NEET-UG EXAMINATION PAPER-2023

(Solved)

Time allowed : 3 hours | Maximum Marks : 801

General Instructions :

Read the following instructions carefully and follow them :

i. This question paper contains **200 questions.** All questions are **compulsory.**

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

iii. **Section A** – questions number **1 to 200** are multiple choice questions

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

v. Use of calculator is NOT allowed.

Section A

Question 1.

The minimum wavelength of X-rays produced by an electron accelerated through a potential difference of V volts is proportional to

[4 Marks]

(A) $1/\sqrt{V}$

(B) 1/V

(C) V^2

(D) $\sqrt{V}$

Explanation:

Since, eV = hc / λ_min => λ_min = hc / eV ∴ λ_min ∝ 1 / V NOTES: X ray photo of maximum energy is emitted when an electron loses its whole energy during a single collision with the atom

Question 2.

A Carnot engine has an efficiency of 50% when its source is at a temperature 327°C. The temperature of the sink is

[4 Marks]

(A) 100°C

(B) 27°C

(C) 200°C

(D) 15°C

Explanation:

Given, efficiency η = 50 / 100 = 1 / 2 Source temperature, T_1 = 327 + 273 = 600 K Efficiency of Carnot engine η = 1 - T_2 / T_1 => η = 1 - T_2 / 600 => 1 / 2 = 1 - T_2 / 600 T_2 / 600 = 1 / 2 => T_2 = 300 K ∴ Sink temperature, T_2 = 300 - 273 = 27°C

Question 3.

A bullet is fired from a gun at the speed of 280 m s^{-1} in the direction 30° above the horizontal. The maximum height attained by the bullet is (g = 9.8 m s^{-2}, sin30° = 0.5)

[4 Marks]

(A) 1000 m

(B) 3000 m

(C) 2000 m

(D) 2800 m

Explanation:

Maximum height, H = u^2 $\sin^2$ θ / 2g H = $(280)^2$ × ($\sin^2$ 30) / (2 × 9.8) = 280 × 280 × 0.5 × 0.5 / (2 × 9.8) ∴ H = 1000 m

Question 4.

In a series LCR circuit, the inductance L is 10 mH, capacitance C is 1 μF and resistance R is 100 Ω. The frequency at which resonance occurs is

[4 Marks]

(A) 1.59 rad/s

(B) 15.9 kHz

(C) 1.59 kHz

(D) 15.9 rad/s

Explanation:

For resonance frequency $f = 1 / (2\pi \sqrt{(LC)}) \Rightarrow f = 1 / (2 \times \pi \times \sqrt{(10 \times 10^{-3} \times 1 \times 10^{-6})}) = 10^4 / 2\pi = 10^4 / (2 \times 22/7) = 1.591 \times 10^3 \therefore f = 1.591$ kHz

Question 5.

Given below are two statements:

Statement I: Photovoltaic devices can convert optical radiation into electricity.

Statement II: Zener diode is designed to operate under reverse bias in breakdown region.

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

[4 Marks]

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

(B) Both Statement I and Statement II are correct

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

(D) Both Statement I and Statement II are incorrect

Explanation:

Statement I : Photovoltaic devices convert optical radiation into electricity. II : Zener diode is designed to operate under reverse bias in breakdown region. NOTES: Zener diodes are not damaged by high reverse current.

Question 6.

Light travels a distance x in time t_1 in air and 10x in time t_2 in another denser medium. What is the critical angle for this medium?

[4 Marks]

(A) $\sin^{-1}(t_2 / t_1)$

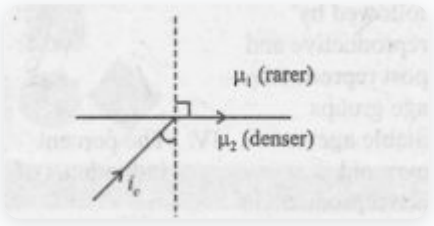
(B) $\sin^{-1}(10t_2 / t_1)$

(C) $\sin^{-1}(t_1 / 10t_2)$

(D) $\sin^{-1}(10t_1 / t_2)$

Explanation:

$\mu_2 \sin i_c = \mu_1 \Rightarrow \sin i_c = \mu_1 / \mu_2$ $\mu = c / V \therefore \sin i_c = \mu_1 / \mu_2 = V_2 / V_1$ $\sin i_c = (10x / t_2) / (x / t_1) \therefore i_c = \sin^{-1}(10t_1 / t_2)$



Question 7.

In hydrogen spectrum, the shortest wavelength in the Balmer series is λ. The shortest wavelength in the Bracket series is

[4 Marks]

(A) 2λ

(B) 4λ

(C) 9λ

(D) 16λ

Explanation:

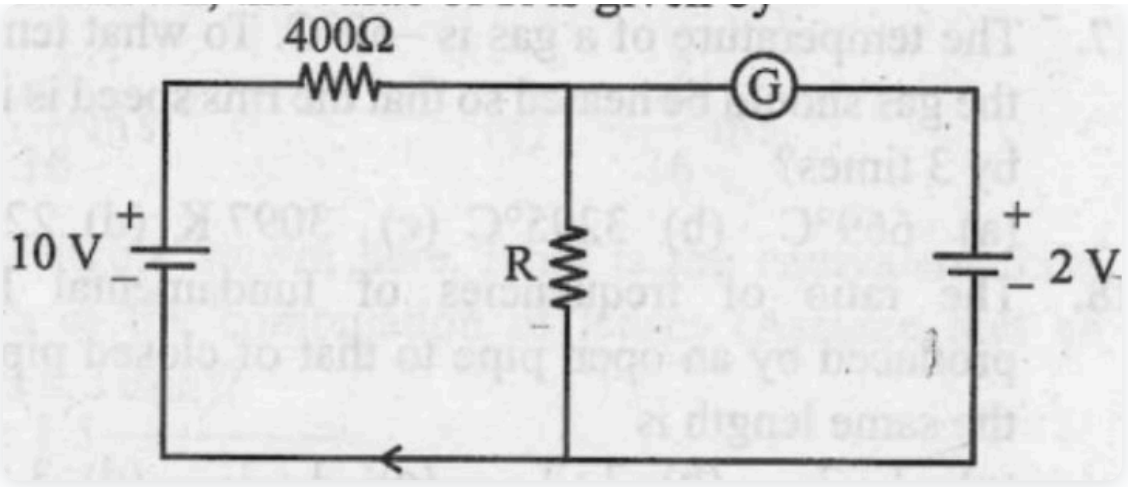
Using $1 / \lambda = R [1 / n_2^2 - 1 / n_1^2]$ For Balmer series, $[n_2 = 2, n_1 = \infty] 1 / \lambda = R [1 / 4 - 1 / \infty] \Rightarrow \lambda = 4 / R$ ... (i) And for bracket series, $(n_2 = 4, n_1 = \infty) 1 / \lambda' = R [1 / 16 - 1 / \infty] \Rightarrow \lambda' = 16 / R$ ... (ii) Dividing eq (i) by (ii)

$\lambda / \lambda' = (4 / R) / (16 / R) \therefore \lambda' = 4\lambda$

Question 8.

If the galvanometer G does not show any deflection in the circuit shown, the value of R is given by

[4 Marks]



(A) 200 Ω

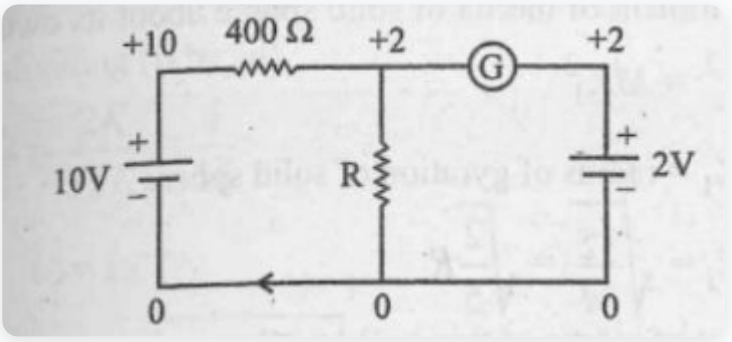
(B) 400 Ω

(C) 50 Ω

(D) 100 Ω

Explanation:

Since galvanometer does not show any deflection ∴ i_g = 0 From the circuit diagram, (10 - 2) / 400 = 2 / R ∴ R = (2 × 400) / 8 = 100 Ω



Question 9.

The amount of energy required to form a soap bubble of radius 2 cm from a soap solution is nearly (surface tension of soap solution = 0.03 N m^{-1})

[4 Marks]

(A) 30.16 × 10^{-4} J

(B) 3.01 × 10^{-4} J

(C) 5.06 × 10^{-4} J

(D) 50.1 × 10^{-4} J

Explanation:

Amount of energy required to form a soap bubble = [S × ΔA] × 2 = [0.03 × 4 × π × 4 × 10^{-4}] × 2 = 3.015 × 10^{-4} J

Question 10.

The magnetic energy stored in an inductor of inductance 4 μH carrying a current of 2 A is

[4 Marks]

(A) 8 μJ

(B) 8 mJ

(C) 4 mJ

(D) 4 μJ

Explanation:

Magnetic energy stored in an inductor U = 1/2 L i^2 = 1/2 × 4 × 10^{-6} × $(2)^2$ = 8 × 10^{-6} J = 8 μJ

Question 11.

A 12 V, 60 W lamp is connected to the secondary of a step-down transformer, whose primary is connected to ac mains of 220 V. Assuming the transformer to be ideal, what is the current in the primary winding?

