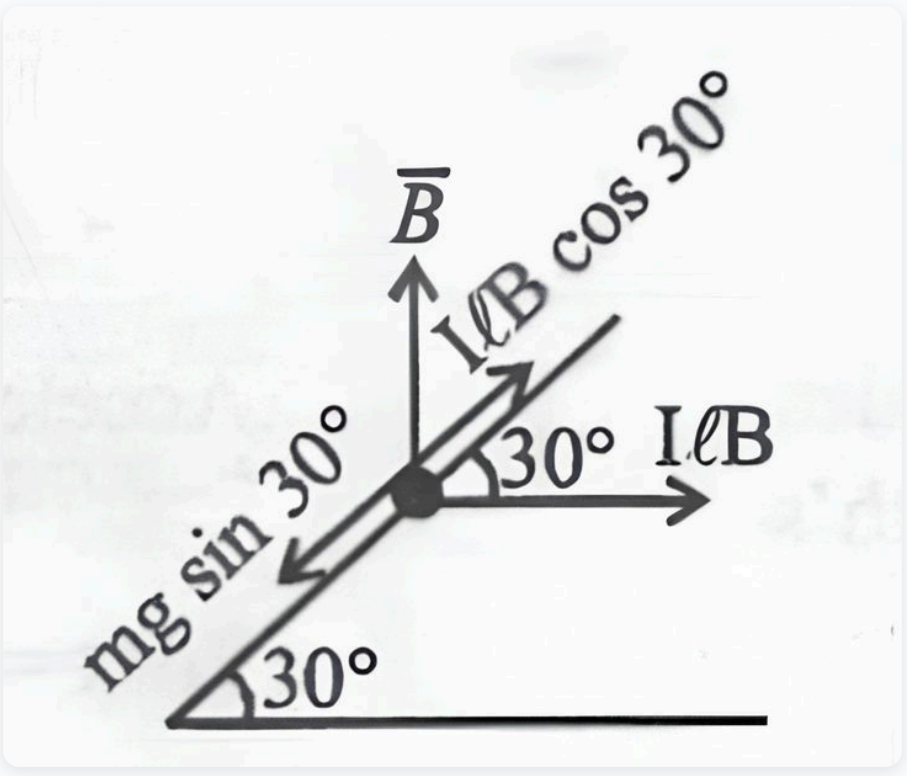
Explanation:

From figure, for equilibrium,

mg sin 30°=1/B 30°

⇒ I =mg/ℓB tan 30°

= 0.5 x9.8/0.25 x√3 = 11.32A



Question 24.

Current sensitivity of a moving coil galvanometer is 5 div/ mA and its voltage sensitivity (angular deflection per unit voltage applied) is 20 div/V. The resistance of the galvanometer is

[4 Marks]

(A) 250Ω

(B) 500Ω

(C) 40Ω

(D) 25Ω

Explanation:

Current sensitivity of moving coil galvanometer

$I_s = NBA/C$ ...(i)

Voltage sensitivity of moving coil galvanometer,

$V_s = NBA/ CR_G$ ..(ii)

Dividing eq. (i) by (ii)

Resistance of galvanometer

$R_G = I_s / V_s = 5 \times 1 / 20 \times 10^{-3} = 5000 / 20 = 250\ \Omega$

Question 25.

A thin diamagnetic rod is placed vertically between the poles of an electromagnet. When the current in the electromagnet is switched on, then the diamagnetic rod is pushed up, out of the horizontal magnetic field. Hence the rod gains gravitational potential energy. The work required to do this comes from

[4 Marks]

(A) the lattice structure of the ‘material of the rod

(B) the induced electric field due to the changing magnetic field

(C) the current source

(D) the magnetic field

Explanation:

Rod gains gravitational potential energy which comes from energy of current source.

Question 26.

The magnetic potential energy stored in a certain inductor is 25 mJ, when the current in the inductor is 60 mA. This inductor is of inductance

[4 Marks]

(A) 13.89 H

(B) 1.389H

(C) 138.88H

(D) 0.138H

Explanation:

From question energy stored in inductor,

$U = 25 \times 10^{-3}$ J

Current, I = 60 mA

Energy stored in inductor $U = 1/2LI^2$

$25 \times 10^{-3} = 1/2 \times L \times (60 \times 10^{-3})^2$

$L = 25 \times 2 \times 10^6$ x10^{-3} /3600 = 13.89 Hm

Question 27.

An inductor 20 mH, a capacitor 100 μFanda resistor 50Ω are connected in series across a source of emf, V.= 10 sin 314 t. The power loss in the circuit is

[4 Marks]

(A) 0.79W

(B) 0.43W

(C) 1.13W

(D) 2.74 W

Explanation:

Power dissipated in an LCR series circuit connected to an a.c. source emf E

$P = E_{rms}\, I_{rms} \cos \Phi = E^2_{rms}R/Z^2 = E^2_{rms}R / R^2 + (\omega L - 1/C\omega)^2$

$(10/\sqrt{2})^2 \times 50 / (50)^2 + (314 \times 20 \times 10^{-3} - 1/(314 \times 100 \times 10^{-6}))^2]$ Solving we get, P =0.79 W

Question 28.

An em wave is propagating in a medium with a velocity □□ = $\mathbf{V}\hat{i}$. The instantaneous oscillating electric field of this em wave is along +y axis. Then the direction of oscillating 'magnetic field of the em wave will be along

[4 Marks]

(A) -z direction

(B) -y direction

(C) +z direction

(D) —x direction

Explanation:

As we know, □□ × □□= □□

(□□$\hat{j}$ × □□) =□□$\hat{i}$ (∵Electric field vector is along +y axis)

So, □□ = B$\hat{k}$

i.e., direction of magnetic field vector is along +z direction.

Question 29.

The refractive index of the material of a prism is √2 and the angle of the prism is 30°.One of the two refracting surfaces of the prism is made a mirror inwards, by silver coating. A beam of monochromatic light entering the prism from the other face will retrace its path (after reflection from the silvered surface) if its angle of incidence on the prism is

[4 Marks]

(A) Zero

(B) 60^0

(C) 45^0

(D) 30^0

Explanation:

For refracting the path, light ray should be normally incident on slivered face.

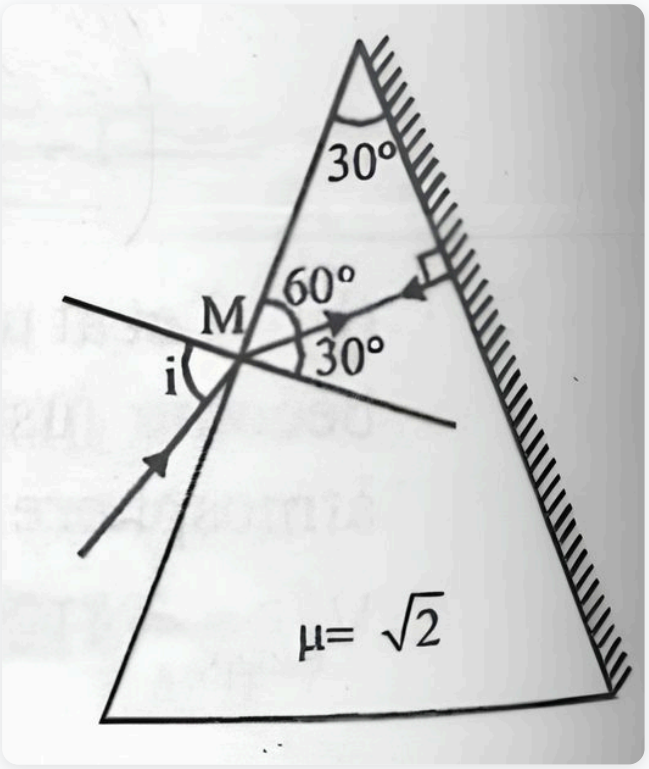
A = r + o ⇒ r = 30°

Applying Snell's law at point M,

sin i/sin30° = √2/1

⇒sin i = √2 × 1/2

or, sin r = 1/√2 i.e., i = 45°



Question 30.

An astronomical refracting telescope will have large angular magnification and high angular resolution, when it has an objective lens of

[4 Marks]

(A) small focal length and large diameter

(B) large focal length and small diameter

(C) small focal length and small diameter

(D) large focal length and large diameter

Explanation:

For telescope, angular magnification = f_0 / f_E

So, focal length of objective lens should be large.

Angular resolution = D/1.22 λ So, D objective lens of refracting telescope should have large focal length (f_0) and larger diameter D for larger magnification.

Question 31.

In Young's double slit experiment the separation d between the slits is 2 mm, the wavelength λ of the light used is 5896 Å and distance D between the screen and slits is 100 cm. It is found that the angular width of the fringes is 0.20°. To increase the fringe angular width to 0.21° (with same λ and D) the separation between the slits needs to be changed to

[4 Marks]

(A) 1.9mm

(B) 1.8mm

(C) 2.1mm

(D) 1.7mm

Explanation:

Angular width = λ/d

So, 0.20° = λ/2 mm

⇒ λ = 0.20° × 2

Again, 0.21° = λ/d

Now putting the value of λ,

d = 0.20° × 2 mm/0.21°

∴ d = 1.9 mm

Question 32.

Unpolarised light is incident from air on a plane surface of a material of refractive index 'μ'. At a particular angle of incidence 'i', it is found that the reflected and refracted rays are perpendicular to each other. Which of the: following options is correct for this situation?

[4 Marks]

(A) $i = \sin^{-1}(1/\mu)$

(B) $i = \tan^{-1}(1/\mu)$

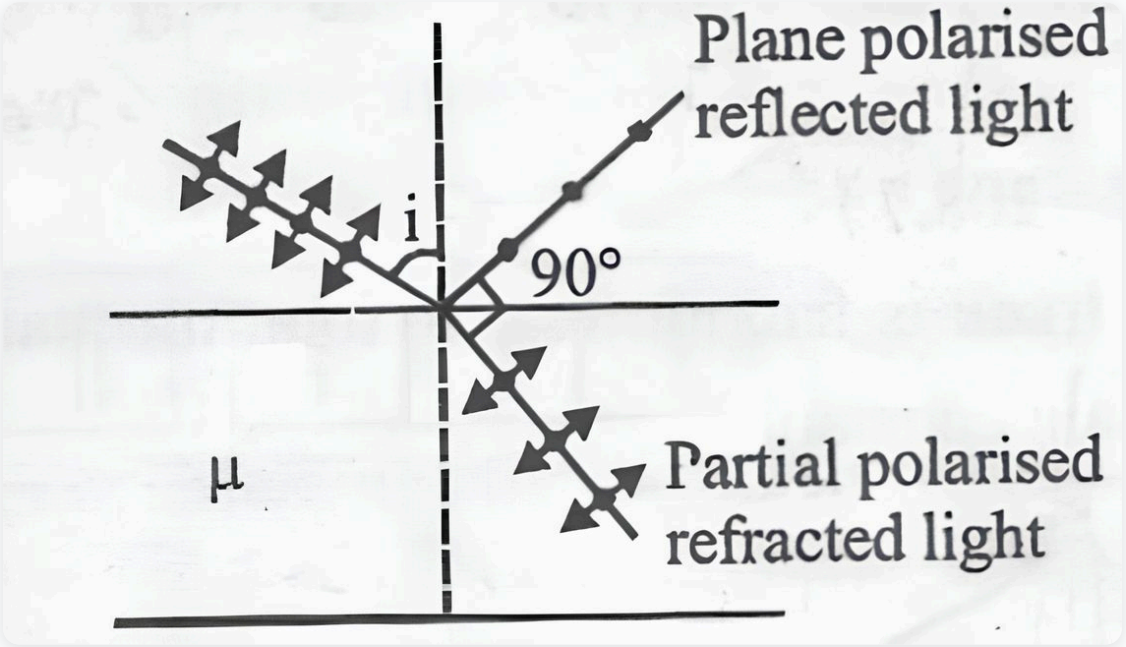
(C) Reflected light is polarised with its electric vector parallel to the plane of incidence

(D) Reflected light is polarised with its electric vector perpendicular to the plane of incidence

Explanation:

When reflected light rays and refracted rays are perpendicular, reflected light is polarised with electric field vector perpendicular to the plane of incidence.

Also, tan i = μ (i (Brewster angle)



Question 33.

An electron of mass m_0 with an initial velocity □□ = v_0 î (v_0 > 0) enters an electric field □□ = −E_0 î (E_0 = constant > 0) at t = 0. If λ_0 is its de-Broglie wavelength at t = 0, then its de-Broglie wavelength after time t is

[4 Marks]

(A) $\lambda_0 t$

(B) $\lambda_0/(1+eE_0/mV_0\ t)$

(C) $\lambda_0(1+ eE_0/,v_0\ t)$

(D) λ_0

Explanation:

Initial de-Broglie wavelength

$\lambda_0 = h/(mV_0)$ ...(i)

Acceleration of electron

$a = eE_0/m$ ($\because F = ma = eE_0$)

Velocity after time 't'

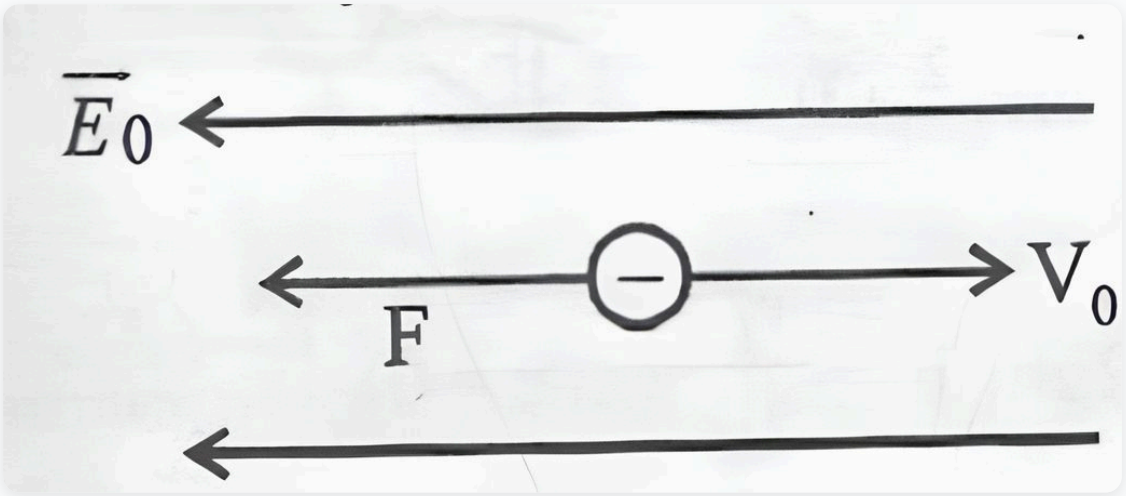
$V = (V_0 + (eE_0/m(t))$

So, $\lambda = h/mV = h/m(V_0+eE_0/m(t)$

$= h/mV_0[1+eE_0/mV_0\ (t)] = \lambda_0/[1+eE_0/mV_0\ (t)\ ]$ ...(ii)

Dividing eqs. (ii) by (i),

de- Broglie wavelength $\lambda = \lambda_0/[1+ eE_0/mV_0(t)]$



Question 34.

The ratio of kinetic energy to the total energy of an electron in a Bohr orbit of the hydrogen atom, is

[4 Marks]

(A) 2:-1

(B) 1:-2

(C) 1:-1

(D) 1:1

Explanation:

In a Bohr orbit of hydrogen atom Kinetic energy,

$K = kze^2/2r_n$

Total energy, $E = -kze^2/2r_n$

So, Kinetic energy : total energy = 1 : −1

Question 35.

For a radioactive material, half-life is 10 minutes. If initially there are 600 number of nuclei, the time taken (in minutes) for the disintegration of 450 nuclei is

[4 Marks]

(A) 30

(B) 15

(C) 10

(D) 20

Explanation:

Number of nuclei remaining, N = 600 − 450 = 150 after time 'T'

$N/N_0 = 150/600 = 1/4$

$N = N_0e^{-\lambda t} \Rightarrow \ell n(N_0/N) = \lambda t \Rightarrow \ell n\ (N_0/N\ ) = \lambda t$

$\Rightarrow t = 1/\ \lambda\ \ell n\ (N_0/N)$

$2.303 \times T_{1/2} / 0.693(\ \log_{10}\ )\ N_0/N$

$= 2.303 \times 10 / 0.693\ (\log_{10}\ 4)$

Question 36.