[4 Marks]

(A) 2.7 A

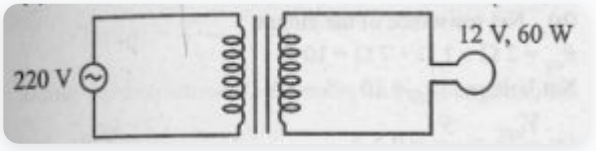
(B) 0.27 A

(C) 3.7 A

(D) 0.37 A

Explanation:

As transfer to be ideal and for ideal transformer P_input = P_output ∴ (V I)_in = 60 => 220 × I = 60 ∴ I = 0.27 A



Question 12.

An electric dipole is placed at an angle of 30° with an electric field of intensity 2×10^5 N C^{-1}. It experiences a torque equal to 4 N m. Calculate the magnitude of charge on the dipole, if the dipole length is 2 cm.

[4 Marks]

(A) 8 mC

(B) 2 mC

(C) 6 mC

(D) 4 mC

Explanation:

Given E = 2×10^5 N/C, l = 2 cm and τ = 4 N$\vec{m}$ $\vec{\tau} = \vec{p} \times \vec{E} = p E \sin\theta$

4 = p × 2 × 10^5 × sin 30° => p = 4 × 10^{-5} c m ∴ Charge on the dipole, q = p / l = (4 × 10^{-5}) / 0.02 = 2 mC

Question 13.

A vehicle travels half the distance with speed v and the remaining distance with speed 2v. Its average speed is

[4 Marks]

(A) 2v / 3

(B) v / 3

(C) 3v / 4

(D) 4v / 3

Explanation:

Average speed, $v_{avg} = 2 v_1 v_2 / (v_1 + v_2) = (2 \times v \times 2v) / (v + 2v) = 4v / 3$

Question 14.

Let a wire be suspended from the ceiling (rigid support) and stretched by a weight W attached at its free end. The longitudinal stress at any point of cross-sectional area A of the wire is

[4 Marks]

(A) W/2A

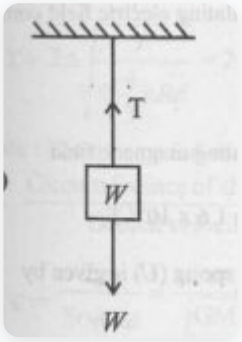
(B) 2W/A

(C) W/A

(D) Zero

Explanation:

Longitudinal stress = Internal restoring force / Area = F_ext / Area ∴ Stress = W / A



Question 15.

If ∮_s E . dS = 0 over a surface, then

[4 Marks]

(A) All the charges must necessarily be inside the surface

(B) The electric field inside the surface is necessarily uniform

(C) The number of flux lines entering the surface must be equal to the number of flux lines leaving it

(D) The magnitude of electric field on the surface is constant

Explanation:

Since, ϕ_net = ∮_s E . dS = 0 i.e., Net flux through surface is zero, so number of flux lines entering the surface must be equal to the number of flux lines leaving it. NOTES: In the expression ∮_s E . dS = 0 the electric field is the sum of electric field due to charge within the surface and due to charge outside the surface.

Question 16.

The work functions of Caesium (Cs), Potassium (K) and Sodium (Na) are 2.14 eV, 2.30 eV and 2.75 eV respectively. If incident electromagnetic radiation has an incident energy of 2.20 eV, which of these photosensitive surfaces may emit photoelectrons?

[4 Marks]

(A) Na only

(B) K only

(C) Both Na and K

(D) Cs only

Explanation:

Energy of incident radiation = 2.20 eV Work function of Cs, ϕ_{Cs} = 2.14 eV and ϕ_K = 2.30 eV ϕ_{Na} = 2.75 eV Since the work function of caesium, $\phi_{Cs} < \phi_{incident}$. Hence photons may be emitted from caesium.

Question 17.

The temperature of a gas is -50°C. To what temperature the gas should be heated so that the rms speed is increased by 3 times?

[4 Marks]

(A) 223 K

(B) 3097 K

(C) 3295°C

(D) 669°C

Explanation:

RMS speed, $v_{rms} = \sqrt{(3RT / m)} \Rightarrow v_{rms} \propto \sqrt{T}$ v_{rms} is increased by 3 times, So, final rms speed = v + 3v = 4v T_1 = 273 - 50 = 223 K and T_2 = ? $v_1 / v_2 = \sqrt{(T_1 / T_2)} \Rightarrow v / 4v = \sqrt{(223 / T_2)} \Rightarrow 1 / 16 = 223 / T_2 \therefore T_2$ = 3568 K or, T_2 = 3568 - 273 = 3295°C

Question 18.

The ratio of frequencies of fundamental harmonic produced by an open pipe to that of closed pipe having the same length is

[4 Marks]

(A) 3 : 1

(B) 1 : 3

(C) 2 : 1

(D) 1 : 2

Explanation:

Fundamental harmonic produced by open pipe, $f_{open\ pipe} = v / 2l$ And by closed pipe, $f_{closed\ pipe} = v / 4l$ $\therefore f_o / f_c = (v / 2l) \times (4l / v) = 2 / 1$ $\therefore f_o : f_c = 2 : 1$

Question 19. Resistance of a carbon resistor determined from colour codes is (22000 ± 5%) Ω. The colour of third band must be

[4 Marks]

(A) Red

(B) Green

(C) Yellow

(D) Orange

Explanation: Resistance = (22000 ± 5%) Ω = (22×10^3) Ω ± 5% Since third band corresponds to decimal multiplier Decimal multiplier = 10^3 Multiplier 1 = Black, 10^1 = Brown, 10^2 = Red and 10^3 = Orange. Therefore the colour of third band must be orange.

Question 20.

For Young's double slit experiment, two statements are given below:

Statement I : If screen is moved away from the plane of slits, angular separation of the fringes remains constant.

Statement II : If the monochromatic source is replaced by another monochromatic source of larger wavelength, the angular separation of fringes decreases.

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

[4 Marks]

(A) Statement I is false but Statement II is true.

(B) Both Statement I and Statement II are true.

(C) Both Statement I and Statement II are false.

(D) Statement I is true but Statement II is false.

Explanation:

For Young's double slit experiment, angular fringe width $\alpha = \lambda / d$ It does not depend on the distance of screen from the slit, so statement I is correct. Angular fringe width $\propto \lambda$ So if λ increases, angular separation of fringes increases. Therefore, statement I is true and statement II is false.

Question 21. A metal wire has mass (0.4 ± 0.002) g, radius (0.3 ± 0.001) mm and length (5 ± 0.02) cm. The maximum possible percentage error in the measurement of density will nearly be

[4 Marks]

(A) 1.2%

(B) 1.3%

(C) 1.4%

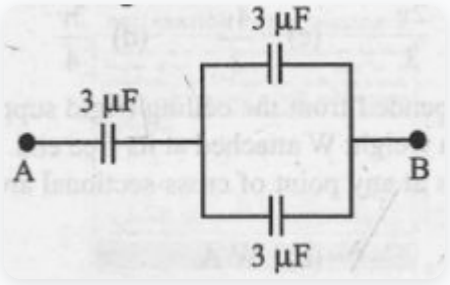
(D) 1.6%

Explanation: Density, ρ = mass / volume = $M / (\pi r^2 l)$ $\Delta\rho / \rho = \Delta M / M + 2\Delta r / r + \Delta l / l = (0.002 / 0.4 + 2 \times 0.001 / 0.3 + 0.02 / 5)$ $\Delta\rho / \rho = 0.0156$ % error in density = $\Delta\rho / \rho$ % = 1.56% ≈ 1.6%

Question 22.

The equivalent capacitance of the system shown in the following circuit is

[4 Marks]



(A) 3 μF

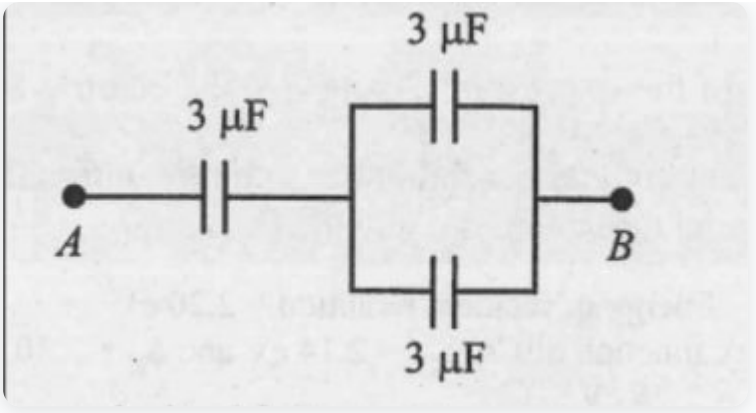
(B) 2 μF

(C) 9 μF

(D) 6 μF

Explanation:

For parallel grouping, $C_{eq} = C_1 + C_2 + ... C_n$ $C_1 = 3 + 3 = 6$ μF For series grouping, $1 / C_{eq} = 1 / C_1 + 1 / C_2 + ... 1 / C_n$ $C_{eq} = C_1C_2 / (C_1 + C_2) = 3 \times 6 / (3 + 6) = 18 / 9 = 2$ μF



Question 23.

Two bodies of mass m and 9m are placed at a distance R. The gravitational potential on the line joining the bodies where the gravitational field equals zero, will be (G = gravitational constant)

[4 Marks]

(A) -20Gm / R

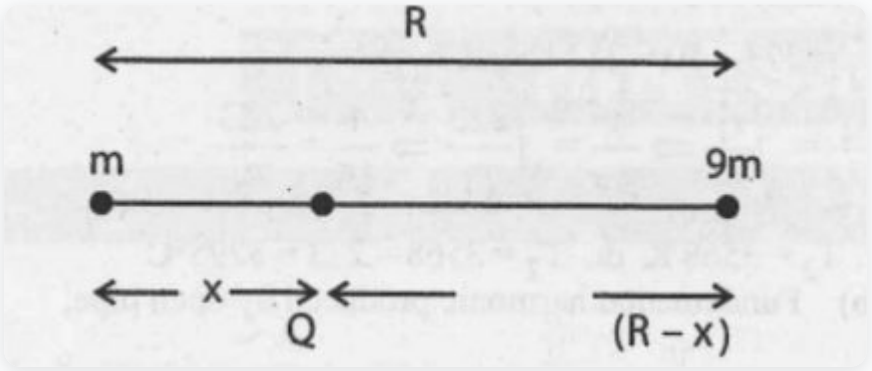
(B) -16Gm / R

(C) -12Gm / R

(D) -8Gm / R

Explanation:

Let gravitational field at point Q be zero ∴ $Gm / x^2 = G(9m) / (R - x)^2$ $(R - x)^2 / x^2 = 9$ => x = R / 4 V_Q = -Gm / x - G(9m) / (R - x) V_Q = -Gm / (R / 4) - G(9m) / (3R / 4) = -4Gm / R - 12Gm / R = -16Gm / R



Question 24.

The venturi-meter works on

[4 Marks]

(A) The principle of parallel axes

(B) Bernoulli's principle

(C) The principle of perpendicular axes

(D) Huygen's principle

Explanation:

Venturi-meter works on the Bernoulli's principle.

Question 25.

The half life of a radioactive substance is 20 minutes. In how much time, the activity of substance drops to $(1/16)^{th}$ of its initial value?

[4 Marks]

(A) 80 minutes

(B) 60 minutes

(C) 40 minutes

(D) 20 minutes

Explanation:

$N = N_0 / 2^n \Rightarrow N / N_0 = 1 / 2^n \Rightarrow 1 / 16 = 1 / 2^n \Rightarrow 1 / 2^4 = 1 / 2^n \therefore n = 4$ $n = t / T_1 \therefore t = 4 \times T_{1/2} = 4 \times 20 = 80$ minutes

Question 26.

A football player is moving southward and suddenly turns eastward with the same speed to avoid an opponent. The force that acts on the player while turning is

[4 Marks]

(A) Along eastward

(B) Along northward

(C) Along north-east

(D) Along south-west

Explanation:

Change in momentum, ΔP vector = vector P_f - vector P_î

vector P_f = m uî

vector $P_{\hat{i}} = m u (-\hat{j}) \Delta P = m u\hat{i} - m u (-\hat{j}) \Delta P = m u (\hat{i} + \hat{j})$

vector F = ΔP vector / Δt

Direction of change of momentum and direction of force acting on the player will be same i.e., along north-east.

Question 27.

The errors in the measurement which arise due to unpredictable fluctuations in temperature and voltage supply are

[4 Marks]

(A) Least count errors

(B) Random errors

(C) Personal errors

(D) Instrumental errors

Explanation:

NOTES: Random errors is also called chance error. It occurs due to parameter which are beyond the control of experimenter.

Question 28.

The angular acceleration of a body, moving along the circumference of a circle, is

[4 Marks]

(A) Along the tangent to its position

(B) Along the radius towards the centre

(C) Along the axis of rotation

(D) Along the radius, away from centre

Explanation:

Using the Right hand screw rule, angular acceleration of a body, moving along the circumference of a circle is along the axis of rotation.

Question 29.

A full wave rectifier circuit consists of two p-n junction diodes, a centre-tapped transformer, capacitor and a load resistance. Which of these components remove the ac ripple from the rectified output?

[4 Marks]

(A) Load resistance

(B) p-n junction diodes

(C) Capacitor

(D) A centre-tapped transformer

Explanation:

Capacitor is used to remove the ac ripple from the rectified output.

Question 30. The ratio of radius of gyration of a solid sphere of mass M and radius R about its own axis to the radius of gyration of the thin hollow sphere of same mass and radius about its axis is

[5 Marks]

(A) 5 : 3

(B) √3 : √5

(C) 2 : 5

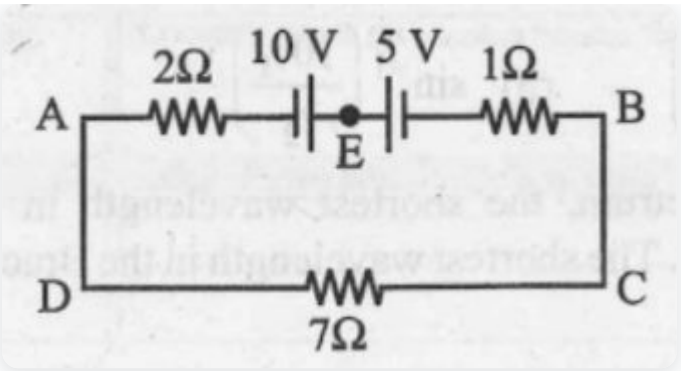
(D) 5 : 2

Explanation: Moment of inertia of solid sphere about its own axis $I_1 = 2/5\ MR^2 = MK_1^2$ Here K_1 = radius of gyration of solid sphere $\therefore K_1 = \sqrt{(I_1 / M)} = \sqrt{(2/5)}\ R$ Moment of inertia of thin hollow sphere, $I_2 = 2/3\ MR^2 = MK_2^2$ Here K_2 = radius of gyration of hollow sphere $\therefore K_2 = \sqrt{(I_2 / M)} = \sqrt{(2/3)}\ R \therefore K_1 / K_2 = \sqrt{(2/5)} \times \sqrt{(3/2)} = \sqrt{(3/5)}$

Question 31.

The magnitude and direction of the current in the following circuit is

[4 Marks]



(A) 1.5 A from B to A through E

(B) 5/9 A from A to B through E

(C) 0.5 A from A to B through E

(D) 0.2 A from B to A through E

Explanation:

Net resistance of the circuit, R_eq = 2 Ω + 1 Ω + 7 Ω = 10 Ω Net Voltage, V_net = 10 - 5 = 5 V i = V_net / R_eq = 5 / 10 = 0.5 A

Question 32.

An ac source is connected to a capacitor C. Due to decrease in its operating frequency

[4 Marks]

(A) Displacement current decreases

(B) Displacement current increases

(C) Capacitive reactance remains constant

(D) Capacitive reactance decreases

Explanation:

Capacitive reactance X_C = 1 / ωC = 1 / 2πνC Since ν decreasing, X_C will increase ∴ Current, I = E_0 / X_C will decrease As conduction current = displacement current Therefore displacement current will decrease.

Question 33.

The net magnetic flux through any closed surface is

[4 Marks]

(A) Infinity

(B) Zero

(C) Positive

(D) Negative

Explanation:

For closed loops Magnetic flux = $\oint$ vector B . ds vector = zero Magnetic monopole doesn't exist. Hence net magnetic flux through any closed surface is zero.

Question 34.

In a plane electromagnetic wave travelling in free space, the electric field component oscillates sinusoidally at a frequency of 2.0 x 10^{10} Hz and amplitude 48 Vm^{-1}. Then the amplitude of oscillating magnetic field is (Speed of light in free space = 3 x 10^{8} m s^{-1})

[4 Marks]

(A) 1.6 x 10^{-6} T

(B) 1.6 x 10^{-7} T

(C) 1.6 x 10^{-8} T

(D) 1.6 x 10^{-9} T

Explanation:

Given, Amplitude of oscillating electric field component, E_0 = 48 Vm^{-1} Using, c = E_0 / B_0 Here, B_0 = Amplitude of oscillating magnetic field ∴ B_0 = 48 / (3 × 10^{8}) = 16 × 10^{-8} = 1.6 × 10^{-7} T

Question 35.

The potential energy of a long spring when stretched by 2 cm is U. If the spring is stretched by 8 cm, potential energy stored in it will be

[4 Marks]

(A) 16 U

(B) 8 U

(C) 4 U

(D) 2 U

Explanation:

Potential energy stored in spring (U) is given by $U = 1/2\ Kx^2$ Initially $U_i = 1/2\ K(2)^2$ where x = 2 cm => $U_i = 1/2\ (K) . (4) = 2\ K$ ... (i) Finally, $U_f = 1/2\ K(8)^2 = 1/2\ K \times 64 = 32\ K$ ... (ii) On dividing (i) by (ii) $U_i / U_f = 2K / 32K = 1 / 16$ => $U_f = 16\ U_i$

Question 36.