In ap-n junction diode, change in temperature due to heating

[4 Marks]

(A) Affects the overall V-I characteristics of p-n junction

(B) Does not affect resistance of p-n junction

(C) Affects only reverse resistance

(D) Affects only forward resistance

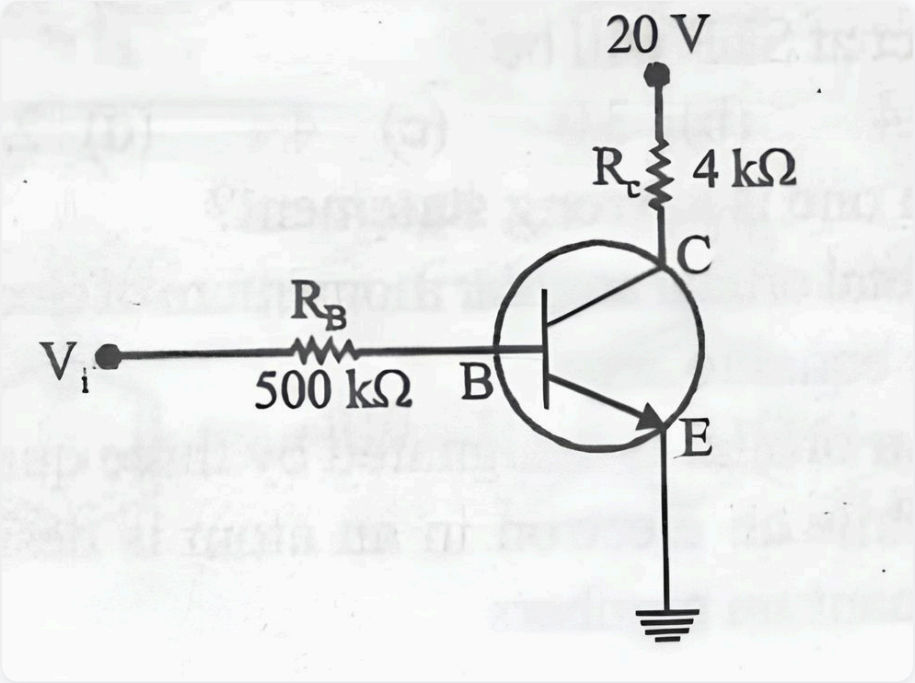
Explanation:

On heating, number of electron-hole pairs increases, so overall resistance of diode will change. Hence forward biasing and reversed biasing both are changed.

Question 37.

In the circuit shown in the figure, the input voltage V_i is 20 V, V_BE = 0 and V_CE) = 0. The values of I_β, I□ and β are given by

[4 Marks]



(A) I_β = 40 μA, I□ = 10 mA, β = 250

(B) I_β = 40 μA, I□ = 5 mA, β = 125

(C) I_β = 25 μA, I□ = 5 mA, β = 200

(D) I_β = 20 μA, I□ = 5 mA, β = 250

Explanation:

From question, V_BE = = 0, V_i = 20V

V_CE = 0

V_b = 0 (earthed)

I_B = ?, I□ = ?, β = ?

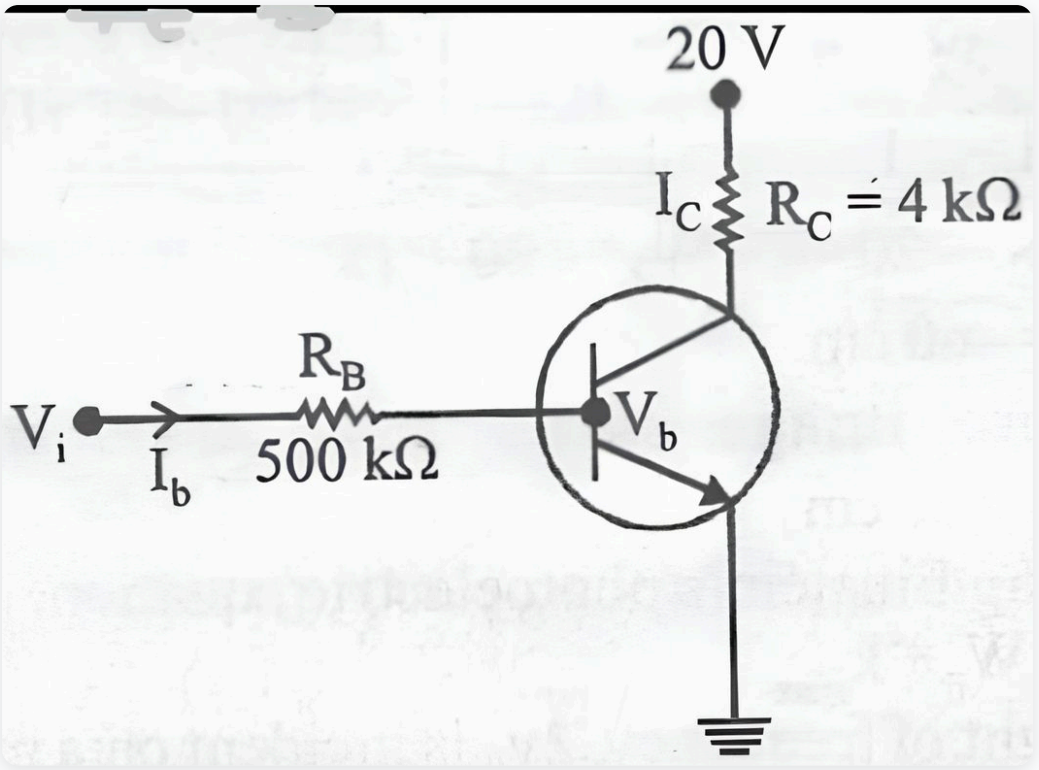
I□ = (20 − 0)/4 × 10^3 = 5 × 10^{-3} = 5 mA

V_i = V_BE + I_BR_B or, Vi = 0 + I_BR_B

⇒ 20 = I_B × 500 × 10^3

⇒ I_B = 20/500 × 10^3 = 40 μA

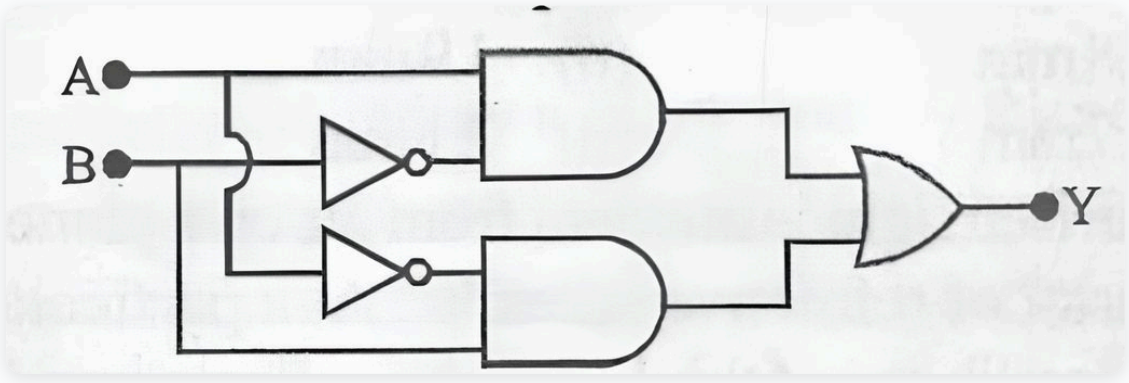
$\beta = I_c / I_b = 25 \times 10^{-3} / 40 \times 10^{-6} = 125$



Question 38.

In the combination of the following gates the output Y can be written in terms of inputs A and B as

[4 Marks]



(A) $\overline{A}.\overline{B}$

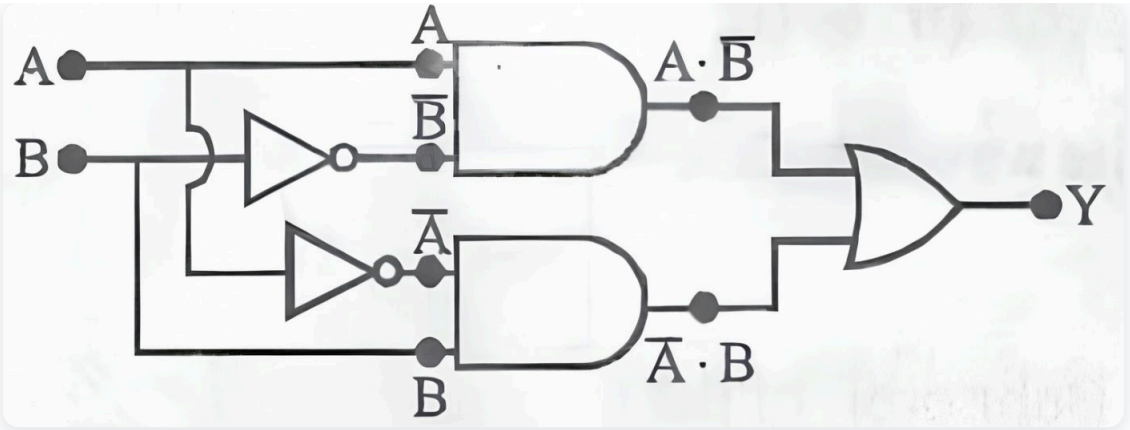
(B) $A.\overline{B} + \overline{A}.B$

(C) $\overline{A}.\overline{B} + A.B$

(D) $\overline{A}+\overline{B}$

Explanation:

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



Question 39.

A battery consists of a variable number 'n' of identical cells (having internal resistance 'r' each) which are connected in series. The terminals of the battery are short-circuited and the current I is measured. Which of the graphs shows the correct relationship between I and n?

[4 Marks]

(A)



(B)



(C)



(D)

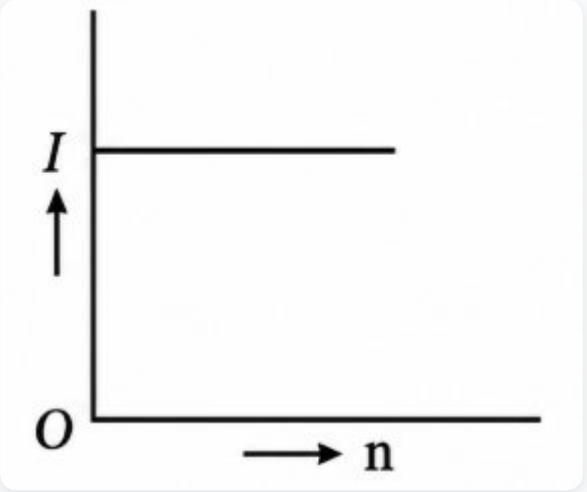


Explanation:

Short circuited current,

$I = n\varepsilon / nr1 = \varepsilon / r$

So, I is independent of n and I is constant.



Question 40.

An object is placed at a distance of 40 cm from a concave mirror of focal length 15 cm. If the object is displaced through a distance of 20 cm towards the mirror, the displacement of the image will be

[4 Marks]

(A) 36 cm towards the mirror

(B) 30 cm towards the mirror

(C) 36 cm away from the mirror

(D) 30 cm away from the mirror

Explanation:

using mirror formula,

$1/f = 1/v_1 + 1/u$

$-1/15 = 1/v_1 + 1/u$

$\Rightarrow 1/v_1 = 1/-15 + 1/40$

$\therefore v_1 = 24$ cm

When object is displaced by 20 cm towards mirror

Now, $u_2 = -20$

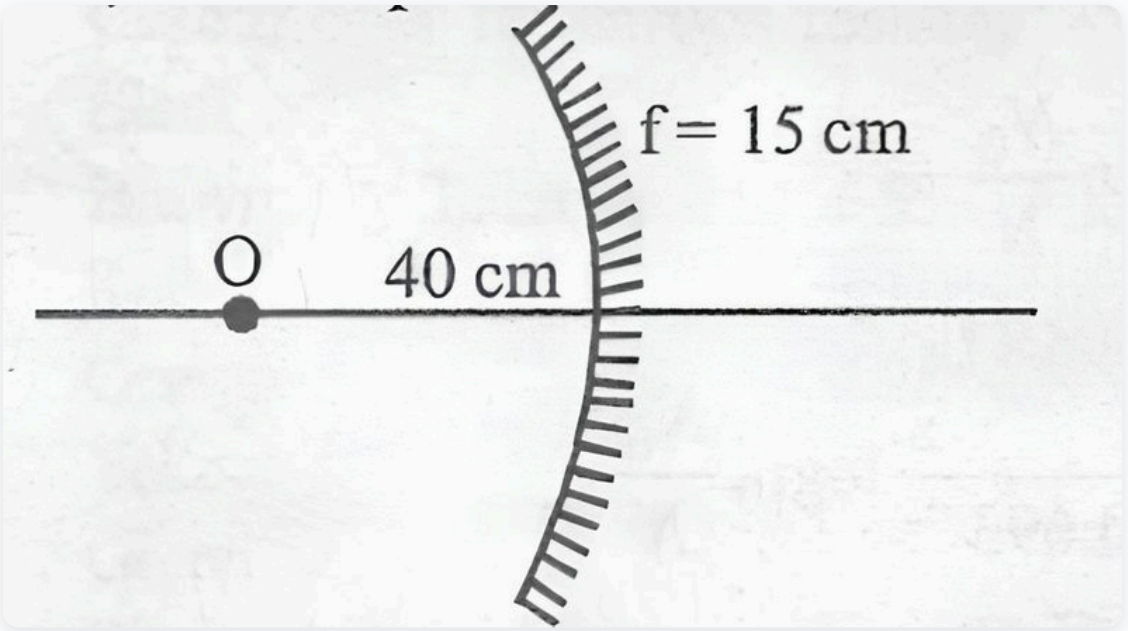
So, $1/f = 1/v_2 + 1/u_2$

$1/-15 = 1/v_2 + 1/20 \Rightarrow 1/v_2 = 1/20 - 1/15$

$\therefore v_2 = -60$ cm

Therefore image shifts away from mirror by

60 − 24 = 36 cm



Question 41.

'When the light of frequency $2v_0$ (where v_0 is threshold frequency), is incident on a metal plate, the maximum velocity of electrons emitted is v_1. When the frequency of the incident radiation is increased to $5v_0$, the maximum velocity of electrons emitted from the same plate is v_2. The ratio of v_1 to v_2 is'

[4 Marks]

(A) 2:1

(B) 4:1

(C) 1:4

(D) 1:2

Explanation:

Using Einstein's photoelectric equation,

$E = W_0 + K_{max}$

When light of frequency, $2v_0$ is incident on a metal plate,

$h(2v_0) = hv_0 + 1/2\ mv_1^2$

$hv_0 = ½\ mv_1^2$ .....(i)

When light of frequency, $5v_0$ is incident on a metal plate

$h(5v_0) = hv_0 + ½mv_2^2$

$4hv_0 = ½mv_2^2$ .....(ii)

Dividing eqn. (i) by (ii),

$1/4 = v_1^2/v_2^2$

$\therefore v_1/v_2 = 1/2$

Question 42.

If the mass of the Sun were ten times smaller and th universal gravitational constant were ten times larger magnitude, which of the following is not correct?

[4 Marks]

(A) Time period of asimple pendulum on the Earth would decrease

(B) 'g' on the Earth will not change

(C) Walking on the ground would become more difficult

(D) Raindrops will fall faster

Explanation:

If universal gravitational constant becomes ten times,

G' = 10G

Acceleration due to gravity, $g = GM/R^2$

So, acceleration due to gravity increases.

Question 43.

A sample of 0.1 g of water at 100°C and normal pressure ($1.013 \times 10^5 Nm^{-2}$) requires 54 cal of heat energy to convert to steam at 100°C. If the volume of the steam produced is 167 . 1 cc, the change in internal energy of the sample , is

[4 Marks]

(A) 42.2J

(B) 84.5J

(C) 208.7J

(D) 104.3J

Explanation:

Using first law of thermodynamics equation,

$\Delta Q = \Delta U + \Delta W$

$\Rightarrow 54 \times 4.18$

$= \Delta U + 1.013 \times 10^5 (167.1 \times 10^{-6} - 0)$

$(\because \Delta W = P\Delta V)$

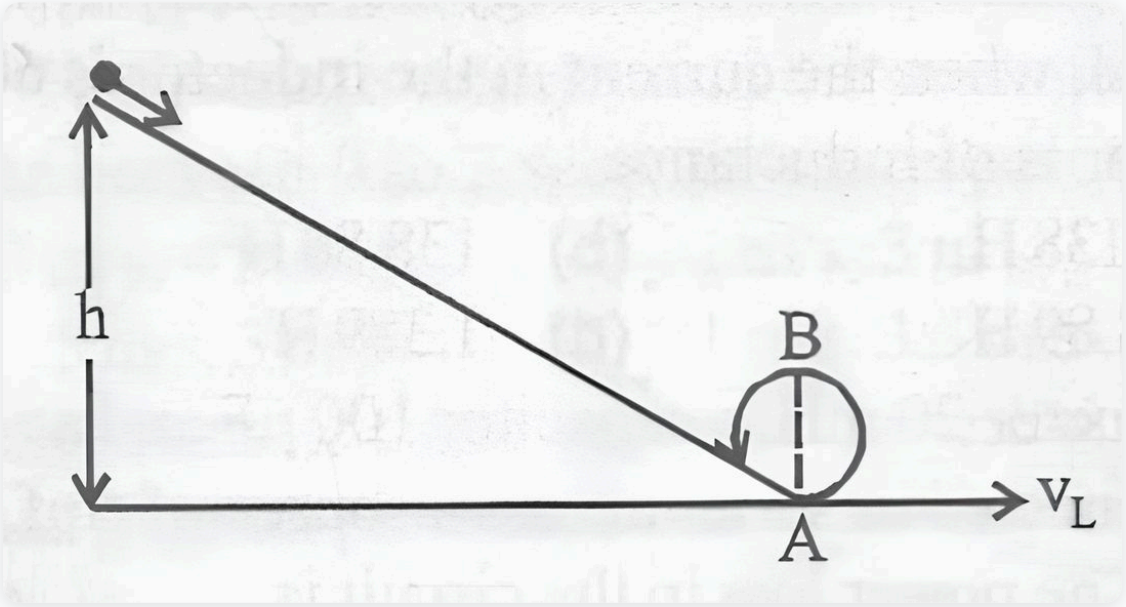
$\Rightarrow \Delta U = 208.7$ J

Question 44.