A bullet from a gun is fired on a rectangular wooden block with velocity u. When bullet travels 24 cm through the block along its length horizontally, velocity of bullet becomes u / 3. Then it further penetrates into the block in the same direction before coming to rest exactly at the other end of the block. The total length of the block is

[4 Marks]

(A) 30 cm

(B) 27 cm

(C) 24 cm

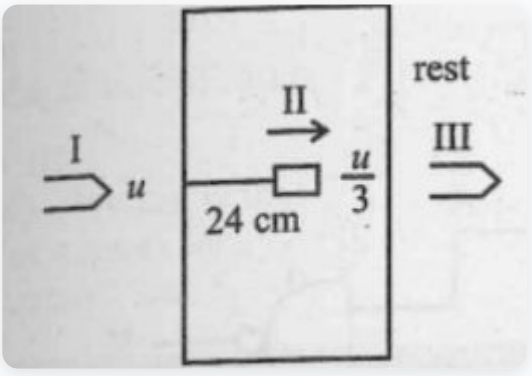
(D) 28 cm

Explanation:

Using third equation of motion between I and II $v^2 - u^2 = 2as$ => $(u / 3)^2 = u^2 - 2a \times 24$ => $2a(24) = 8u^2 / 9$ ... (i) Using third equation of motion again between II and III

$0 = (u / 3)^2 - 2as$ => $u^2 / 9 = 2as$ ... (ii) From equation (i) and (ii) $2a \times 24 = 8(2as)$ => s = 3 cm

Length of wooden block = 24 + 3 = 27 cm



Question 37. A satellite is orbiting just above the surface of the earth with period T. If d is the density of the earth and G is the universal constant of gravitation, the quantity $3\pi / Gd$ represents

[4 Marks]

(A) T

(B) T^2

(C) $\sqrt{T}$

(D) T^3

Explanation: Time period of satellite just above earth surface (T) is given by $T = 2\pi \sqrt{(R / g)}$ But $g = GM / R^2 = G / R^2 (4/3 \pi R^3 d) = Gd 4/3 \pi R \therefore T = 2\pi \sqrt{(R / (G 4/3 \pi R d))} = 2\pi \sqrt{(3 / (4\pi G d))} \Rightarrow T^2 = 3\pi / Gd$ Note : The time period of satellite, T = Circumference of the orbit of satellite / Orbital velocity of Satellite $\Rightarrow T = 2\pi r / v_{Orbital} = 2\pi r / \sqrt{(GM / r)}$ ($\because v_{Orbital} = \sqrt{(GM / r)}$) $\Rightarrow T = 2\pi \sqrt{(r^3 / GM)} = 2\pi \sqrt{(r^3 / gR^2)}$ ($\because GM = gR^2$) $\Rightarrow T = 2\pi \sqrt{((R + h)^3 / gR^2)}$ Here, r = R + h When satellite lies close to the earth $R + h \approx R \Rightarrow T = 2\pi \sqrt{(r^3 / gR^2)} = 2\pi \sqrt{(R / g)}$

Question 38.

The radius of inner most orbit of hydrogen atom is 5.3×10^{-11} m. What is the radius of third allowed orbit of hydrogen atom?

[4 Marks]

(A) 1.59 Å

(B) 4.77 Å

(C) 1.06 Å

(D) 0.53 Å

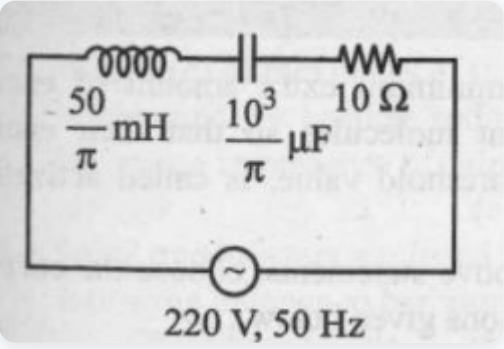
Explanation:

Given, Radius of inner most orbit of hydrogen atom, $r_1 = 5.3 \times 10^{-11}$ m Radius of n^{th} orbit $r_n = n^2 / Z \Rightarrow r_n \propto n^2 \therefore r_1 / r_2 = (n_1 / n_2)^2 \Rightarrow r_1 / r_2 = (1 / 3)^2 \Rightarrow r_2 = 9r_1 = 5.3 \times 10^{-11} \times 9 = 47.7 \times 10^{-11} = 4.77$ Å

Question 39.

The net impedance of circuit (as shown in figure) will be

[4 Marks]



(A) 25 Ω

(B) $10\sqrt{2}$ Ω

(C) 15 Ω

(D) 5√5 Ω

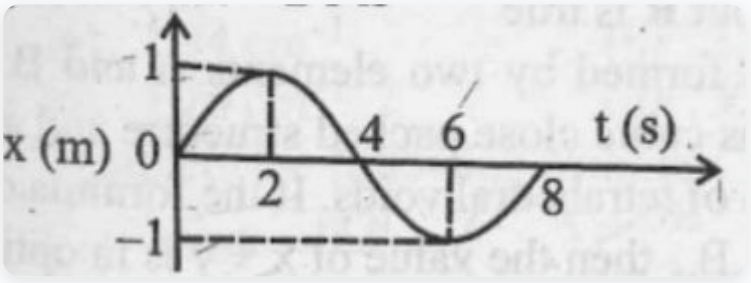
Explanation:

Inductance, L = 50 / π mH Resistance, R = 10 Ω Capacitance, C = 10^3 / π × 10^{-6} Inductive reactance, $X_L = \omega L = 2\pi fL = 2\pi \times 50 \times (50 / \pi) \times 10^{-3} = 5\ \Omega$ Capacitive reactance, $X_C = 1 / \omega C = 1 / 2\pi fC = (1 \times \pi) / (2\pi \times 50 \times 10^3 \times 10^{-6}) = 10^3 / 100 = 10\ \Omega$ Impedance $Z = \sqrt{((X_C - X_L)^2 + R^2)} = \sqrt{((10 - 5)^2 + 10^2)} \Rightarrow Z = \sqrt{125} = 5\sqrt{5}\ \Omega$

Question 40.

The x-t graph of a particle performing simple harmonic motion is shown in the figure. The acceleration of the particle at t = 2 s is

[4 Marks]



(A) $\pi^2 / 8\ m\ s^{-2}$

(B) $-\pi^2 / 8\ m\ s^{-2}$

(C) $\pi^2 / 16\ m\ s^{-2}$

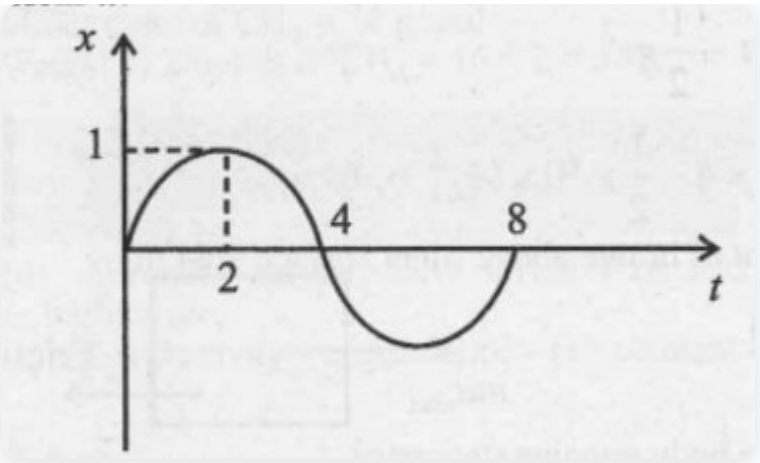
(D) $-\pi^2 / 16\ m\ s^{-2}$

Explanation:

Position of particle as function of time x = A sin ωt

From figure, at t = 2 s x = 1 Time period, T = 8 s $\omega = 2\pi / T = 2\pi / 8 = \pi / 4$ $a = -\omega^2 x = -(\pi / 4)^2 \times 1 \Rightarrow a = -\pi^2 / 16\ m/s^{-2}$

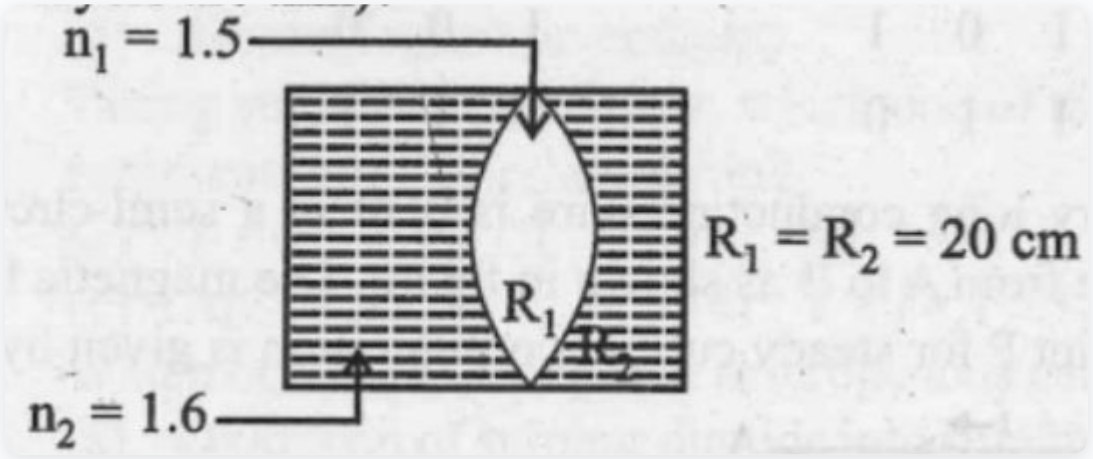
NOTES: In SHM, we cannot apply equation of translatory motion as acceleration is not ($a = \omega^2 x$) constant.



Question 41.

In the figure shown here, what is the equivalent focal length of the combination of lenses (Assume that all layers are thin)?

[4 Marks]



(A) -50 cm

(B) -100 cm

(C) 40 cm

(D) -40 cm

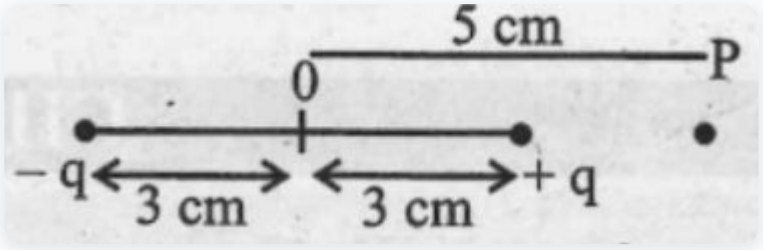
Explanation:

From the lens maker's formula $1 / f = (\mu - 1)(1 / R_1 - 1 / R_2) \therefore 1 / f_1 = (1.6 - 1)(1 / \infty - 1 / 20) = -0.6 / 20 = -3 / 100 \therefore 1 / f_2 = (1.5 - 1)(1 / 20 - 1 / -20) = 0.5 / 10 = 1 / 20 \therefore 1 / f_3 = (1.6 - 1)(1 / -20 - 1 / \infty) = -0.6 / 10 = -3 / 100$ Effective focal length (f_eff) is $1 / f_{eff} = 1 / f_1 + 1 / f_2 + 1 / f_3 \Rightarrow 1 / f_{eff} = -3 / 100 + 1 / 20 - 3 / 100 \Rightarrow 1 / f_{eff} = -1 / 100 \Rightarrow f_{eff} = -100$ cm

Question 42.

An electric dipole is placed as shown in the figure. The electric potential (in 10^2 V) at point P due to the dipole is (ε_0 = permittivity of free space and $1 / (4\pi \varepsilon_0) = K$)

[4 Marks]



(A) (8/3) qK

(B) (8/5) qK

(C) (3/8) qK

(D) (5/8) qK

Explanation:

Electrostatic potential due to a point charge is given by $V = Kq / r \therefore V_{net} = Kq / (2 \times 10^{-2}) - Kq / (8 \times 10^{-2}) \Rightarrow V_{net} = (Kq \times 10^2) / 2 (1 - 1 / 4) = (3/8\ Kq) \times 10^2\ V = 3/8\ qK$

Question 43. A horizontal bridge is built across a river. A student standing on the bridge throws a small ball vertically upwards with a velocity 4 m s^{-1}. The ball strikes the water surface after 4 s. The height of bridge above water surface is (Take g = 10 m s^{-2})

[4 Marks]

(A) 56 m

(B) 60 m

(C) 64 m

(D) 68 m

Explanation: Given, Initial velocity of ball, u = 4 ms^{-1} $s = ut - 1/2\ gt^2 = 4 \times 4 - 1/2 \times 10 \times (4)^2 = -64$ m Height of bridge above water surface = 64 m

Question 44.

Calculate the maximum acceleration of a moving car so that a body lying on the floor of the car remains stationary. The coefficient of static friction between the body and the floor is 0.15 (g = 10 m s^{-2}).

[4 Marks]

(A) 50 m s^{-2}

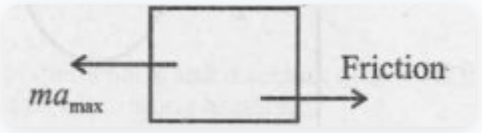
(B) 1.2 m s^{-2}

(C) 1.5 m s^{-2}

(D) 150 m s^{-2}

Explanation:

As the body remains stationary, ∴ ma_max = μ_s mg ⇒ a_max = μ_s g = 0.15 × 10 = 1.5 m/s²



Question 45.

10 resistors, each of resistance R are connected in series to a battery of emf E and negligible internal resistance. Then those are connected in parallel to the same battery, the current is increased n times. The value of n is

[4 Marks]

(A) 1000

(B) 1

(C) 100

(D) 10

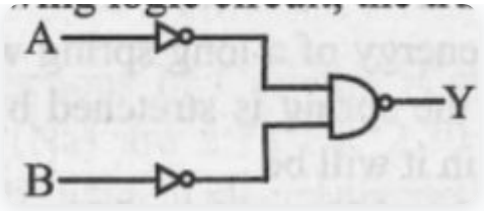
Explanation:

For series combination, Equivalent resistance, R_eq = 10R Current i_1 = E / 10R For parallel combination, Equivalent resistance, R_eq = R / 10 ∴ i_2 = E / (R / 10) = 10E / R ∴ i_2 / i_1 = (10E / R) × (R / E) = 100 => i_2 = 100i_1 According to question, i_2 = ni_1 ∴ n = 100

Question 46.

For the following logic circuit, the truth table is

[4 Marks]



(A)

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

(B)

A	B	Y
0	0	1
0	1	0
1	0	1
1	1	0

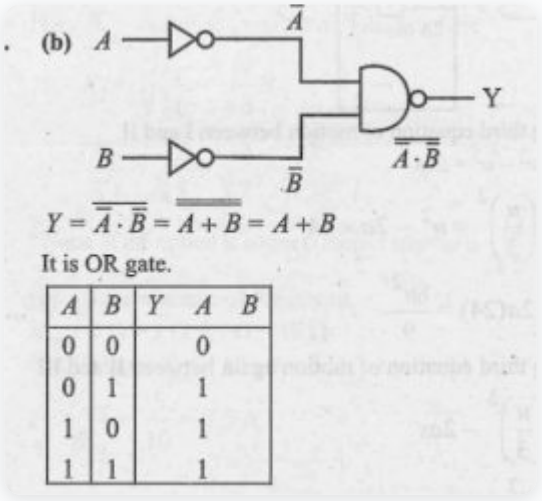
(C)

A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

(D)

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

Explanation:



$Y = \overline{\bar{A} \cdot \bar{B}} = \overline{\bar{A} + \bar{B}} = A + B$

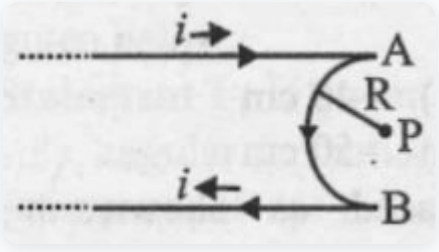
It is OR gate.

A	B	Y	A	B
0	0	0		
0	1	1		
1	0	1		
1	1	1		

Question 47.

A very long conducting wire is bent in a semi-circular shape from A to B as shown in figure. The magnetic field at point P for steady current configuration is given by

[4 Marks]



(A) $\mu_0 i$ / 4R pointed into the page

(B) $\mu_0 i$ / 4R pointed away from the page

(C) $\mu_0 i$ / 4R [1 - 2/π] pointed away from page

(D) $\mu_0 i$ / 4R [1 - 2/π] pointed into the page

Explanation:

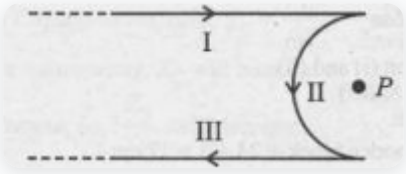
Magnetic field due to wire I = $\mu_0 i$ / 4πR

Magnetic field due to wire III = $\mu_0 i$ / 4πR

Magnetic field due to semiconductor arc II = $\mu_0 i$ / 4R

Magnetic field due to wire I and III = $-\mu_0 i$ / 4πR (into page) + $\mu_0 i$ / 4πR (into page) = $\mu_0 i$ / 2πR (into page)

B_total = B_arc - B_wires = $\mu_0 i$ / 4R - $\mu_0 i$ / 2πR = $\mu_0 i$ / 4R [1 - 2/π] Pointed away from page.



Question 48.

The resistance of platinum wire at 0°C is 2 Ω and 6.8 Ω at 80°C. The temperature coefficient of resistance of the wire is

[4 Marks]

(A) $3 \times 10^{-1}\ °C^{-1}$

(B) $3 \times 10^{-2}\ °C^{-1}$

(C) $3 \times 10^{-3}\ °C^{-1}$

(D) $3 \times 10^{-4}\ °C^{-1}$

Explanation:

Given, Resistance at 0°C, R_0 = 2 Ω Resistance at 80°C, R = 6.8 Ω Using $R = R_0(1 + \alpha\Delta T)$ where α is the temperature coefficient of resistance ∴ 6.8 = 2{1 + α(80 - 0)} => 6.8 / 2 - 1 = α × 80 => α = (3.4 - 1) / 80 = 2.4 / 80 = 0.03 ∴ $\alpha = 3 \times 10^{-2}\ °C^{-1}$

Question 49.

A wire carrying a current I along the positive x-axis has length L. It is kept in a magnetic field B = (2î+3ĵ-4k̂) T. The magnitude of the magnetic force acting on the wire is

[4 Marks]

(A) 3 IL

(B) √5 IL

(C) 5 IL

(D) √3 IL

Explanation:

Given, Magnetic Field, B = (2î+3ĵ-4k̂) T Magnetic force acting on a current carrying wire is F = Il vector × B vector = I L Î × (2î+3ĵ-4k̂) = 3IL k̂+ 4IL ĵ Magnitude of force, |F| = √((3IL)² + (4IL)²) = 5IL

Question 50.

Two thin lenses are of same focal lengths (f), but one is convex and the other one is concave. When they are placed in contact with each other, the equivalent focal length of the combination will be

[4 Marks]

(A) f / 2

(B) f / 4

(C) Infinite

(D) Zero

Explanation:

We know that For convex lens $f_1 > 0$, concave lens $f_2 < 0$ 1 / f_net = 1 / f_1 + 1 / f_2 = 1 / f - 1 / f = 0 => f_net = Infinite NOTES: If two thin lenses of same focal length but having opposite nature are placed in contact then combination will behave like a plane glass plate.

Question 51.

Select the correct statements from the following

A. Atoms of all elements are composed of two fundamental particles.

B. The mass of the electron is 9.10939×10^{-31} kg.

C. All the isotopes of a given element show same chemical properties.

D. Protons and electrons are collectively known as nucleons.

E. Dalton's atomic theory, regarded the atom as an ultimate particle of matter. Choose the correct answer from the options given below

[4 Marks]

(A) A and E only

(B) B, C and E only

(C) C, D and E only

(D) A, B and C only

Explanation:

(A) Atoms consist of three fundamental particles : Electrons, protons and neutrons

(D) Protons and neutrons present in the nucleus are collectively called as nucleons. So, the correct statements are B, C, E only.

Question 52.

Given below are two statements :

: Assertion A : A reaction can have zero activation energy.

Reason R : The minimum extra amount of energy absorbed by reactant molecules so that their energy becomes equal to threshold value, is called activation energy. In the light of the above statements, choose the correct answer from the options given below :

[4 Marks]

(A) A is false but R is true

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

(C) A is true but R is false

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

Explanation:

Activation energy is defined as the minimum amount of extra energy absorbed by reactant molecules to achieve threshold energy. Zero activation energy means the reactant molecules have the sufficient energy to form product.