A body initially at rest and sliding along a frictionless track from a height h (as shown in the figure) just complete a vertical circle of diameter AB=D. The height h is equal

to

[4 Marks]



(A) 7/5(D)

(B) 3/2(D)

(C) 5/4(D)

(D) D

Explanation:

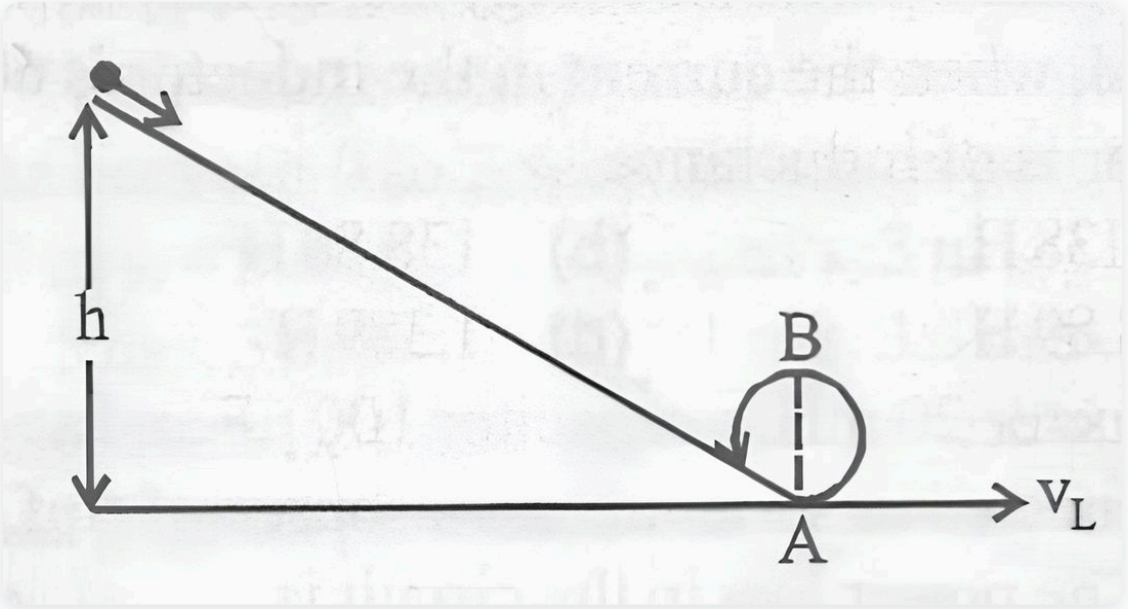
As track is frictionless, so total mechanical energy will remain constant

i.e.,$0 + mgh = \frac{1}{2}mv_L^2 + 0$

Using $v^2 - u^2 = 2gh$, $h = v^2/2g$ $(\because u = 0)$

For completing the vertical circle, $v_L \geq \sqrt{5gR}$

or, $h = 5gR/2g = 5/2(R) = 5/4(D)$



Question 45.

In which case is number of molecules of water maximum?

[4 Marks]

(A) 18 mL of water

(B) 10^{-3} mol of water

(C) 0.00224 L of water vapours at 1 atm and 273 K

(D) 0.18 g of water

Explanation:

(a) Mass of water = 18 × 1 = 18 g

Molecules of water = mole × N_A

= 18/18 N_A = N_A

(b) Molecules of water = mole × N_a

= 0.18/18 NA = 10^{-2} N_A

(c) Molecules of water = mole × N_A

= 0.00224/0.0224 × N_A = 10^{-3} N_A

(d) Moles of water = 0.00224/22.4 = 10^{-4}

Molecules of water = mole × N_A = 10^{-4} N_A

Question 46.

A mixture of 2.3 g formic acid and 4.5 g oxalic acid is treated with conc. H_2SO_4. The evolved gaseous mixture is passed through KOH pellets. Weight (in g) of the remaining product at STP will be

[4 Marks]

(A) 4.4

(B) 1.4

(C) 3.0

(D) 2.8

Explanation:

CO_2 is absorbed by KOH.

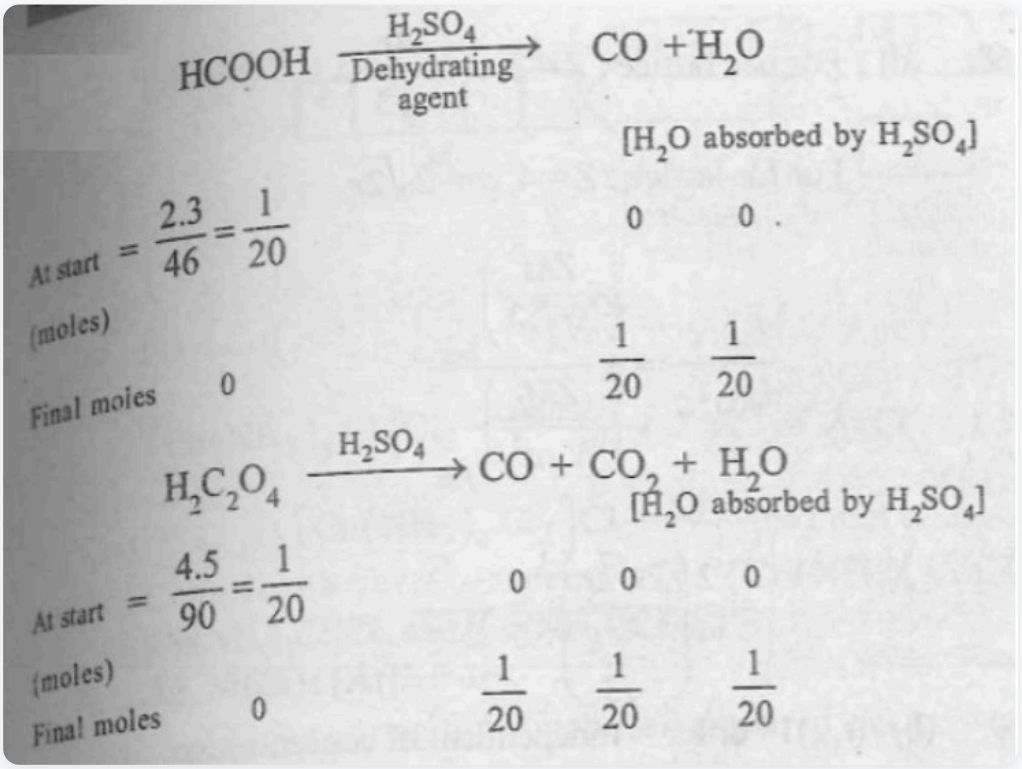
So, the remaining product is only CO.

Moles of CO formed from both reactions

= 1/20 + 1/20 = 1/10

Left mass of CO = moles × molar mass

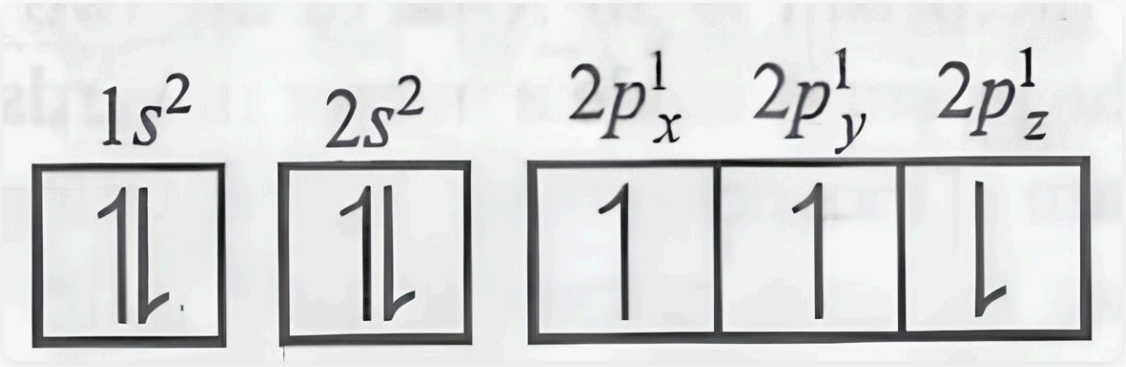
= 1/10 × 28 = 2.8 g



Question 47.

Which one is a wrong statement?

[4 Marks]



(A) Total orbital angular momentumn of electron in s' orbital is equal to zero

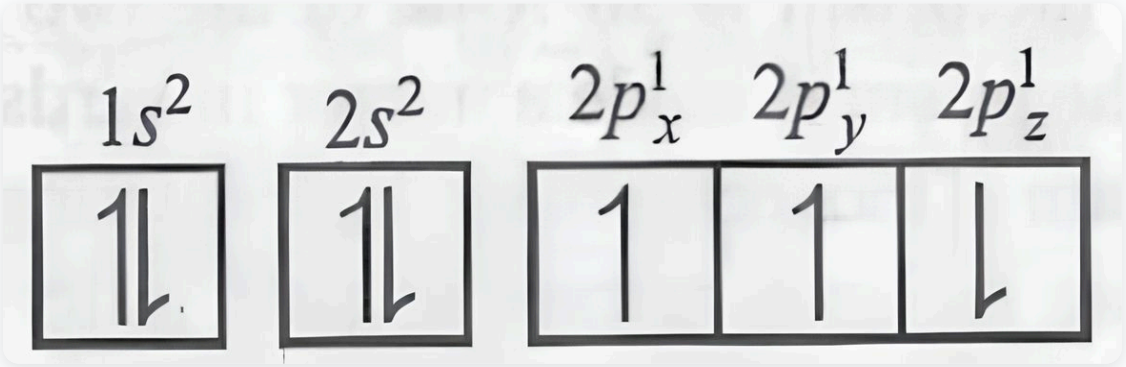
(B) An orbital is designated by three quantum numbers while an electron in an atom is designated by four quantum numbers

(C) The value of m for d^2z is zero

(D) The electronic configuration of N atom is

Explanation:

The correct configuration of N' is



Question 48.

The correct order of atomic radii in group 13 elements is

[4 Marks]

(A) B

(B) B

(C) B

(D) B

Explanation:

Due to poor shielding effect of 3d electrons in Ga, the to mic radii of Ga < AL Thus, the correct order of atomic is B<Ga<Al <In<Tl

Question 49.

In the structure of ClF_3, the number of lone pair of electron on central atom 'Cl' is

[4 Marks]

(A) Three

(B) Two

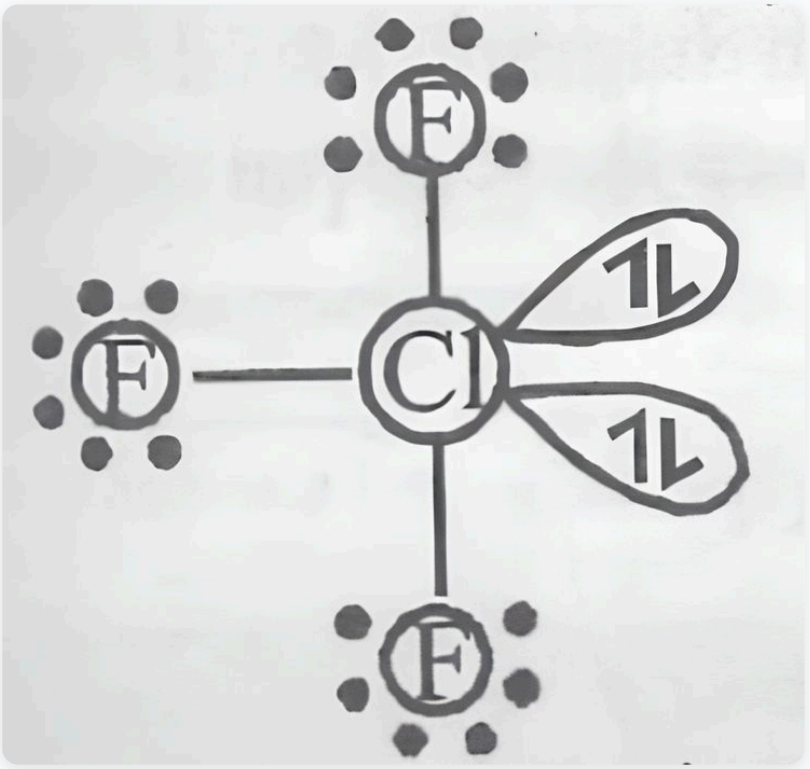
(C) One

(D) Four

Explanation:

The structure of ClF_3 is

The number of lone pair of electrons on central Cl is 2.



Question 50.

Which of the following molecules represents the order of hybridisation sp^2, sp^2, sp, sp from left to right atoms?

[4 Marks]

(A) $CH_2 = CH - C \equiv CH$

(B) $HC \equiv C- C \equiv CH$

(C) $CH_2 = CH - CH = CH_2$

(D) $CH_3 - CH = CH - CH_3$

Explanation:

sp^2, sp^2, sp, sp

$CH_2 = CH - C \equiv CH$

Question 51.

Consider the following species

CN^+, CN^-, NO and CN

'Which one of these will have the highest bond order?

[4 Marks]

(A) CN

(B) CN^+

(C) CN^-

(D) NO

Explanation:

NO : $(\sigma 1s)^2$, $(\sigma^* 1s)^2$, $(\sigma 2s)^2$, $(\sigma^* 2s)^2$, $(\sigma 2p\square)^2$,$(\pi 2p_x)^2$, =$(\pi 2p_y)^2$, $(\pi^* 2p_x)^1$= $(\pi 2p_y)^0$,

B.O. = 10 − 5/2 = 2.5

CN^- : $(\sigma 1s)^2$, $(\sigma^* 1s)^2$, $(\sigma 2s)^2$, $(\sigma^* 2s)^2$, $(\pi 2p_x)^2$,=$(\pi 2p_y)^2$, $(\sigma 2p\square)^2$

B.O. = 10 − 4/2 = 3

CN : $(\sigma 1s)^2$, $(\sigma^* 1s)^2$, $(\sigma 2s)^2$, $(\sigma^* 2s)^2$, $(\pi 2p_x)^2$=$(\pi 2p_y)^2$, $(\sigma 2p\square)^1$

B.O. = (9 − 4)/2 = 2.5

CN^+ : $(\sigma 1s)^2$, $(\sigma^* 1s)^2$, $(\sigma 2s)^2$, $(\sigma^* 2s)^2$, $(\pi 2p_x)^2$ = $(\pi 2p_y)^2$

B.O. = (8 − 4)/2 = 2

Hence, option CN^- should be the right answer.

Question 52.

The correction factor 'a' to the ideal gas equation corresponds to

[4 Marks]

(A) Density of the gas molecules

(B) Volume of the gas molecules

(C) Blectric field present between the gas molecules

(D) Forces of atiraction between the gas molecules

Explanation:

In real gas equation,

van der Wall constant (a) α forces of attraction.

Question 53.

Given van der Waals constants for NH_3, H_2, O_2 and CO_2 are respectively 4.17, 0.244, 1.36 and 3.59, which one of the following gases is most easily liquefied?

[4 Marks]

(A) O_2

(B) CO_2

(C) H_2

(D) NH_3

Explanation:

van der Waal constant 'a', signifies intermolecular forces of attraction.

Higher is the value of 'a', easier will be the liquefaction of gas.

Question 54.

The bond dissociation energies of X_2, Y_2 and XY are in the ratio of 1 : 0.5 : 1. ΔH for the formation of XY is -200 kJ mol^{-1}. The bond dissociation energy of X_2 will be :

[4 Marks]

(A) 200kJmol^{-1}

(B) 100kJmol^{-1}

(C) 400kJmol^{-1}

(D) 800kJmol^{-1}

Explanation:

Let B.E. of X_2, Y_2 and XY are x kJ mol^{-1}, 0.5x kJ mol^{-1} and x kJ mol^{-1} respectively.