NOTES: According to Arrhenius equation k = A e^(-E_a / RT) Zero activation energy means E_a = 0 => k = A e^0 => k = A, where A is the frequency factor. It simply implies that all collisions lead to successful collisions and should results in the formation of product which is practically not possible.

Question 53.

A compound is formed by two elements A and B. The element B forms cubic close packed structure and atoms of A occupy 1/3 of tetrahedral voids. If the formula of the compound is A_x B_y, then the value of x + y is in option

[4 Marks]

(A) 2

(B) 4

(C) 5

(D) 3

Explanation:

Let the number of atoms of element B = N So, the number of atoms of element A = 1/3 × 2 N ∴ The formula of the compound is $A_2/_3$ _N B_N = A_2B_3 So, x = 2, y = 3, x + y = 5

Question 54.

Given below are two statements :

Assertion A : Metallic sodium dissolves in liquid ammonia giving a deep blue solution, which is paramagnetic.

Reason R : The deep blue solution is due to the formation of amide. In the light of the above statements, choose the correct answer from the options given below :

[4 Marks]

(A) A is false but R is true

(B) A is true but R is false

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

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

Explanation:

On dissolving alkali metal (sodium) in liquid ammonia, a deep blue solution is developed due to ammoniated electron which absorbs energy in visible region of light and imparts blue colour. Due to

the presence of unpaired electrons, solution is paramagnetic.

$M + (x + y)NH_3 \longrightarrow [M(NH_3)_x]^+ + [e(NH_3)_y]^-$

Question 55.

Amongst the following the total number of species NOT having eight electrons around central atom in its outermost shell, is NH_3, $AlCl_3$, $BeCl_2$, CCl_4, PCl_5 :

[4 Marks]

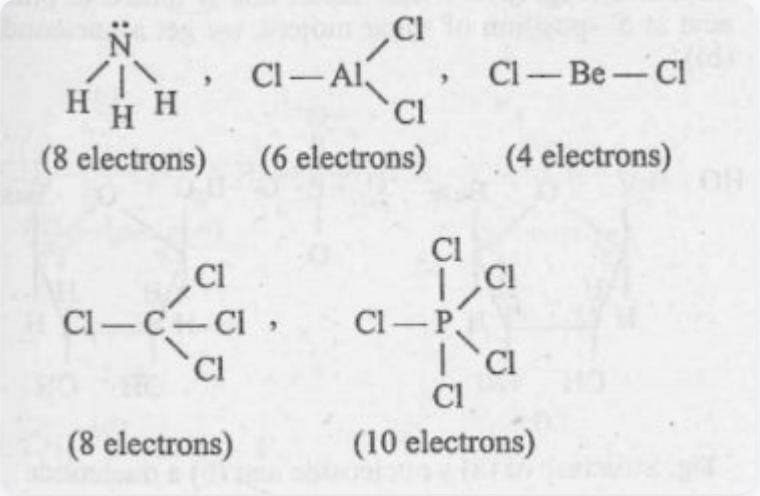
(A) 4

(B) 1

(C) 3

(D) 2

Explanation:

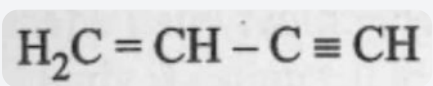


Question 56.

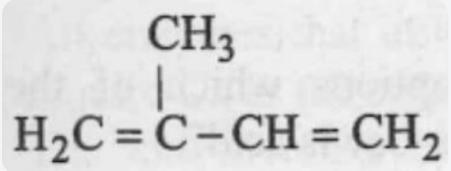
Which amongst the following molecules on polymerization produces neoprene?

[4 Marks]

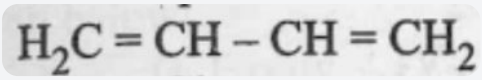
(A)



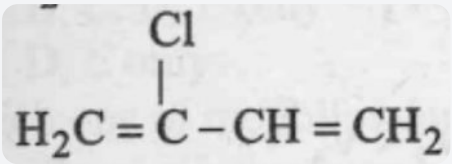
(B)



(C)

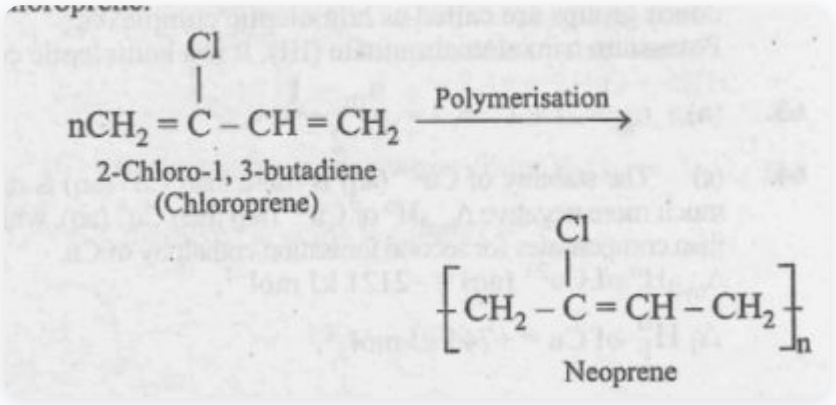


(D)



Explanation:

Neoprene is formed by free radical polymerisation of chloroprene.



Question 57.

In Lassaigne's extract of an organic compound, both nitrogen and sulphur are present, which gives blood red colour with Fe^{3+} due to the formation of

[4 Marks]

(A) $Fe_4[Fe(CN)_6]_3 \cdot xH_2O$

(B) NaSCN

(C) $[Fe(CN)_5NOS]^{4-}$

(D) $[Fe(SCN)]^{2+}$

Explanation:

In case, nitrogen and sulphur both are present in organic compound, sodium thiocyanate is formed. It gives blood red colour and no Prussian blue since there are no free cyanide ions. Na + C + N + S ———> NaSCN Fe^{3+} + SCN^- ———> $[Fe(SCN)]^{2+}$ (Blood red)

NOTES:

If sodium fusion is carried out with excess of sodium, the thiocyanate decomposes to yield cyanide and sulphide. These ions now give their usual tests. NaSCN + 2Na ———> NaCN + Na_2S

Question 58.

Weight (g) of two moles of the organic compound, which is obtained by heating sodium ethanoate with sodium hydroxide in presence of calcium oxide is :

[4 Marks]

(A) 16

(B) 32

(C) 18

(D) 30

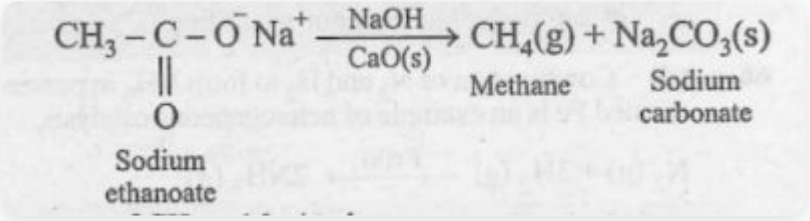
Explanation:

This reaction is called soda lime decarboxylation

Molar mass of CH_4 = 16 g/mol

Weight of 2 moles of CH_4 = 16 × 2 = 32 g

NOTES: Decarboxylation with soda lime produces alkane containing one carbon less than the carboxylic acid.



Question 59. Some tranquilizers are listed below. Which one from the following belongs to barbiturates?

[4 Marks]

(A) Chlordiazepoxide

(B) Meprobamate

(C) Valium

(D) Veronal

Explanation: Veronal is the derivative of Barbituric acid and considered as barbiturate.

Question 60.

The conductivity of centimolar solution of KCl at 25°C is 0.0210 ohm^{-1} cm^{-1} and the resistance of the cell containing the solution at 25°C is 60 ohm. The value of cell constant is

[4 Marks]

(A) 3.34 cm^{-1}

(B) 1.26 cm^{-1}

(C) 3.28 cm^{-1}

(D) 1.34 cm^{-1}

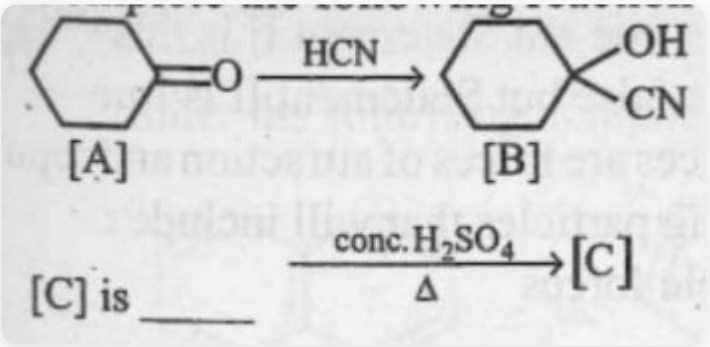
Explanation:

Conductivity = conductance × cell constant k = 1/R × l/A l/A = k × R = 0.0210 × 60 = 1.26 cm^{-1}

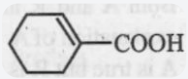
Question 61.

Complete the following reaction

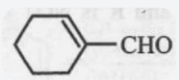
[4 Marks]



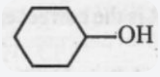
(A)



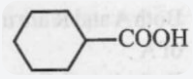
(B)



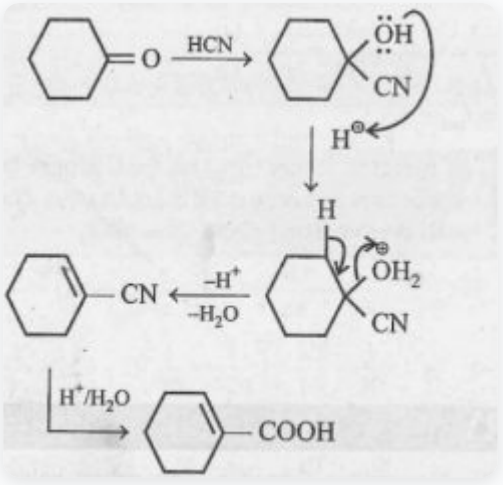
(C)



(D)



Explanation:



Question 62.