1/2 X_2 + 1/2 Y_2 → XY ; $\Delta H = -200$ kJ mol^{-1}

$\Delta H = \Sigma$(B.E.)_Reactants $-\Sigma$(B.E.)_product

= [1/2 x + ½(0.5x)] − [1 x (x)]

On solving, x = 800 kJ mol^{-1}.

Question 55.

'Which one of the following conditions will favour maximum formation of the product in the reaction,

$A_2(g) + B_2(g) \rightleftharpoons X_2(g) \quad \Delta_r H = -X$ kJ;

[4 Marks]

(A) High temperature and low pressure

(B) High temperature and high pressure

(C) Low temperature and low pressure

(D) Low temperature and high pressure

Explanation:

$A_2(g) + B_2(g) \rightleftharpoons X_2(g) \quad \Delta_r H = -X$ kJ;

On increasing pressure equilibrium shifts in a direction where number of moles decreases i.e. forward direction. On decreasing temperature, equilibrium shifts in exothermic direction .e., forward direction.

So, high pressure and low temperature favours maximum formation of product.

Question 56.

Following solutions were prepared by mixing different volumes of NaOH and HCl of different concentrations :

a- 60 mL M/10 HCl + 40 mL M/10 NaOH

b-55 mL M/10 HCl + 45 mL M/10 NaOH

c-75 mL M/5 HCl + 25 mL M/5 NaOH

d- 100 mL M/10 HCl + 100 mL M/10 NaOH

pH of which one of them will be equal to 1?

[4 Marks]

(A) d

(B) c

(C) b

(D) a

Explanation:

Meq. of HCl = 75 × 1/5 × 1 = 15

Meq. of NaOH = 25 × 1/5 × 1 = 5

Meq. of HCl in resulting solution = 10

Molarity of $[H^+]$ in resulting mixture = 10/100 = 1/10

pH = $-\log[H^+] = -\log[1/10] = 1.0$

Question 57.

The solubility of $BaSO_4$ in water is 2.42×10^{-3} gL^{-1} at 298 K. The value of its solubility product (K_{sp}) will be

(Given molar mass of $BaSO_4$ = 233 g mol^{-1})

[4 Marks]

(A) 1.08×10^{-12} mol^2L^{-2}

(B) 1.08×10^{-10} mol^2L^{-2}

(C) 1.08×10^{-8} mol^2L^{-2}

(D) 1.08×10^{-14} mol^2L^{-2}

Explanation:

Solubility of $BaSO_4$ = 2.42×10^{-3} g L^{-1}

$\therefore s = (2.42 \times 10^{-3})/233 = 1.038 \times 10^{-5}$ mol L^{-1}

$K_{sp} = s^2 = (1.038 \times 10^{-5})^2 = 1.08 \times 10^{-10}$ mol^2 L^{-2}

Question 58.

For the redox reaction

$MnO_4^- + C_2O_4^{2-} + H^+ \rightarrow Mn^{2+} + CO_2 + H_2O$

The correct coefficients of the reactants for the balanced equation are

[4 Marks]

	MnO_4^-	$C_2O_4^{2-}$	H^+
(a)	16	5	2
(b)	2	5	16
(c)	5	16	2
(d)	2	16	5

(A) D

(B) C

(C) B

(D) A

Explanation:

$\overset{+7}{Mn}O_4^- \longrightarrow \overset{+2}{Mn^{2+}}$; $5e^-$ gain ...(i)

$\overset{+3}{C_2}O_4^{2-} \longrightarrow \overset{+4}{CO_2}$; $2e^-$ loss ...(ii)

Multiplying (i) by 2 and (ii) by 5 to balance e^-

$$2\,MnO_4^- + 5\,C_2O_4^{2-} \longrightarrow 2\,Mn^{2+} + 10\,CO_2$$

On balancing charge;

$$2\,MnO_4^- + 5\,C_2O_4^{2-} + 16\,H^+ \longrightarrow$$

$$2\,Mn^{2+} + 10\,CO_2 + 8\,H_2O$$

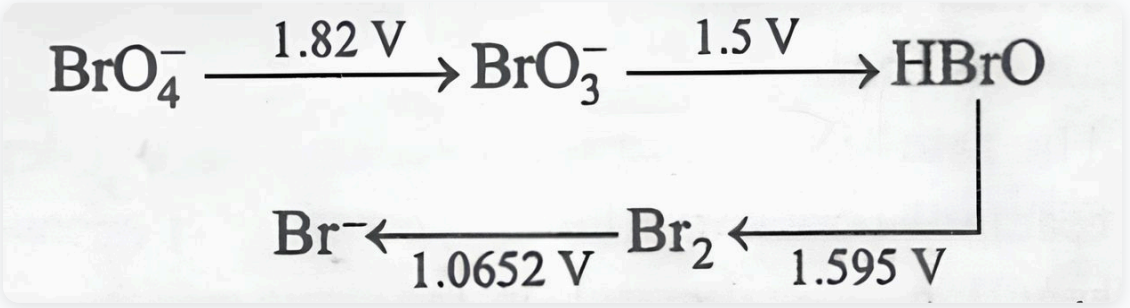
Question 59.

Consider the change in oxidation state of bromine corresponding to different emf values as shown in the

diagram below :

Then the species undergoing disproportion-ation is

[4 Marks]



(A) $Br\bar{O}_4$

(B) $Br\bar{O}_3$

(C) HBrO

(D) Br_2

Explanation:

Calculate E°_cell corresponding to each compound undergoing disproportionation reaction. The reaction for which E°_cell comes out +ve is spontaneous.

$HBrO \rightarrow Br_2$ E° = 1.595 V, SRP (cathode)

$HBrO \rightarrow BrO_3^-$ $E° = -1.5$ V, SOP (anode)

$2HBrO \longrightarrow Br_2 + BrO_3^-$

E°_cell = SRP (cathode) − SRP (anode)

= 1.595 − 1.5

= 0.095 V

E°_cell > 0 ⇒ ΔG° < 0 [spontaneous]

Question 60.

Which of the following oxides is most acidic in nature?

[4 Marks]

(A) CaO

(B) BaO

(C) BeO

(D) MgO

Explanation:

In metals 'moving down the group, metallic character Al increases, so basic nature increases hence most acidic will be BeO.

BeO <Mg0 <Ca0 <BaO

_____

increasing basic character

Question 61.

Among CaH_2, BeH_2, BaH_2, the order of 'ionic character is

[4 Marks]

(A) $BeH_2 < BaH_2 < CaH_2$

(B) $BaH_2 < BeH_2 < CaH_2$

(C) $BeH_2 < CaH_2 < BaH_2$

(D) $CaH_2 < BeH_2 < BaH_2$

Explanation:

$BeH_2 < CaH_2 < BaH_2$

Smaller the size of cation, more will be its polarising power.

Hence, BeH_2, will be least ionic.

Question 62.

'Which one of the following elements is unable to form

$MF^3{}_6^-$ ion?

[4 Marks]

(A) In

(B) Ga

(C) Al

(D) B

Explanation:

Boron belongs to 2nd period and it does not have vacant d-orbital.

Question 63.

'Which of the following is correct with respect to — I effect

of the substituents? (R = alkyl)

[4 Marks]

(A) $-NH_2 > -OR > -F$

(B) $-NR_2 > -OR > -F$

(C) $-NH_2$ <-OR<-F

(D) $-NR_2 < -OR < -F$

Explanation:

−I effect increases on increasing electronegativity of atom. So, correct order of −I effect is

$-NH_2 < -OR < -F$.

Question 64.

Hydrocarbon (A) reacts with bromine by substitution to form an alkyl bromide which by Wurtz reaction is converted to gaseous hydrocarbon containing less than four carbon

atoms. (A) is

[4 Marks]

(A) CH≡CH

(B) $CH_2=CH_2$

(C) CH_4

(D) CH_3-CH_3

Explanation:

$$CH_4 \xrightarrow[h\nu]{Br_2} CH_3-Br \xrightarrow[\text{ether}]{Na} \underset{\text{(less than four 'C')}}{CH_3-CH_3}$$

Question 65.

Which oxide of nitrogen is not a common pollutant introduced into the atmosphere both due to natural and

'human activity?

[4 Marks]

(A) NO

(B) NO_2

(C) N_2O_5

(D) N_2O

Explanation:

Nitrous oxide (N_2O) occurs naturally in environment.

In automobile engine, when fuel is burnt dinitrogen and dioxygen combine to yield NO and NO_2.

Thus, N_2O_5 is the answer

Question 66.

Iron exhibits bcc structure at room temperature. Above 900°C, it transforms to fcc structure. The ratio of density of iron at room temperature to that at 900°C (assuming molar mass and atomic radii of iron remains constant with temperature) is

[4 Marks]

(A) $3\sqrt{3}/4\sqrt{2}$

(B) 1/2

(C) $\sqrt{3}/\sqrt{2}$

(D) $4\sqrt{3}/3\sqrt{2}$

Explanation:

For bcc lattice : Z = 2, $a = 4r/\sqrt{3}$

For fcc lattice : Z = 4, $a = 2\sqrt{2}r$

$\therefore d_{25°C}/d_{900°C} = (ZM/N_A\ a^3)_bcc\ /(ZM/_A^{a3})_fcc$

$= 2/4 \times (2\sqrt{2}r/(4r/\sqrt{3})^3$

$= 3\sqrt{3}/4\sqrt{2}$

Question 67.

The correct difference between first and second order reactions is that

[4 Marks]

(A) Therate of a first-order reaction does not depend on reactant concentrations, the rate of a second-order reaction does depend on reactant concentrations

(B) The half-life of a first-order reaction does not depend on $[A]_0$, the half-life of a second-order reaction does depend on $[A]_0$,

(C) The rate of a first-order reaction does depend on reactant concentrations, the rate of asecond-order reaction does not depend on reactant concentrations

(D) A first-order reaction can be catalyzed, a second order reaction cannot be catalyzed

Explanation:

$(t_1/_2)^{1st}$ order = Independent of concentration

$(t_1/_2)^{2nd}$ order $\propto 1/[A]_0$

Question 68.

'When initial concentration of the reactant is doubled, the half-life period of a zero order reaction

[4 Marks]

(A) is doubled

(B) remains unchanged

(C) is halved

(D) is tripled

Explanation:

$(t_{1/2})_zero = [A]_0/2k$

$\therefore$ If $[A]_0$ = doubled, $t_{1/2}$ doubled

Question 69.

On which of the following properties does the coagulating power of an ion depend?

[4 Marks]

(A) The sign of charge on the ion alone

(B) Both magnitude and sign of the charge on the ion

(C) Size of the ion alone

(D) The magnitude of the charge on the ion alone

Explanation:

According to Hardy Schulze rule, coagulating power of an ion depends on both magnitude and sign of the charge on the ion

Question 70.

Considering Ellingham diagram, which of the following metals can be used to reduce alumina?

[4 Marks]

(A) Cu

(B) Mg

(C) Fe

(D) Zn

Explanation:

Mg has more −ΔG value than alumina. So it will be in the lower part of Ellingham diagram. Metals which have more −ΔG value can reduce those metal oxides which have less −ΔG value.

Question 71.

The correct order of N-compounds in its decreasing order of oxidation states is

[4 Marks]

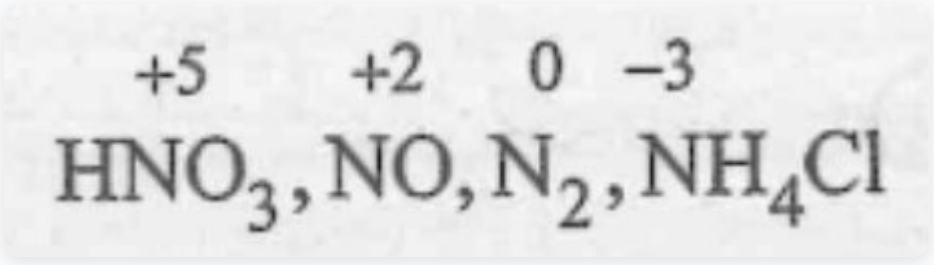
(A) HNO_3, NO, N_2, NH_4Cl

(B) HNO_3, NH_4Cl, NO, N_2

(C) HNO_3, NO, NH_4Cl, N_2

(D) NH_4Cl, N_2, NO, HNO_3

Explanation:



Question 72.

'Which one of the following ions exhibits d-d transition and paramagnetism as well?

[4 Marks]

(A) MnO_4^{2-}

(B) MnO_4^-

(C) CrO_4^{2-}

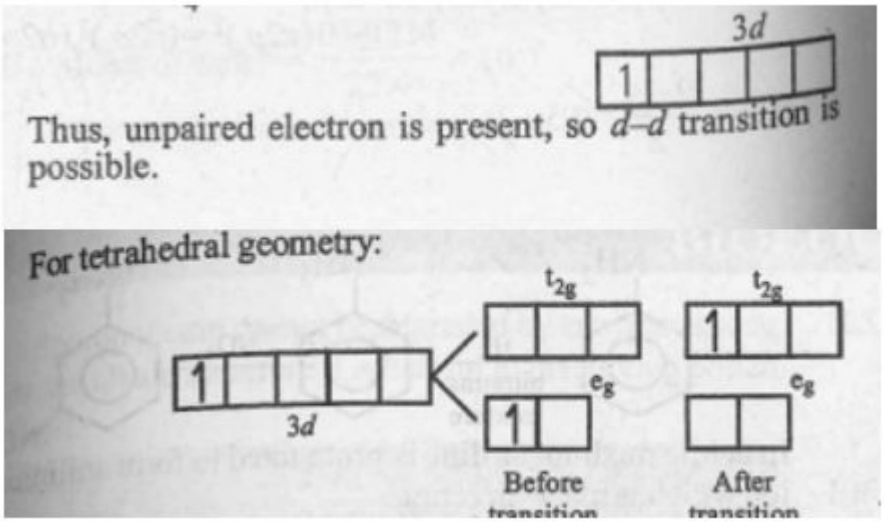
(D) $Cr_2O_7^2$

Explanation:

CrO_4^{2-} Cr^{6+} diamagnetic
$Cr_2O_7^{2-}$ Cr^{6+} diamagnetic

MnO_4^- Mn^{7+} diamagnetic

MnO_4^{2-} Mn^{6+} paramagnetic



Question 73.

The type of isomerism shown by the complex $[CoCl_2(en)_2]$ is

[4 Marks]

(A) Coordination isomerism

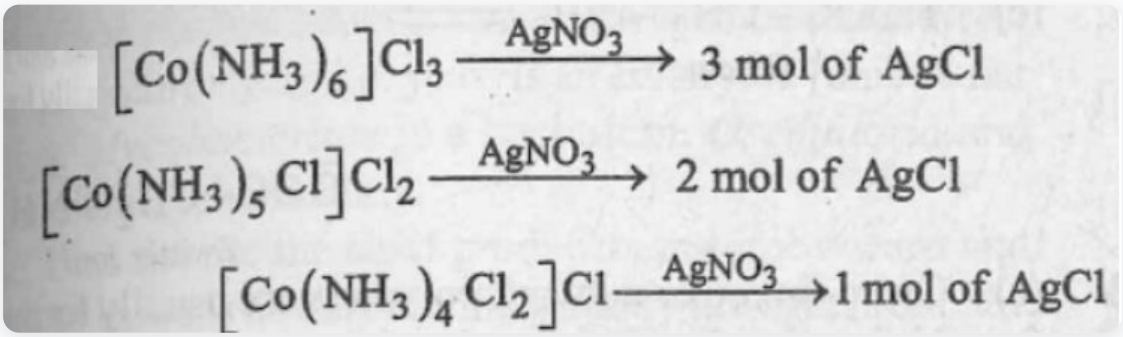
(B) Geometrical isomerism

(C) Linkage isomerism

(D) Ionization isomerism

Explanation:

Complexes are respectively $[Co(NH_3)_6]Cl_3$, $[Co(NH_3)_5Cl]Cl_2$ and $[Co(NH_3)_4Cl_2]Cl$.



Question 74.

The geometry and magnetic behaviour of the complex $[Ni(CO)_4]$ are

[4 Marks]

(A) Square planar geometry and diamagnetic

(B) Tetrahedral geometry and diamagnetic

(C) Tetrahedral geometry and paramagnetic

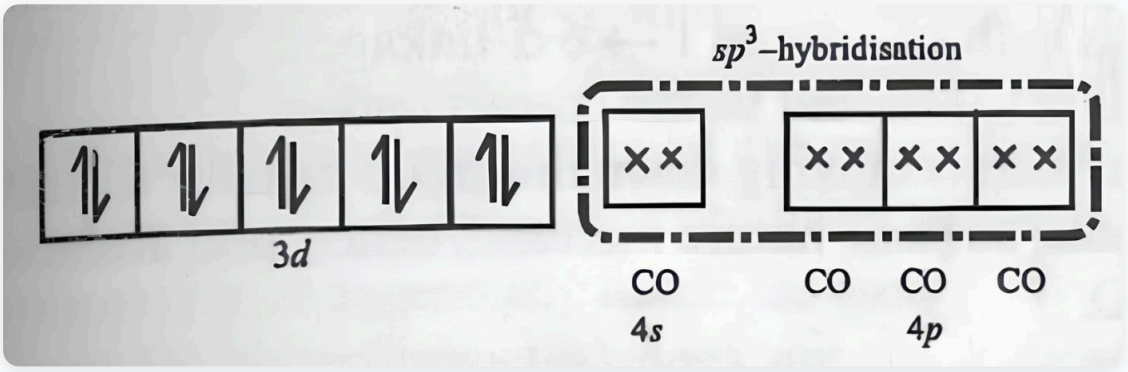
(D) Square planar geometry and paramagnetic

Explanation:

Ni(28) : Ar]$3d^8$ $4s^2$

∵ CO is a strong field ligand, so unpaired electrons get paired. Hence, configuration would be:

For four 'CO' ligands hybridisation would be sp^3 and thus the complex would be diamagnetic and of tetrahedral geometry.



Question 75.

Match the metal ions given in Column I with the spin magnetic moments of the ions given in Column II and assign the correct code :

[4 Marks]

	Column I		Column II
a.	Co^{3+}	i.	$\sqrt{8}$ BM
b.	Cr^{3+}	ii.	$\sqrt{35}$ BM
c.	Fe^{3+}	iii.	$\sqrt{3}$ BM
d.	Ni^{2+}	iv.	$\sqrt{24}$ BM
		v.	$\sqrt{15}$ BM

	a	b	c	d
(a)	iv	v	ii	i
(b)	i	ii	iii	iv
(c)	iii	v	i	ii
(d)	iv	i	ii	iii

(A) A

(B) B

(C) C

(D) D

Explanation:

Co^{3+} = [Ar]$3d^6$, unpaired e^-(n) = 4

Spin magnetic moment
= √4(4+2) = √24 B.M.

Cr^{3+} = [Ar]$3d^3$, unpaired e^-(n) = 3

Spin magnetic moment
= √3(3+2) = √15 B.M.

Fe^{3+} = [Ar]$3d^5$, unpaired e^-(n) = 5

Spin magnetic moment
= √5(5+2) = √35 B.M.

Ni^{2+} = [Ar]$3d^8$, unpaired e^-(n) = 2

Spin magnetic moment
= √2(2+2) = √8 B.M.

Question 76.

Iron carbonyl, $[Fe(CO)_5]$ is

[4 Marks]

(A) Tetranuclear

(B) Mononuclear

(C) Trinuclear

(D) Dinuclear

Explanation:

$[Fe(CO)_5]$

EAN = Z − O.N. + 2(C.N.)

= 26 − 0 + 2(5)

= 26 + 10

= 36

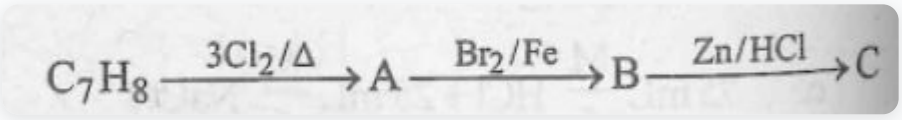
Only one central metal atom/ion is present and it follows the EAN rule, so it is mononuclear**.**

Question 77.

The compound C_7H_8 undergoes the following reactions:

The product 'C' is

[4 Marks]



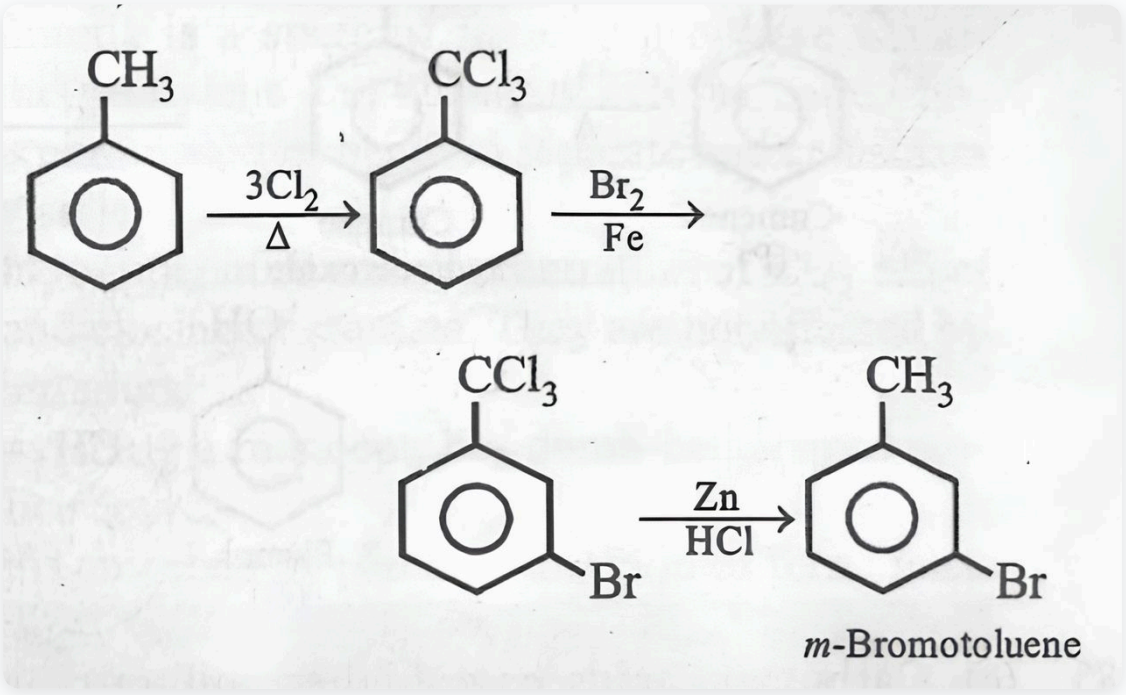
(A) m-bromotoluene

(B) o-bromotoluene

(C) 3-bromo-2,4,6-trichlorotoluene

(D) p-bromotoluene

Explanation:



Question 78.

The compound A on treatment with Na gives B, and with PCl_5 gives C. B and C react together to give diethyl ether. A, B and C are in the order

[4 Marks]

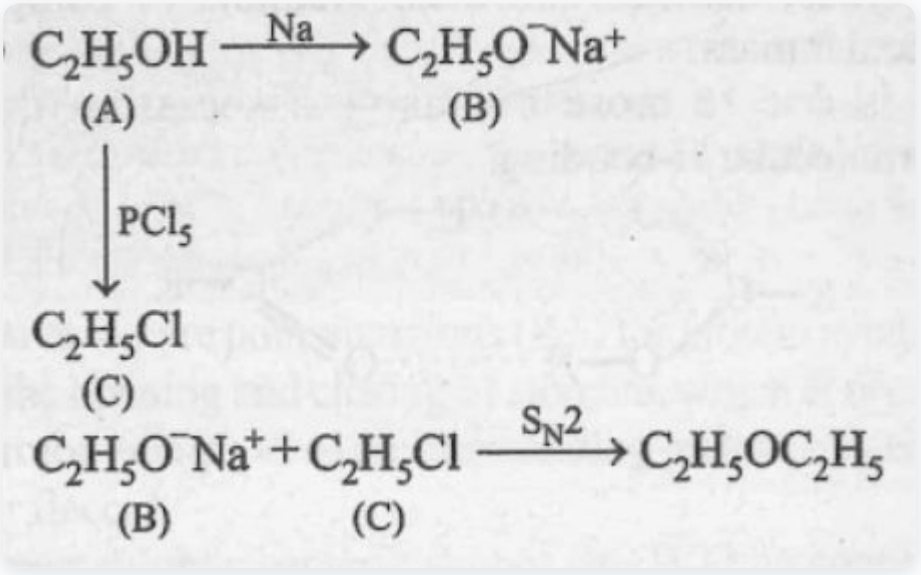
(A) C_2H_5OH, C_2H_5ONa, C_2H_5Cl

(B) C_2H_5Cl, C_2H_5, C_2H_5OH

(C) C_2H_5OH, C_2H_5, C_2H_5Cl

(D) C_2H_5OH, C_2H_5Cl, C_2H_5ONa

Explanation:



Question 79.

Carboxylic acids have higher boiling points than aldehydes, ketones and even alcohols of comparable molecular mass. It is due to their

[4 Marks]

(A) More extensive association of ‘carboxylic acid via van der Waals force of attraction

(B) Formation of carboxylate ion

(C) Formation of intramolecular H-bonding

(D) Formation of intermolecular H-bonding

Explanation:

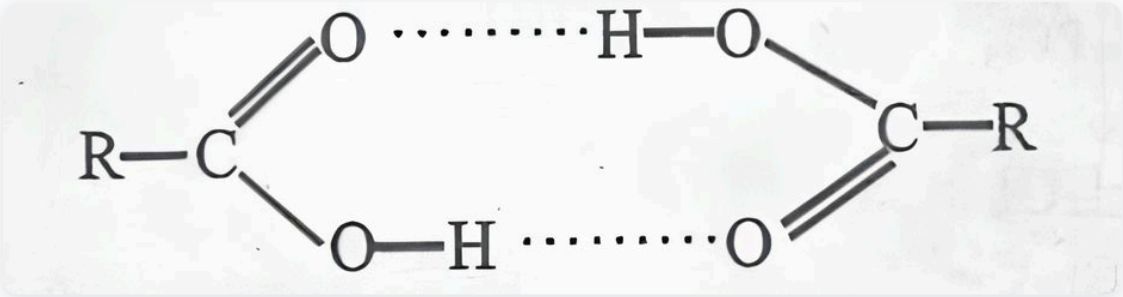
Carboxylic acids have higher boiling points than

aldehydes, ketones and even alcohols of comparable

molecular mass.

This is due to more extensive association through

intermolecular H-bonding



Question 80.

Nitration of aniline in strong acidic medium also gives mnitroaniline because

[4 Marks]

(A) In absence of substituents, nitro group always goes to m-position.

(B) In electrophilic substitution reactions, amino group is meta directive.

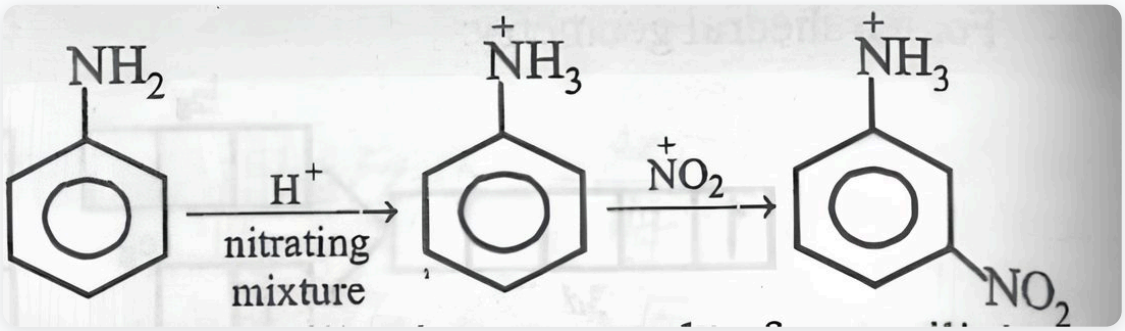
(C) In acidic (strong) medium aniline is present as anilinium ion.

(D) Inspite of substituents nitro group always goes to only m-position.

Explanation:

In acidic medium aniline is protonated to form anilinium

ion which is meta-directing.



Question 81.

'Which of the following compounds can form a zwitterion?

[4 Marks]

(A) Glycine

(B) Acetanilide

(C) Aniline

(D) Benzoic acid

Explanation:

$HOOC–CH_2–NH_2 \rightleftharpoons$

Glycine

$^-OOC–CH_2–^+NH_3$

Zwitter ion

Question 82.

Regarding cross-linked or network polymers, which of the following statements is incorrect?

[4 Marks]

(A) Examples are bake lite and melamine.

(B) Theyare formed from bi- and tri-fiunctional monomers.

(C) Theycontain strong covalents bonds in their polymer chains.

(D) They contain covalent bonds between various linear polymer chains.

Explanation:

Cross-linked or network polymers are usually formed from bi-functional and tri-functional monomers and contain strong covalent bonds between various linear polymer chains like melamine, bake lite etc.

Question 83.

The difference between amylose and amylopectin is

[4 Marks]

(A) Amylopectin has 1 -----> 4∝ -linkage and 1 ----. 6 α- linkage

(B) Amylose has 1 → 4 α-linkage and 1 → 6 β-linkage

(C) Amylopectin has 1 → 4 α-linkage and 1 → 6 β-linkage

(D) Amylose is made up of glucose and galactose

Explanation:

Amylose and amylopectin are polymers of α-D-glucose, so β-link is not possible. Amylose is linear with 1 → 4 α-linkages whereas amylopectin is branched and has both 1 → 4 and 1 → 6 α-linkages.

So option Amylopectin has 1 -----> 4∝ -linkage and 1 ----. 6 α- linkage should be the correct option.

Question 84.

Which of the following oxides is most acidic in nature?

[4 Marks]

(A) MgO

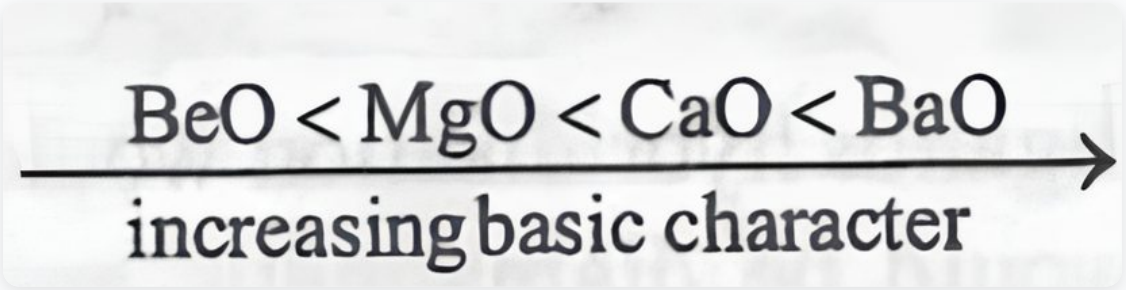
(B) BeO

(C) CaO

(D) BaO

Explanation:

In metals moving down the group metallic character increases, so basic nature increases; hence most acidic will be BeO.



Question 85.

Which of the following has proved helpful in preserving pollen as fossils?

[4 Marks]

(A) Sporopollenin

(B) Cellulosic intine

(C) Pollenkitt

(D) Oil content

Explanation:

Sporopollenin cannot be degraded by enzyme: strong acids and alkali, therefore it is helpful in preserving pollen as fossil

Question 86.

Which among the following is not a prokaryote?

[4 Marks]

(A) Saccharomyces

(B) Mycobacterium

(C) Oscillatoria

(D) Nostoc

Explanation:

Saccharomyces i.e. yeast is an eukaryote (unicellular fungi).

Mycobacterium is a bacterium. Oscillatoria and nostoc

are cyanobacteria.

Question 87.

which of the following organisms are know as chief producers in the oceans?

[4 Marks]

(A) Dinoflagellates

(B) Euglenoids

(C) Cyanobacteria

(D) Diatoms

Explanation:

Diatoms are the chief producers in some oceans and in some seasons as they are the primary producers and the food chain in marine ecosystem depends on it.

Question 88.

Ciliates differ from all other protozoans in

[4 Marks]

(A) using pseudopodia for capturing prey

(B) having two types of nuclei

(C) using flagella for locomotion

(D) having a contractile vacuole for removing excess water

Explanation:

Ciliates differs from other protozoans in having two

types of nuclei. B.g., Paramoecium have two types of nuclei i.e. macronucleus & micronucleus.

Question 89.

Which one is wrongly matched?

[4 Marks]

(A) Biflagellate zoospores — Brown algae

(B) Gemma cups — Marchantia

(C) Uniflagellate gametes — Polysiphonia

(D) Unicellular organism — Chlorella

Explanation:

Polysiphonia is a genus of red algae, where asexual spores and gametes are non-motile or non-flagellated.

Question 90.