Homoleptic complex from the following complexes is

[4 Marks]

(A) Diamminechloridonitrito-N-platinum (II)

(B) Pentaamminecarbonatocobalt (III) chloride

(C) Potassium trioxalatoaluminate (III)

(D) Triamminetriaquachromium (III) chloride

Explanation:

complexes in which a metal is bound to only one kind of donor groups are called as homoleptic complexes. Potassium trioxalatoaluminate (III). It is a homoleptic complex.

Question 63.

The relation between n_m, (n_m = the number of permissible values of magnetic quantum number (m)) for a given value of azimuthal quantum number (l), is

[4 Marks]

(A) $n_m = l + 2$

(B) $n_m = 2l^2 + 1$

(C) $l = 2n_m + 1$

(D) $l = (n_m - 1) / 2$

Explanation:

$n_m = 2l + 1 \Rightarrow l = (n_m - 1) / 2$

Question 64.

The stability of Cu^{2+} is more than Cu^{+} salts in aqueous solution due to

[4 Marks]

(A) First ionisation enthalpy

(B) Enthalpy of atomization

(C) Hydration energy

(D) Second ionisation enthalpy

Explanation:

The stability of Cu^{2+} (aq) is more than Cu^{+} (aq) is due to the much more negative $\Delta_{hyd}H°$ of Cu^{2+} (aq) than Cu^{+} (aq), which more than compensates for second ionisation enthalpy of Cu. $\Delta_{hyd} H°$ of Cu^{2+} (aq) = -2121 kJ mol^{-1}, $\Delta_i H°_1$ of Cu = +745 kJ mol^{-1}, $\Delta_i H°_2$ of Cu = +1960 kJ mol^{-1}

Question 65.

Taking stability as the factor, which one of the following represents correct relationship?

[4 Marks]

(A) $TlCl_3 > TlCl$

(B) $TlCl > TlCl_3$

(C) $InI_3 > InI$

(D) $AlCl > AlCl_3$

Explanation:

As we move down the group, due to poor shielding effect of intervening d and f orbitals, the increased effective nuclear charge holds ns electrons tightly and therefore restricting their participation in bonding. This effect is known as inert pair effect. So, the relative stability of +1 O.S increases for heavier elements. Hence, TlI is more stable than TlI_3. NOTES: Boron and Aluminium do not show the inert pair effect. The inert pair effect is only shown by the elements which have d and f orbitals influencing their outermost s-orbital electrons by having poor shielding.

Question 66.

Which one is an example of heterogenous catalysis?

[4 Marks]

(A) Combination between dinitrogen and dihydrogen to form ammonia in the presence of finely divided iron

(B) Decomposition of ozone in presence of nitrogen monoxide

(C) Hydrolysis of sugar catalysed by H^+ ions

(D) Oxidation of sulphur dioxide into sulphur trioxide in the presence of oxides of nitrogen

Explanation:

Combination of N_2 and H_2 to form NH_3 in presence of finely divided Fe is an example of heterogeneous catalysis.

$$N_2(g) + 3H_2(g) \xrightarrow{Fe(s)} 2NH_3(g)$$

Question 67.

The number of σ bonds, π bonds and lone pair of electrons in pyridine, respectively are:

[4 Marks]

(A) 11, 2, 0

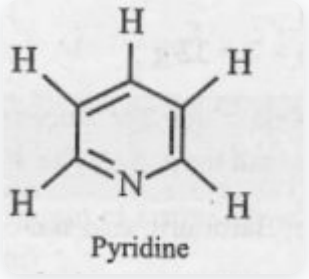
(B) 12, 3, 0

(C) 12, 2, 1

(D) 11, 3, 1

Explanation:

No. of σ bonds = 11, No. of π bonds = 3, No. of lone pair of e^- = 1



Pyridine

Question 68.

The correct order of energies of molecular orbitals of N_2 molecule, is

[4 Marks]

(A) $\sigma 1s < \sigma^*1s < \sigma 2s < \sigma^*2s < \sigma 2p_z < \sigma^*2p_z < (\pi 2p_x = \pi 2p_y) < (\pi^*2p_x = \pi^*2p_y)$

(B) $\sigma 1s < \sigma^*1s < \sigma 2s < \sigma^*2s < (\pi 2p_x = \pi 2p_y) < (\pi^*2p_x = \pi^*2p_y) < \sigma 2p_z < \sigma^*2p_z$

(C) $\sigma 1s < \sigma^*1s < \sigma 2s < \sigma^*2s < (\pi 2p_x = \pi 2p_y) < \sigma 2p_z < (\pi^*2p_x = \pi^*2p_y) < \sigma^*2p_z$

(D) $\sigma 1s < \sigma^*1s < \sigma 2s < \sigma^*2s < \sigma 2p_z < (\pi 2p_x = \pi 2p_y) < (\pi^*2p_x = \pi^*2p_y) < \sigma^*2p_z$

Explanation:

For molecules like B_2, C_2, N_2 etc. the increasing order of energies of various molecular orbitals is $\sigma 1s < \sigma^*1s < \sigma 2s < \sigma^*2s < (\pi 2p_x = \pi 2p_y) < \sigma 2p_z < (\pi^*2p_x = \pi^*2p_y) < \sigma^*2p_z$

Question 69.

Given below are two statements :

Assertion A : Helium is used to dilute oxygen in diving apparatus.

Reason R : Helium has high solubility in O_2. In the light of the above statements, choose the correct answer from the options given below:

[4 Marks]

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

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

(C) A is false but R is true

(D) A is true but R is false

Explanation:

Helium is used as diluent for oxygen in modern diving apparatus because of its very low solubility in blood.

NOTES: The solubility of he is less than that of nitrogen and it diffuses more rapidly, the elimination of inert gas from blood and tissues would be more rapid if Helium was substituted for nitrogen.

Question 70.

For a certain reaction, the rate = $k[A]^2[B]$, when the initial concentration of A is tripled keeping concentration of B constant, the initial rate would

[4 Marks]

(A) Decrease by a factor of nine

(B) Increase by a factor of three

(C) Increase by a factor of nine

(D) Increase by a factor of six

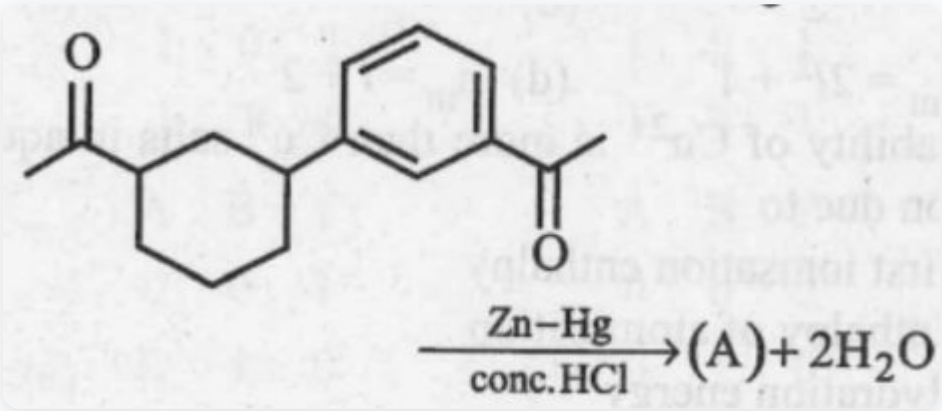
Explanation:

Rate = k[A]²[B] When concentration of A is tripled, [A'] = [3A] New rate, r' = k[A']²[B] = k[3A]²[B] = 9k[A]²[B] => r' = 9r, increases by factor of nine.

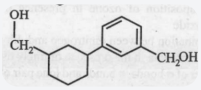
Question 71.

Identify product (A) in the following reaction:

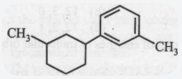
[4 Marks]



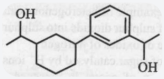
(A)



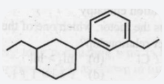
(B)



(C)

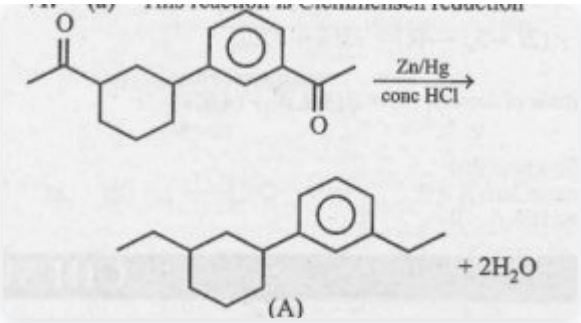


(D)



Explanation:

This reaction is Clemmensen reduction



Question 72. Which amongst the following options is correct graphical representation of Boyle's law?

[4 Marks]

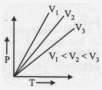
(A)



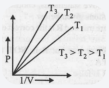
(B)



(C)



(D)



Explanation: According to Boyle's law, P ∝ 1/V, option (b) is the correct representation.

Question 73.

Amongst the given options which of the following molecules/ ion acts as a Lewis acid?