After karyogamy followed by meiosis, spores are produced exogenously in

[4 Marks]

(A) Neurospora

(B) Agaricus

(C) Alternaria

(D) Saccharomyces

Explanation:

In Agaricus (a genus of basidiomycetes), basidio- spores or meiospores are produced exogenously. Neurosa pora (a genus of ascomycetes) produces ascospores as meiospores but endogenously inside the ascus). Alternaria (a genus of deuteromycetes) does not produce sexual spores. Saccharomyces (Unicellular ascomycetes) produces ascospores, endogenously.

Question 91.

Select the wrong statement :

[4 Marks]

(A) Mitochondria are the powerhouse of the cell in all kingdoms except Monera

(B) Cell wall is present in members of Fungi and Plantae

(C) Mushrooms belong to Basidiomycetes

(D) Pseudopodia are locomotory and feeding structures in Sporozoans

Explanation:

Pseudopodia are locomotory and feeding structures in sarcodines

(amoeboid).

Question 92.

Which of the following animals does not undergo metamorphosis?

[4 Marks]

(A) Earthworm

(B) Tunicate

(C) Starfish

(D) Moth

Explanation:

Metamorphosis refers to transformation of larva into adult. Animal that perform metamorphosis are said to have indirect development. Metamorphosis includes, in insects, the transformation of a maggot into an adult fly and a caterpillar into a butterfly and, in amphibians, the changing of a tadpole into a frog. In earthworm development is direct which means no larval stage are there and hence no metamorphosis.

Question 93.

Pneumatophores occur in

[4 Marks]

(A) Submerged hydrophytes

(B) Free-floating hydrophytes

(C) Halophytes

(D) Carnivorous plants

Explanation:

Some lateral roots of mangroves become specialised as pneumatophores in saline mud flats. These are lateral roots that grow upward (negative geotropism) for varying distances and function as the site of oxygen intake for the submerged primary root system.

Question 94.

Winged pollen grains are present in

[4 Marks]

(A) Mustard

(B) Cycas

(C) Mango

(D) Pinus

Explanation:

Winged pollen grains are present in Pinus. Each pollen grain has two wing-like structures which enables it to float in air, as an adaptation for dispersal by the wind.

Question 95.

Casparian strips occur in

[4 Marks]

(A) Epidermis

(B) Pericycle

(C) Endodermis

(D) Cortex

Explanation:

Casparian strip is a band of cell wall material deposited in the radial and transverse walls of the endodermis. Casparian strip is made of suberin and sometimes lignin

Question 96.

Secondary xylem and phloem in dicot stem are produced by

[4 Marks]

(A) Vascular cambium

(B) Phellogen

(C) Axillary meristems

(D) Apical meristems

Explanation:

Secondary tissues are generated from the growth of a cambium. Vascular cambium gives rise to secondary xylem to the inside, and to secondary phloem to the outside.

Question 97.

Plants having little or no secondary growth are

[4 Marks]

(A) Cycads

(B) Conifers

(C) Grasses

(D) Deciduous angiosperms

Explanation:

Grasses are monocots and monocots usually do not have secondary growth. Palm like monocots have anomalous secondary growth.

Question 98.

The two functional groups characteristic of sugars are

[4 Marks]

(A) Carbonyl and methyl

(B) Carbonyl and phosphate

(C) Carbonyl and ‘hydroxyl

(D) Hydroxyl and methyl

Explanation:

Sugar is a carbohydrate. These are polyhydroxy aldehyde, ketone or their derivatives, which means they ‘have carbonyl and hydroxyl groups in its structure.

Question 99.

The stage during which separation of the paired homologous chromosomes begins is

[4 Marks]

(A) Zygotene

(B) Diakinesis

(C) Diplotene

(D) Pachytene

Explanation:

Diplotene is a stage of meiotic prophase which follows the pachytene and during which the paired homologous chromosomes begin to separate and chiasmata become visible.

Question 100.

Stomatal movement is not affected by

[4 Marks]

(A) Light

(B) CO_2 concentration

(C) Temperature

(D) O_2 concentration

Explanation:

Light, temperature and concentration of CO_2 affect opening and closing of stomata. They are not affected by O_2 concentration.

Question 101.

Stomata in grass leaf are

[4 Marks]

(A) Rectangular

(B) Barrel shaped

(C) Dumb-bell shaped

(D) Kidney shaped

Explanation:

Grass being a monocot, has dumb-bell shaped stomata in their leaves.

Question 102.

In which of the following forms is iron absorbed by plant?

[4 Marks]

(A) Ferric

(B) Ferrous

(C) Free iron

(D) Both ferric and ferrous

Explanation:

Iron is absorbed by plants in the form of ferric ions

Question 103.

Which of the following elements is responsible for maintaining turgor in cells?

[4 Marks]

(A) Potassium

(B) Sodium

(C) Calcium

(D) Magnesium

Explanation:

Plants require potassium ions (K+) for protein synthesis and for the opening and closing of stomata, which is regulated by proton pumps to make surrounding guard cells either turgid or flaccid.

Question 104.

Oxygen is not produced by photosynthesis by

[4 Marks]

(A) Green sulphur bacteria

(B) Chara

(C) Nostoc

(D) Cycas

Explanation:

Green sulphur bacteria do not use H_2O as source of proton, therefore they do not evolve O_2.

Question 105.

Which of the following is not a product of light reaction of photosynthesis?

[4 Marks]

(A) Oxygen

(B) ATP

(C) NADH

(D) NADPH

Explanation:

The light reactions of photosynthesis take place on the thylakoid membranes of the chloroplast. During light reactions of photosynthesis, light is absorbed and the energy is used to drive electrons from water to generate NADPH and to drive protons across a membrane. These protons return through ATP synthase to make ATP. ATP, NADPH and oxygen are products of light reaction, while NADH is a product of respiration process.

Question 106.

What is the role of NAD^+ in cellular respiration?

[4 Marks]

(A) It is the final electron acceptor for anaerobic respiration.

(B) It is a nucleotide source for ATP synthesis.

(C) It functions as an enzyme.

(D) It functions as an electron carrier.

Explanation:

In cellular respiration, NAD+ act as an electron carrier.

Question 107.

Which of the following terms describe human dentition?

[4 Marks]

(A) Pleurodont, Monophyodont, Homodont

(B) Pleurodont, Diphyodont, Heterodont

(C) Thecodont, Diphyodont, Heterodont

(D) Thecodont, Diphyodont, Homodont

Explanation:

In thecodont teeth are present in the sockets of the jaw bone called alveoli. In diphyodont teeth erupts twice, temporary milk or deciduous teeth are replaced by a set of permanent or adult teeth. In heterodont dentition it consists of different types of teeth namely incisors, canine, premolars and molars.

Question 108.

Match the items given in Column I with those in Column ll and select the correct option given below:

[4 Marks]

	Column I		Column II
A.	Tidal volume	i.	2500 – 3000 mL
B.	Inspiratory Reserve volume	ii.	1100 – 1200 mL
C.	Expiratory Reserve volume	iii.	500 – 550 mL
D.	Residual volume	iv.	1000 – 1100 mL

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

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

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

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

Explanation:

Tidal volume (TV) is volume of air inspired or expired during normal respiration. It is approximately 500 mL. Inspiratory reserve volume (IRV) is additional volume of air a person can inspire by a forceful inspiration. It is around 2500 - 3000 mL. Expiratory reserve volume (ERV) is additional volume of air a person can be expired by a forceful expiration. This averages 1000 - 1100 mL. Residual volume

(RV) is volume of air remaining in lungs even after forceful expiration. This averages 1100 - 1200 mL.

Question 109.

Which part of poppy plant is-used to obtain the drug “Smack"?

[4 Marks]

(A) Leaves

(B) Latex

(C) Roots

(D) Flowers

Explanation:

‘Smack’ also called as brown sugar/Heroin is formed by acetylation of morphine. It is obtained from the latex of unripe capsule of Poppy plant (Papaver somniferum).

Question 110.

Which of the following is an occupational respiratory disorder?

[4 Marks]

(A) Anthracis

(B) Botulism

(C) Silicosis

(D) Emphysema

Explanation:

Silicosis is an occupational disease caused due to excess inhalation of silica dust in the workers involved grinding or stone breaking industries.

Question 111.

Match the items given in Column I with those in Column T and

select the correct option given below:

[4 Marks]

	Column I		Column II
A.	Fibrinogen	(i)	Osmotic balance
B.	Globulin	(ii)	Blood clotting
C.	Albumin	(iii)	Defence mechanism

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

(B) Aiii- B-ii C-i

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

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

Explanation:

Fibrinogen forms fibrin strands during coagulation. These strands forms a network and the meshes of which are occupied by blood cells, this structure - finally forms a clot.

Question 112.

Match the items given in Column I with those in Column II and

select the correct option given below:

[4 Marks]

	Column I		Column II
A.	Tricuspid valve	i.	Between left atrium and left ventricle
B.	Bicuspid valve	ii.	Between right ventricle and pulmonary artery
C.	Semilunar valve	iii.	Between right atrium and right ventricle

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

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

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

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

Explanation:

Tricuspid valves are AV valve present between right atrium and right ventricle in heart. Bicuspid valves (mitral valves) are AV valve present between left atrium and left ventricle. Semilunar valves are present at the openings of aortic and pulmonary aorta.

Question 113.

Match the items given in Column I with those in Column I and

select the correct option given below:

[4 Marks]

	Column I		Column II
A.	Glycosuria	i.	Accumulation of uric acid in joints
B.	Gout	ii.	Mass of crystallised salts within the kidney
C.	Renal calculi	iii.	Inflammation in glomeruli
D.	Glomerular	iv.	Presence of in nephritis glucose urine

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

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

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

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

Explanation:

Glycosuria denotes presence of glucose in the urine. Gout is due to deposition of uric acid crystals in the joint. Renal calculi are precipitates of calcium phosphate produced in the pelvis of the kidney. Glomerular nephritis is the inflammatory condition of glomerulus characterised by proteinuria and haematuria.

Question 114.

Calcium is important in skeletal muscle contraction because it

[4 Marks]

(A) Prevents the formation of bonds between the myosin cross bridges and the actin filament.

(B) Detaches the myosin head from the actin filament.

(C) Activates the myosin ATPase by binding to it.

(D) Binds to troponin to remove the masking of active sites on actin for myosin.

Explanation:

The sarcoplasmic reticulum to release calcium ions into the muscle interior where they bind to troponin, thus causing tropomyosin to shift from the face of the actin filament to which myosin heads need to bind to produce contraction.

Question 115.

'Which of the following is not an autoimmune disease ?

[4 Marks]

(A) Vitiligo

(B) Alzheimer's disease

(C) Psoriasis

(D) Rheumatoid arthritis

Explanation:

Alzheimer's disease is a neurodegenerative disorder due to deficiency of neurotransmitter acetylcholine. Rheumatoid arthritis is an autoimmune disorder in which antibodies are produced against the synovial membrane and cartilage. Vitiligo causes white patches on skin also characterized as autoimmune disorder. Psoriasis is a skin disease that causes itchy or sore patches of thick red skin and is also autoimmune.

Question 116.

Which of the following hormones can play a significant role in osteoporosis?

[4 Marks]

(A) Parathyroid hormone and Prolactin

(B) Estrogen and Parathyroid hormone

(C) Progesterone and Aldosterone

(D) Aldosterone and Prolactin

Explanation:

Osteoporosis has three causes: excess parathyroid hor- 'mone, advanced age, and lack of estrogen in older females. Estrogen promotes the activity of osteoblast. and inhibits osteoclast.

'Parathormone promotes mobilisation of calcium from bone into blood. Excessive activity of parathormone causes demineralisation leading to osteoporosis.

Question 117.

Which of the following structures or regions is incorrectly paired with its functions?

[4 Marks]

(A) Hypothalamus : production of releasing hormones and regulation of temperature, hunger and thirst.

(B) Limbic system : consists of fibre tracts that interconnect different regions of brain; controls movement.

(C) Medulla oblongata : controls respiration and cardiovascular reflexes

(D) Corpus callosum : band of fibers connecting left and right cerebral hemispheres

Explanation:

The limbic system (emotional motor system) is responsible for the experience and expression of emotion but not movement. It is located in the core of the brain and includes the amygdala, hippocampus and hypothalamus.

Question 118.

Nissl bodies are mainly composed of

[4 Marks]

(A) DNA and RNA

(B) Proteins and lipids

(C) Free ribosomes and RER

(D) Nucleic acids and SER

Explanation:

Nissl bodies are present in the soma or cell body of a neuron. When observed under electron microscope, they appear to be composed of rough endoplasmic reticulum (RER) and free ribosomes hence help in protein synthesis.

Question 119.

The transparent lens in the human eye is held in its place by

[4 Marks]

(A) smooth muscles attached to the iris

(B) smooth muscles attached to the ciliary body

(C) ligaments attached to the ciliary body

(D) ligaments attached to the iris

Explanation:

The muscles that move the eyeball are attached to the sclera. Suspensory ligament of lens - a series of fibers that connect the ciliary body of the eye with the lens, holding it in place.

Question 120.

Which of the following is an amino acid derived hormone?

[4 Marks]

(A) Estradiol

(B) Estriol

(C) Ecdysone

(D) Epinephrine

Explanation:

Epinephrine is derived from tyrosine by the removal of carboxyl group. It is a catecholamine.

Question 121.

Offsets are produced by

[4 Marks]

(A) Parthenocarpy

(B) Parthenogenesis

(C) Mitotic divisions

(D) Meiotic divisions

Explanation:

An offset is a small, virtually complete daughter plant that has been naturally and asexually produced on the mother plant. They are clones, meaning that they, genetically identical to the mother plant. Offset is a vegetative part of a plant, formed by mitosis.

Question 122.

Which of the following flowers blooms only once in its life-time?

[4 Marks]

(A) Mango

(B) Papaya

(C) Jackfruit

(D) Bamboo species

Explanation:

A monocarpic plant flowers and produces seeds only once before dying, e.g. bamboo. A polycarpic plant reproduces sexually more than once in its lifetime, , e.g jackfruit , papaya , mango etc.

Question 123.

Pollen grains can be stored for several years in liquid nitrogen having a temperature of

[4 Marks]

(A) −196°C

(B) −160°C

(C) −80°C

(D) −120°C

Explanation:

Pollen grains can be stored for several years in liquid nitrogen at -196°C (cryopreservation). Cryopreservation is the process of cooling and storing cells, tissues, or org y at very low temperatures; most common -196°C/-321° in liquid nitrogen (N_2) to maintain their viability.

Question 124.

Double fertilization is

[4 Marks]

(A) Fusion of two male gametes with one egg

(B) Syngamy and triple fusion

(C) Fusion of one male gamete with two polar nuclei

(D) usion of two male gametes of a pollen tube with two different eggs

Explanation:

Double fertilization is a unique phenomenon that occurs in angiosperms only.

Double fertilization = Syngamy + Triple fusion

Question 125.

The difference between spermiogenesis and spermiation is

[4 Marks]

(A) In spermiogenesis spermatids are formed, while in spermiation spermatozoa are formed.

(B) In spermiogenesis spermatozoa from Sertoli cells are released into the cavity of seminiferous tubules, while in spermiation spermatozoa are formed.

(C) In spermiogenesis spermatozoa are formed, while in spermiation spermatozoa are released from Sertoli cells into the cavity of seminiferous tubules.

(D) In spermiogenesis spermatids are formed, while in spermiation spermatozoa are formed.

Explanation:

Ovulation is followed by the luteal phase during the corpus luteum secretes oestrogen and progesterone hormones that exerts negative feedback on hypothalamus in turn inhibits the release of FSH and LH. This prevents the development of new follicles during the luteal phase.

Question 126.

Match the items given in Column I with those in Column II and

select the correct option given below:

[4 Marks]

	Column I		Column II
A.	Proliferative Phase	i.	Breakdown of endometrial lining
B.	Secretory Phase	ii.	Follicular Phase
C.	Menstruation	iii.	Luteal Phase

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

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

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

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

Explanation:

Spermiogenesis is conversion of spermatids info: spermatozoa whereas spermiation is the release of the sperms from sertoli cells into the cavity of seminiferous tubule.

Question 127.

The amnion of mammalian embryo is derived from

[4 Marks]

(A) ectoderm and endoderm

(B) endoderm and mesoderm

(C) mesoderm and trophoblast

(D) ectoderm and mesoderm

Explanation:

The extraembryonic membranes are amnion, chorion allantois and yolk sac. Amnion is derived from mesoderm on the outer side and ectoderm on the inner side. Chorion is formed from trophoectoderm and mesoderm, whereas allantois and yolk sac membrane have mesoderm on outerside and endoderm in inner side.

Question 128.

Hormones secreted by the placenta to maintain pregnancy are

[4 Marks]

(A) hCG, hPL, estrogens, relaxin, oxytocin

(B) hCG, hPL, progestogens, prolactin

(C) hCG, hPL, progestogens, estrogens

(D) hCG progestogens, estrogens, glucocorticoids

Explanation:

The placenta s an endocrine gland that is only present during pregnancy. It relases hCG, hPL, progestogens, estro gens, etc. Human chorionic gonadotropic hormone (hCG) stimulates the corpus luteum: during pregnancy to release estrogen and progesterone. Human placental lactogen (hPL) is involved in growth of body of mother and breast. Progesterone maintains pregnancy.

Question 129.

The contraceptive ‘SAHELI’

[4 Marks]

(A) blocks estrogen receptors in the uterus, preventing egg from getting implanted.

(B) is a post-coital contraceptive.

(C) increases the concentration of estrogen and prevents ovulation in females.

(D) is an IUD.

Explanation:

Saheli is world’s first and only oral non steroidal contraceptive pill, dosage-once a week pill. Its functioning is based upon selective estrogen receptor modulation prevents egg from getting implanted.

Question 130.

A woman has an X-linked condition on one of her X chromosomes. This chromosome can be inherited by

[4 Marks]

(A) Only sons

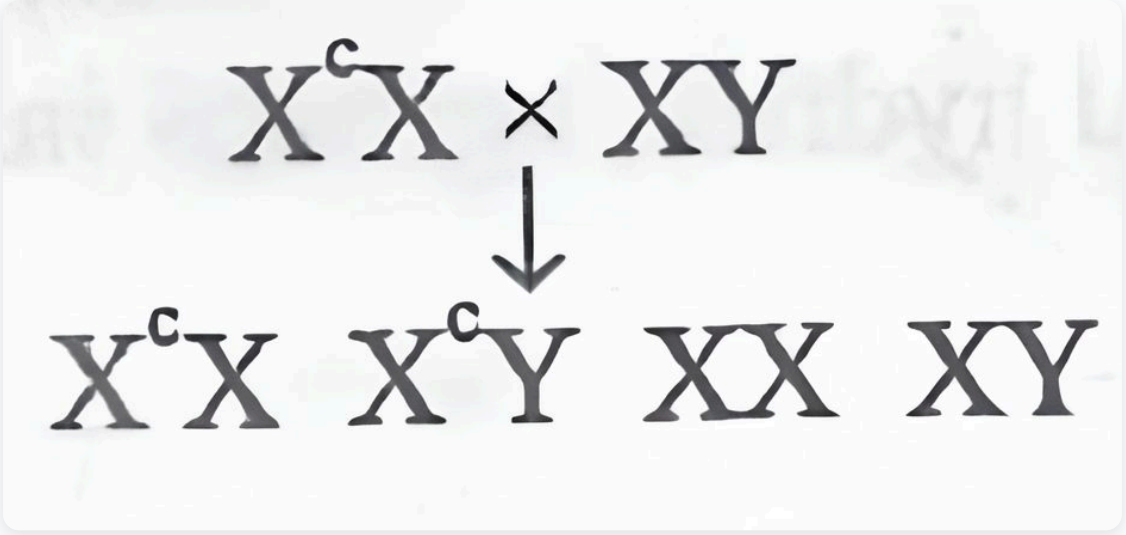
(B) Only daughters

(C) Only grandchildren

(D) Both sons and daughters

Explanation:

'Woman acts as a carrier. Both son & daughter X-chromosome. Although only son would be the diseaséd one.



Question 131.

AGGTATGCCAT is a sequence from the coding strand of a gene. What will be the corresponding sequence of the transcribed mRNA?

[4 Marks]

(A) AGGUAUCGCAU

(B) UGGUTTCGCAT

(C) ACUAUGGGAU

(D) UCCAUAGCGUA

Explanation:

Coding strand and mRNA have the similar nucleotide

'sequence except, Thymine (T) is replaced by Uracil (U) in mRNA

Question 132.

Select the correct match

[4 Marks]

(A) Alec Jeffreys – Streptococcus pneumoniae

(B) Alfred Hershey and Martha Chase – TMV

(C) Matthew Meselson – Pisum sativum and D.F. Stahl

(D) Francois Jacob and Jacques Monod – Lac operon

Explanation:

‘Francois Jacob and Jacque Monod proposed the model of gene regulation known as operon model/lac operon. Alec Jeffreys gave DNA fingerprinting technique. Matthew Meselson and F. Stahl gave semi-conservative DNA replication in E.coli. Alfred Hershey and Martha Chase proved DNA as genetic material not protein.

Question 133.

The experimental proof for semiconservative replication of DNA was first shown in a

[4 Marks]

(A) Fungus

(B) virus

(C) Bacterium

(D) plant

Explanation:

Semi-conservative DNA replication was first shown in bacterium Escherichia coli by Matthew Meselson and Franklin Stahl.

Question 134.

All of the following are part of an operon except

[4 Marks]

(A) an enhancer

(B) structural genes

(C) an operator

(D) a promoter

Explanation:

Unlike eukaryotes in prokaryotes the genes are organised into operon. Operon is a co-ordinated group of genes which are all transcribed together & regulate a metabolic pathway as a unit.

Question 135.

According to Hugo de Vries, the mechanism of evolution is

[4 Marks]

(A) Multiple step mutations

(B) Saltation

(C) Minor mutations

(D) Phenotypic variations

Explanation:

As per mutation theory which was given by Hugo de Vries state that the evolution is a discontinuous phenomenon or saltatory phenomenon/saltation.

Question 136.

Which of the following is commonly used as a vector for introducing a DNA fragment in human lymphocytes?

[4 Marks]

(A) Retrovirus

(B) Ti plasmid

(C) pBR 322

(D) λ phage

Explanation:

Retrovirus is a type of RNA virus that inserts a copy of its genome into the DNA of a host cell that it invades, thus changing the genome of that cell. Retrovirus is commonly used as vector for introducing a DNA fragment in human lymphocyte.

Question 137.

The correct order of steps in Polymerase Chain Reaction (PCR) is

[4 Marks]

(A) Extension, Denaturation, Annealing

(B) Denaturation, Annealing, Extension

(C) Annealing, Extension, Denaturation

(D) Denaturation, Extension, Annealing

Explanation:

PCR is based on three simple steps required for any

DNA synthesis reaction: (i) denaturation of the template into single strands; (ii) annealing of primers to each original strand for new strand synthesis; and (iii) extension of the new DNA strands from the primers.

Question 138.

Use of bioresources by multinational companies and organisations without authorisation from the concerned country and its people is called

[4 Marks]

(A) Biopiracy

(B) Bioexploitation

(C) Biodegradation

(D) Bio-infringement

Explanation:

Biopiracy refers to the use of bioresdurces by multinational companies and other organisation without proper authorisation from the countries and people concerned with compensatory payment.

Question 139.

In India, the organisation responsible for assessing the safety of introducing genetically modified organisms for public use is

[4 Marks]

(A) Genetic Engineering Appraisal Committee (GEAC)

(B)) Research Committee on Genetic Manipulation (RCGM)

(C) Indian Council of Medical Research (ICMR)

(D) Council for Scientific and Industrial Research (CSIR)

Explanation:

Indian Government has setup organisation such as GEAC (Genetic Engineering Appraisal Committee) which will make decisions regarding the validity of GM research and safety of introducing GM-organism for public services.

Question 140.

A ‘new’ variety of rice was patented by a foreign company, though such varieties have been present in India for a long time. This is related to

[4 Marks]

(A) Sharbati Sonora

(B) Co-667

(C) Basmati

(D) Lerma Rojo

Explanation:

In 1997, an American company got patent rights on Basmati rice through the US patent and trademark office that was actually been derived from Indian farmer’s varieties. The diversity of rice in India is one of the richest in the world, 27 documented varieties of Basmati are grown in India.

Question 141.

Which one of these animals is not a homeotherm?

[4 Marks]

(A) Camelus

(B) Psittacula

(C) Chelone

(D) Macropus

Explanation:

The two extremes in the animal kingdom are endothermic homeotherms and ectothermic poikilotherms. Most mammals, including humans, as well as most birds are endothermic homeotherms, while most fish, invertebrates, reptiles, and amphibians are ectothermic poikilotherms. Chelone (Turtle) belongs to class reptilia which is poikilotherm or cold blooded.

Question 142.

Match Column-1 with Column-II

[4 Marks]

Column-I	Column-II
(A) Saprophyte	(i) Symbiotic association of fungi with plant roots
(B) Parasite	(ii) Decomposition of dead organic materials
(C) Lichens	(iii) Living on living plants or animals
(D) Mycorrhiza	(iv) Symbiotic association of algae and fungi

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

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

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

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

Explanation:

Saprophytes are organisms which live on dead organic matter and help in their decomposition. Parasites is an organisms that live in or on other living plants and animals and dependent on them for their food. Lichens represent a type of symbiotic association of algae

and fungi, in which, both of them dependent on each other

for their food and shelter.

Mycorrhiza is also a type of symbiotic association of fungi and plant roots, e.g., Cycas coralloid root.

Question 143.

In a growing population of a country,

[4 Marks]

(A) reproductive and pre-reproductive individuals are equal in number.

(B) pre-reproductive individuals are more than the reproductive individuals.

(C) reproductive individuals are less than the post-reproductive individuals.

(D) pre-reproductive individuals are less than the reproductive individuals

Explanation:

Whenever the pre-reproductive individuals or the younger population size is larger than the reproductive group, the population will be an increasing population.

Question 144.

Which one of the following population interactions is widely used in medical science for the production of antibiotics?

[4 Marks]

(A) Mutualism

(B) Parasitism

(C) Amensalism

(D) Commensalism

Explanation:

Amensalism /antibiosis, association between organisms of two different species in which one is inhibited or destroyed and the other is unaffected. These are chemicals secreted by one microbial group (eg : Penicillium) which harm other microbes (eg : Staphylococcus). It has no effect on Penicillium or the organism which produces it.

Question 145.

Which one of the following plants shows a very close relationship with a species of moth, where none of the two can complete its life cycle without the other?

[4 Marks]

(A) Yucca

(B) Viola

(C) Banana

(D) Hydrilla

Explanation:

In obligate mutualism, one organism cannot survive without the other. Yucca have an obligate mutualism with a species of moth i.e. Pronuba.

Question 146.

World Ozone Day is celebrated on

[4 Marks]

(A) 16th September

(B) 22nd April

(C) 21st April

(D) 5th June

Explanation:

World Ozone day is celebrated on 16th September. 5th June is World Environment Day. 21 April is National Yellow Bat Day. 22 April is National Earth Day.

Question 147.

Niche is

[4 Marks]

(A) physical space where an organism lives.

(B) the range of temperature that the organism needs to live.

(C) the functional role played by the organism where it lives.

(D) all the biological factors in the organism's environment.

Explanation:

Joseph Grinnell in 1917 coined the term niche, which he used as largely equivalent to a species habitat. It refers the functional role played by the organism where it lives.

Question 148.

What type of ecological pyramid would be obtained with the following data?

Secondary consumer : 120 g

Primary consumer : 60 g

Primary producer : 10 g

[4 Marks]

(A) Upright pyramid of biomass

(B) Inverted pyramid of biomass

(C) Pyramid of energy

(D) Upright pyramid of numbers

Explanation:

The given data depicts the inverted pyramid of biomass, usually present in aquatic ecosystem. Upright pyramid of biomass and numbers are not possible, as the data depicts primary producer is less than primary consumer and this is less than secondary consumers. Pyramid of energy is always upright.

Question 149.

All of the following are included in ‘ex-situ conservation” except

[4 Marks]

(A) Seed banks

(B) Wildlife safari parks

(C) Sacred groves

(D) Botanical gardens

Explanation:

In-situ conservation is the on-site conservation or the conservation of genetic resources in natural populations of plant or animal species. E.g. Sacred groves.

Question 150.

Which of the following is a secondary pollutant ?

[4 Marks]

(A) O_2

(B) SO_2

(C) CO

(D) CO_2

Explanation:

A primary pollutant is an air pollutant emitted. directly from a source. A secondary pollutant is not directly emitted as such, but forms when other pollutants (primary pollutants) react in the atmosphere. O_3 (ozone) is a secondary pollutant.

Question 151.

Match the items given in Column I with those in Column II and select the correct option given below:

[4 Marks]

Column-I	Column-II
A. Eutrophication	i. UV-B radiation
B. Sanitary landfill	ii. Deforestation
C. Snow blindness	iii. Nutrient enrichment
D. Jhum cultivation	iv. Waste disposal

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

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

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

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

Explanation:

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

Question 152.

In stratosphere, which of the following elements acts as a catalyst in degradation of ozone and release of molecular oxygen?

[4 Marks]

(A) Cl

(B) Fe

(C) Carbon

(D) Oxygen

Explanation:

Chloroftuorocarbons (CFCs) and other halogenated ozone depleting substances (ODS) are ‘mainly responsible for man-made chemical ozone depletion. CFCs rise into the stratosphere where they are eventually broken down by ultraviolet (UV) rays from the Sun. This causes them to release free chlorine which then reacts with oxygen leading to the chemical process of destroying ozone molecules.

Question 153.

Which of the following options correctly represents the lung conditions in asthma and emphysema, respectively?

[4 Marks]

(A) Increased respiratory surface; Inflammation of bronchioles

(B) Inflammation of bronchioles; Decreased respiratory surface

(C) Decreased respiratory surface; Inflammation of bronchioles

(D) Increased number of bronchioles; Increased respiratory surface

Explanation:

Asthma is a common long-term inflammatory disease of the airways of the lungs. It is a difficulty in breathing causing wheezing due to inflammation of bronchi and bronchioles. Emphysema is a chronic disorder in which alveolar walls are damaged due to which respiratory surface is decreased, and is mainly caused by smoking.

Question 154.

Select the incorrect match:

[4 Marks]

(A) Submetacentric chromosomes — L-shaped chromosomes

(B) Polytene chromosomes — Oocytes of amphibians

(C) Lampbrush chromosomes — Diplotene bivalents

(D) Allosomes — Sex chromosomes

Explanation:

Polytene chromosomes are found in salivary glands of insects of order Diptera.

Question 155.

Many ribosomes may associate with a single mRNA to form multiple copies of a polypeptide simultaneously. Such strings of ribosomes are termed as

[4 Marks]

(A) Polyhedral bodies

(B) Polysome

(C) Plastidome

(D) Nucleosome

Explanation:

A polyribosome (or polysome) is a complex of an mRNA molecule and two or more ribosomes that act to translate mRNA instructions into polypeptides.

Question 156.

Which of the following events does not occur in rough endoplasmic reticulum?

[4 Marks]

(A) Protein folding

(B) Protein glycosylation

(C) Cleavage of signal peptide

(D) Phospholipid synthesis

Explanation:

Phospholipid synthesis does not take place in rough endoplasmic reticulum (RER). Smooth endoplasmic reticulum (SER) is involved in lipid synthesis.

Question 157.

Identify the vertebrate group of animals characterized by crop and gizzard in its digestive system

[4 Marks]

(A) Osteichthyes

(B) Aves

(C) Reptilia

(D) Amphibia

Explanation:

The digestive tract of aves has additional chambers in their digestive system as crop and gizzard. crop is concerned with storage of food grains, whereas gizzard is a masticatory organ in birds used to crush food grain.

Question 158.

Which of the following features is used to identify a male cockroach from a female cockroach?

[4 Marks]

(A) Presence of anal cerci

(B) Presence of caudal styles

(C) Presence of a boat shaped sternum on the 9th abdominal segment

(D) Forewings with darker tegmina

Explanation:

Males bear a pair of short, thread like anal styles which are absent in females. Anal/ caudal styles arise from 9th abdominal segment in male cockroach.

Question 159.

Match the items given in Column I with those in Column II and select the correct option given below:

[4 Marks]

	Column I (Function)		Column II (Part of Excretory system)
A.	Ultrafiltration	i.	Henle's loop
B.	Concentration of urine	ii.	Ureter
C.	Transport of urine	iii.	Urinary bladder
D.	Storage of urine	iv.	Malpighian corpuscle
		v.	Proximal convoluted tubule

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

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

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

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

Explanation:

In renal physiology, ultrafiltration occurs, at the barrier between the blood and the filtrate in the glomerular capsule (Bowman's capsule) in the kidneys. Concentration of urine refers to water absorption from glomerular filtrate created by counter-current mechanism in Henle' loop. Urine is carried from kidney to bladder through ureter. Urinary bladder is for storage of urine

Question 160.

The Golgi complex participates in

[4 Marks]

(A) Fatty acid breakdown

(B) Respiration in bacteria

(C) Formation of secretory vesicles

(D) Activation of amino acid

Explanation:

Golgi complex after processing, packages them in vesicles, and either stores them for later use or sends them out of the cell. It is also the organelle that builds lysosomes (cell digestion machines).

Question 161.

Which of the following is true for nucleolus?

[4 Marks]

(A) It is a membrane-bound structure

(B) Larger nucleoli are present in dividing cells

(C) It takes part in spindle formation

(D) It is a site for active ribosomal RNA synthesis

Explanation:

The nucleolus (plural nucleoli) is a large, distinct, spheroidal subcompartment of the nucleus of eukaryotic cells that is the site of ribosomal RNA (rRNA) synthesis and assembly of ribosomal subunits.

Question 162.

Select the correct match

[4 Marks]

(A) Ribozyme — Nucleic acid

(B) G. Mendel — Transformation

(C) T.H. Morgan — Transduction

(D) F_2 × Recessive parent — Dihybrid cross

Explanation:

Ribozyme is a catalytic RNA, which thus nucleic acid.

Question 163.

Which of the following pairs is wrongly matched?

[4 Marks]

(A) ABO blood grouping — Co-dominance

(B) XO type sex determination — Grasshopper

(C) T.H. Morgan — Linkage

(D) Starch synthesis in pea — Multiple alleles

Explanation:

Starch synthesis in pea is controlled by pleiotropic gene. Pleiotropy occurs when one gene influences two or more seemingly unrelated phenotypic traits.

Question 164.

Natality refers to

[4 Marks]

(A) Birth rate

(B) Death rate

(C) Number of individuals entering a habitat

(D) Number of individuals leaving the habitat

Explanation:

Natality is the birth rate within a population. When compared with the death or mortality rate, the growth or decrease in a population can be determined.

Question 165.

Match the items given in Column I with those in Column II and select the correct option given below:

[4 Marks]

Column I	Column II
A. Herbarium	(i) It is a place having a collection of preserved plants and animals
B. Key	(ii) A list that enumerates methodically all the species found in an area with brief description aiding identification
C. Museum	(iii) Is a place where dried and pressed plant specimens mounted on sheets are kept
D. Catalogue	(iv) A booklet containing a list of characters and their alternates which are helpful in identification of various taxa.

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

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

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

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

Explanation:

Herbarium - Dried and pressed plant specimen.
• Key - Identification tool of various taxa.
• Museum - Plant and animal specimen are prese

Question 166.

Which of the following statements is correct?

[4 Marks]

(A) Horsetails are gymnosperms.

(B) Selaginella is heterosporous, while Salvinia is homosporous.

(C) Stems are usually unbranched in both Cycas and Cedrus.

(D) Ovules are not enclosed by ovary wall in gymnosperms.

Explanation:

The gymnosperms are a group of seed-producing plants. The name is based on their unenclosed condition of their seeds (called ovules in their unfertilized state).

Question 167.

Sweet potato is a modified

[4 Marks]

(A) Rhizome

(B) Adventitious root

(C) Tap root

(D) Stem

Explanation:

Sweet potato is a modified adventitious root for storage of food. Rhizomes are underground modified stem. Tap root is primary root directly elongated from the radicle.

Question 168.

Conversion of milk to curd improves its nutritional value by increasing the amount of

[4 Marks]

(A) Vitamin A

(B) Vitamin D

(C) Vitamin E

(D) Vitamin B12

Explanation:

Curd has enriched presence of B vitamins specially Vit-B_{12} which improves its nutritional value than milk.

Question 169.

Which of the following gastric cells indirectly help in erythropoiesis?

[4 Marks]

(A) Goblet cells

(B) Parietal cells

(C) Mucous cells

(D) Chief cells

Explanation:

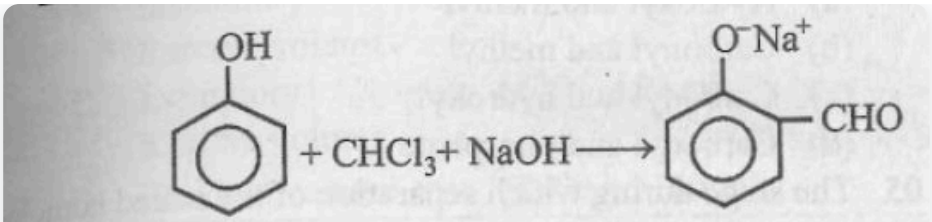
Parietal or oxyntic cell is a source of HCl and intrinsic factor. HCl converts iron present in diet from ferric to ferrous form so that it can be absorbed easily and used during erythropoiesis. Intrinsic factor is essential for the absorption of vitamin B_{12} and its deficiency causes pernicious anaemia.

Question 170.

In the reaction .

The electrophile involved is

[4 Marks]



The electrophile involved is

(a) Dichloromethyl cation $\left(\overset{\oplus}{C}HCl_2\right)$

(b) Formyl cation $\left(\overset{\oplus}{C}HO\right)$

(c) Dichlorocarbene $(:CCl_2)$

(d) Dichloromethyl anion $\left(\overset{\ominus}{C}HCl_2\right)$

(A) D

(B) C

(C) B

(D) A

Explanation:

$$CHCl_3 + NaOH \longrightarrow \bar{C}Cl_3 + H_2O$$

$$\downarrow -Cl\ (\alpha\text{-elimination})$$

$$:CCl_2 \text{ dichlorocarbene (electrophile)}$$

Question 171.

Which one of the following statements is incorrect?

[4 Marks]

(A) Coefficient of sliding friction has dimensions of length.

(B) Rolling friction is smaller than sliding friction.

(C) Limiting value of static friction is directly proportional to normal reaction.

(D) Frictional force opposes the relative motion.

Explanation:

Coefficient of friction or sliding friction has no dimension.

$f = \mu_s N \Rightarrow \mu_s = f/N = [M^0L^0T^0]$

Question 172.

Which of the following statements is not true for halogens?

[4 Marks]

(A) All are oxidizing agents

(B) All form monobasic oxyacids

(C) Chlorine has the highest electron-gain enthalpy

(D) All but fluorine shows positive oxidation states

Explanation:

Due to high electronegativity and small size, F forms only one oxoacid, HOF known as fluoric (I) acid.

Question 173.

Which of these statements is incorrect?

[4 Marks]

(A) Glycolysis operates as long as it is supplied with NAD that can pick up hydrogen atoms

(B) Glycolysis occurs in cytosol

(C) Enzymes of TCA cycle are present in mitochondrial matrix

(D) Oxidative phosphorylation takes place in outer mitochondrial membrane

Explanation:

Oxidative phosphorylation takes place in inner mitochondrial membrane.

Question 174.

Which of the following characteristics represent Inheritance of blood groups' in humans?

A. Dominance

B. Co-dominance

C. Multiple allele

D. Incomplete dominance

E. Polygenic inheritance

[4 Marks]

(A) A,C and B

(B) B,D and E

(C) A, B and C

(D) B,C and E

Explanation:

IAIO, IBIO – Dominant-recessive relationship

IAIB – Codominance

IA, IB & IO – Three different allelic forms of a gene (multiple allelism)

Question 175.

Which of the following carbocations is expected to be most. stable?

[4 Marks]

(A)



(B)



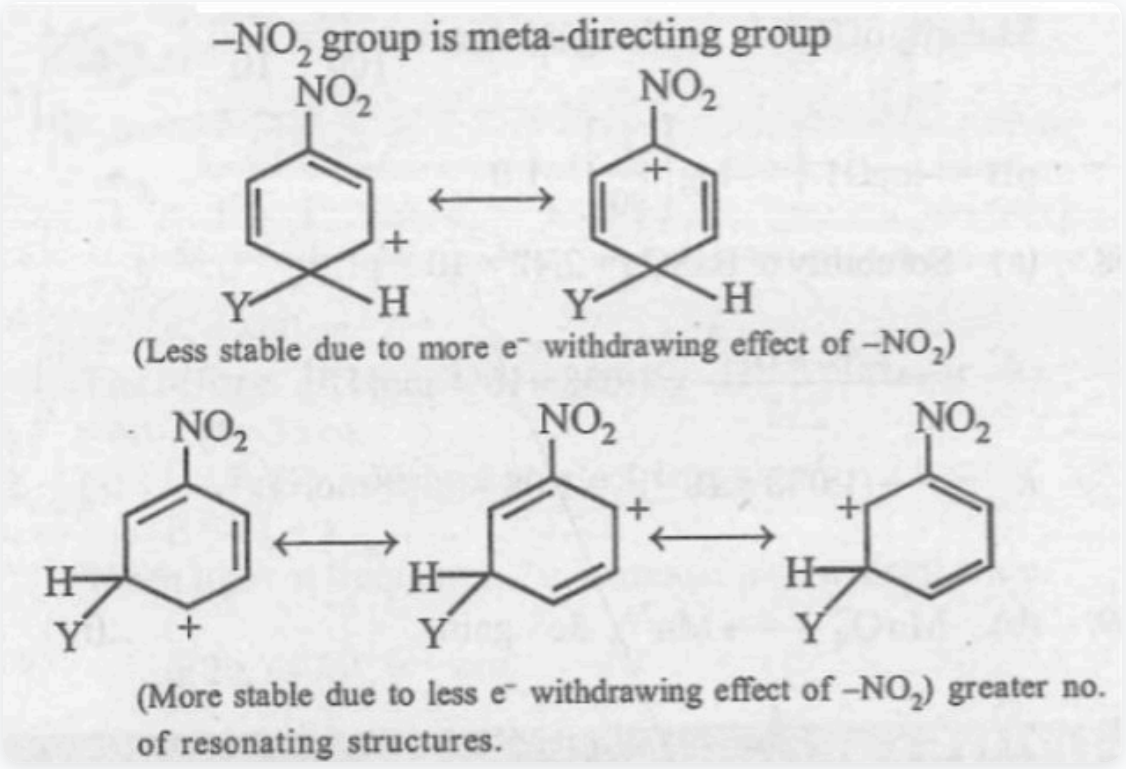
(C)



(D)



Explanation:



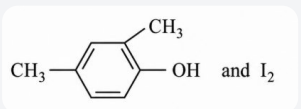
Question 176.

Compound A, $C_8H_{10}O$, is found to react with NaOI (produced by reacting Y with NaOH) and yields a yellow precipitate with characteristic smell.

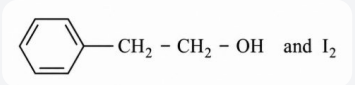
A and Y are respectively

[4 Marks]

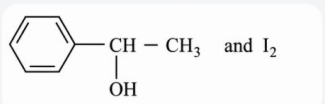
(A)



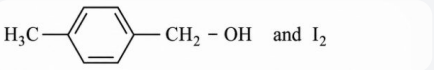
(B)



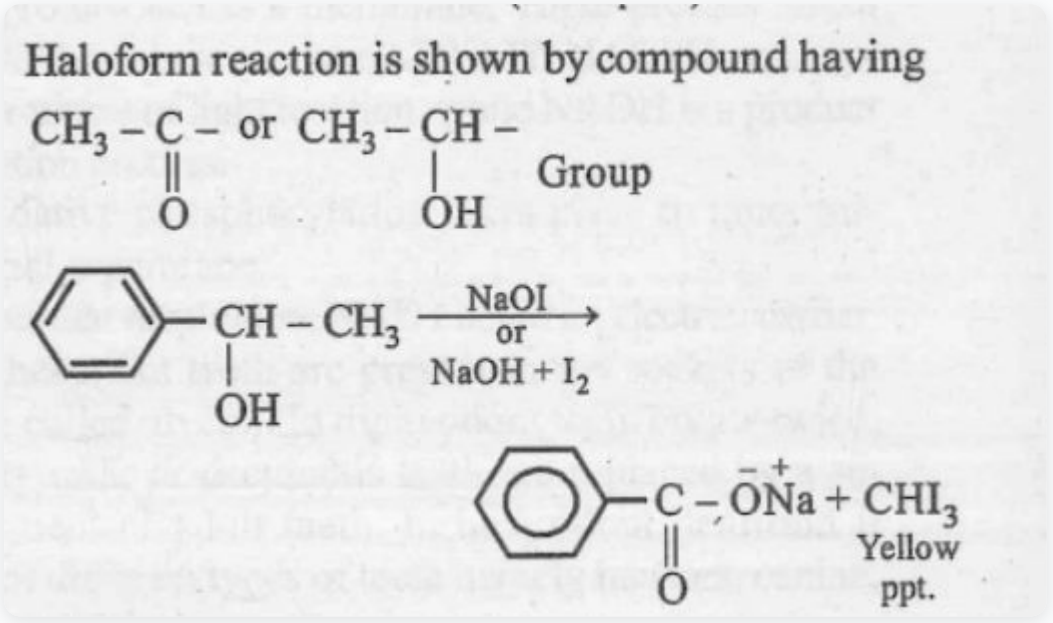
(C)



(D)



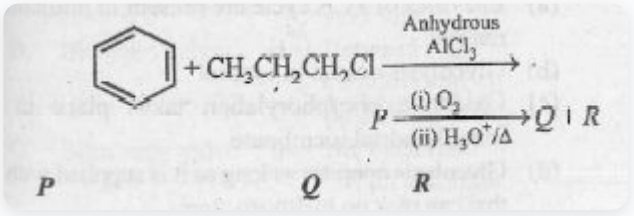
Explanation:



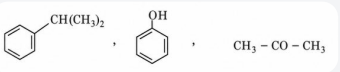
Question 177.

Identify the major products P, Q and R in the following sequence of reactions:

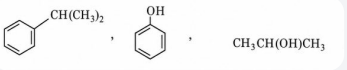
[4 Marks]



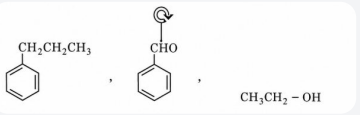
(A)



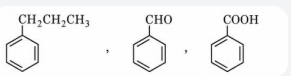
(B)



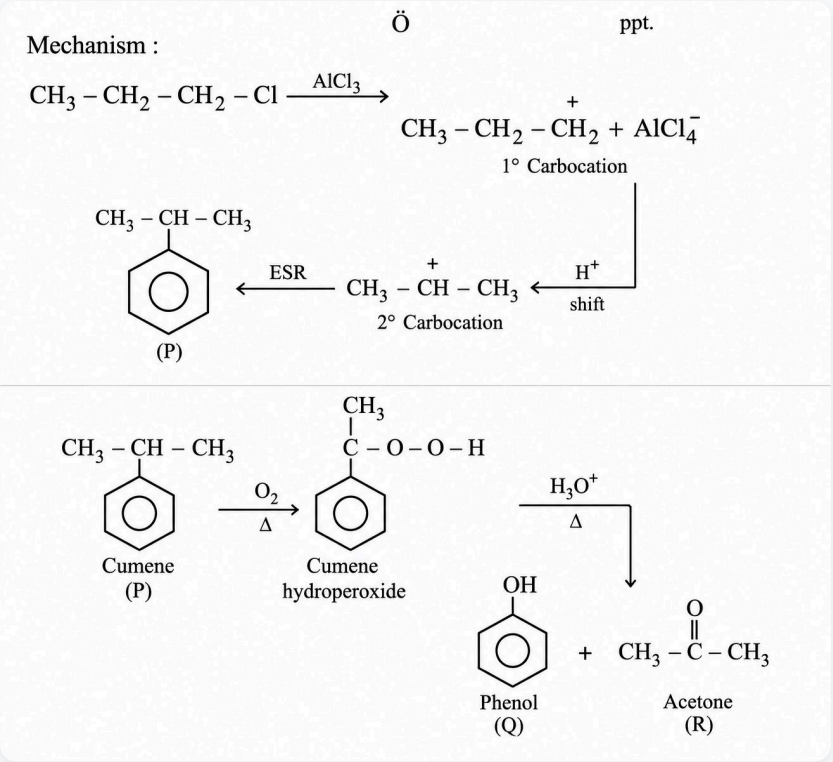
(C)



(D)



Explanation:



Question 178.

Among the following sets of examples for divergent evolution, select the incorrect option:

[4 Marks]

(A) Brain of bat, man and cheetah

(B) Eyeofoctopus, bat and man

(C) Heart of bat, man and cheetah

(D) Forelimbs of man, bat and cheetah

Explanation:

Divergent evolution demonstrates how species can have common (homologous) anatomical structures, where as eye of octopus, bat and man are examples of analogous rgans showing convergent evolution.

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Question 179.

The similarity of bone structure in the forelimbs of many vertebrates is an example of

[4 Marks]

(A) Convergent evolution

(B) Analogy

(C) Homology

(D) Adaptive radiation

Explanation:

Bird and bat wings are analogous, as forelimb is homologous. In different vertebrates, bones of forelimbs are similar but their forelimbs are adapted in different way as per their adaptation, show homology.

Question 180.

In which disease does ‘mosquito transmitted pathogen cause chronic inflammation of lymphatic vessels?

[4 Marks]

(A) Ascariasis

(B) Elephantiasis

(C) Amoebiasis

(D) Ringworm disease

Explanation:

‘Smack’ also called as brown sugar/Heroin is formed by acetylation of morphine. It is obtained from the latex of unripe capsule of Poppy plant (Papaver somniferum)