[4 Marks]

(A) NH_3

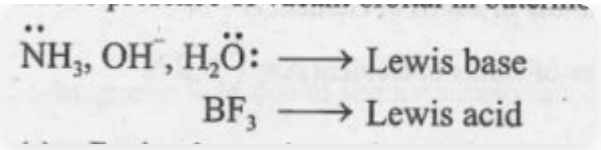
(B) H_2O

(C) OH^-

(D) BF_3

Explanation:

Lewis acids are the one which accepts lone pair of electron due to presence of vacant orbital in outermost shell.



Question 74.

The element expected to form largest ion to achieve the nearest noble gas configuration is

[4 Marks]

(A) N

(B) F

(C) O

(D) Na

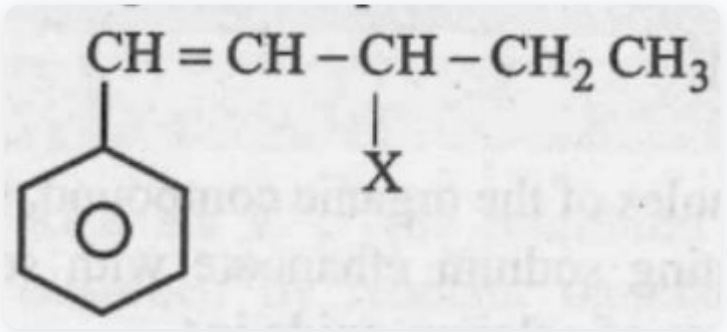
Explanation:

For isoelectronic species, as the charge on anion increases, ionic size increases O ——> O^{2-}, F ——> F^-, N ——> N^{3-}, Na ——> Na^+ Ionic size order : $N^{3-} > O^{2-} > F^- > Na^+$ So, N forms N^{3-} anion with largest ionic size.

Question 75.

The given compound is an example of _____.

[4 Marks]



(A) Vinylic halide

(B) Allylic halide

(C) Benzylic halide

(D) Aryl halide

Explanation:

Allylic halides are the compound where halogen atom attached to sp^3 hybridised carbon atom next to double bond.

Question 76.

Given below are two statements :

Statement I : A unit formed by the attachment of a base to 1' position of sugar is known as nucleoside.
Statement II : When nucleoside is linked to phosphorous acid at 5'–position of sugar moiety, we get nucleotide.

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

[4 Marks]

(A) Both Statement I and Statement II are false

(B) Both Statement I and Statement II are true

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

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

Explanation:

A unit formed by the attachment of a base to 1' position of sugar is known as nucleoside. In nucleosides, the sugar carbons are numbered as 1', 2', 3', etc. in order to distinguish these from the bases (Fig. (a)). When nucleoside is linked to phosphoric acid at 5' -position of sugar moiety, we get a nucleotide (Fig. (b)).

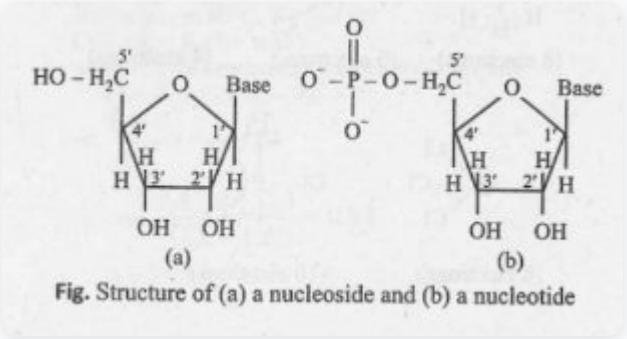


Fig. Structure of (a) a nucleoside and (b) a nucleotide

Question 77.

Intermolecular forces are forces of attraction and repulsion between interacting particles that will include :

A. dipole – dipole forces

B. dipole - induced dipole forces

C. hydrogen bonding

D. covalent bonding

E. dispersion forces

Choose the most appropriate answer from the options given below :

[4 Marks]

(A) A, C, D, E are correct

(B) A, B, C, E are correct

(C) A, B, C, D are correct

(D) B, C, D, E are correct

Explanation:

Intermolecular forces are the forces of attraction and repulsion between interacting molecules. This term does not include covalent s covalent bond holds atoms of a molecule together. Hence, dipole - dipole forces, dipole - induced dipole forces, hydrogen bonding and dispersion forces are intermolecular forces.

Question 78.

Which of the following statements are NOT correct?

A. Hydrogen is used to reduce heavy metal oxides to metals.

B. Heavy water is used to study reaction mechanism.

C. Hydrogen is used to make saturated fats from oils

D. The H–H bond dissociation enthalpy is lowest as compared to a single bond between two atoms of any elements.

E. Hydrogen reduces oxides of metals that are more active than iron.

Choose the most appropriate answer from the options given below:

[4 Marks]

(A) C, D, E only

(B) A, B, C only

(C) B, D only

(D) B, C, D, E only

Explanation:

Statement A, B, C are incorrect.

(D) H - H bond dissociation energy is maximum as compared to single bond between two atom of any element.

(E) Hydrogen reduces oxides of metal that are less active than iron.

Question 79. Which one of the following statements is correct?

[4 Marks]

(A) The daily requirement of Mg and Ca in the human body is estimated to be 0.2–0.3 g

(B) All enzymes that utilise ATP in phosphate transfer require Ca as the cofactor

(C) The bone in human body is an inert and unchanging substance

(D) Mg plays roles in neuromuscular function and interneuronal transmission

Explanation: (b) All enzymes that utilize ATP in phosphate transfer require Mg as the co-factor. (c) Bone in human body is not an inert and unchanging substance but is continuously being solubilised and redeposited. (d) Ca plays important role in neuromuscular function, interneuronal transmission, cell membrance integrity and blood coagulation.

Question 80.

Match List-I with List-II.

[4 Marks]

List-I	List-II
A. Coke	I. Carbon atoms are sp^3 hybridised
B. Diamond	II. Used as a dry lubricant
C. Fullerene	III. Used as a reducing agent
D. Graphite	IV. Cage like molecules

(A) A–III, B–IV, C–I, D–II

(B) A–III, B–I, C–IV, D–II

(C) A–II, B–IV, C–I, D–III

(D) A–IV, B–I, C–II, D–III

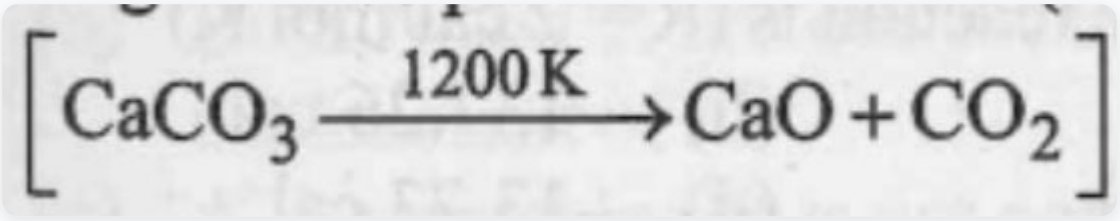
Explanation:

A - III, B - I, C - IV, D - II

Question 81.

The right option for the mass of CO_2 produced by heating 20 g of 20% pure limestone is (Atomic mass of Ca = 40)

[4 Marks]



(A) 1.12 g

(B) 1.76 g

(C) 1.32 g

(D) 2.64 g

Explanation:

$CaCO_3$ ———1200 K———> $CaO + CO_2$

1 mol ——> 1 mol

100 g ——> 44 g

As $CaCO_3$ is 20% pure, So, mass of pure $CaCO_3$ = 20 × 20 / 100 = 4 g

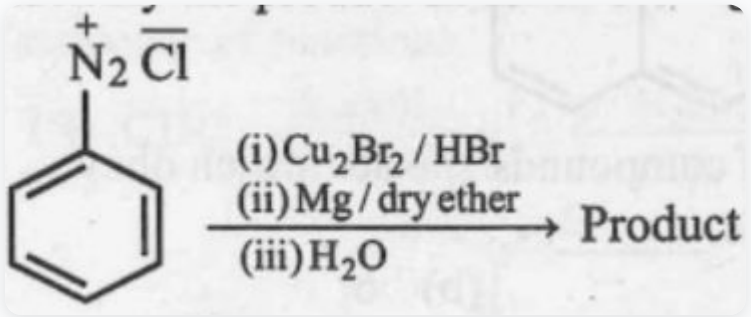
So, 100 g $CaCO_3$ produces 44 g CO_2

∴ 4 g $CaCO_3$ produces 44 / 100 × 4 g CO_2 = 1.76 g CO_2

Question 82.

Identify the product in the following reaction:

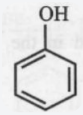
[4 Marks]



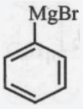
(A)



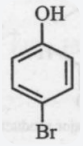
(B)



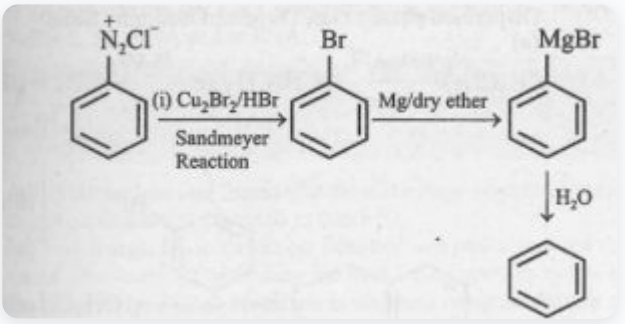
(C)



(D)



Explanation:



Question 83.

Given below are two statements:

Assertion A : In equation Δ_rG = -nFE_cell, value of $\Delta_r G$ depends on n

Reasons R : E_cell is an intensive property and $\Delta_r G$ is an extensive property. In the light of the above statements, choose the correct answer from the options given below

[4 Marks]

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

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

(C) A is true but R is false

(D) A is false but R is true

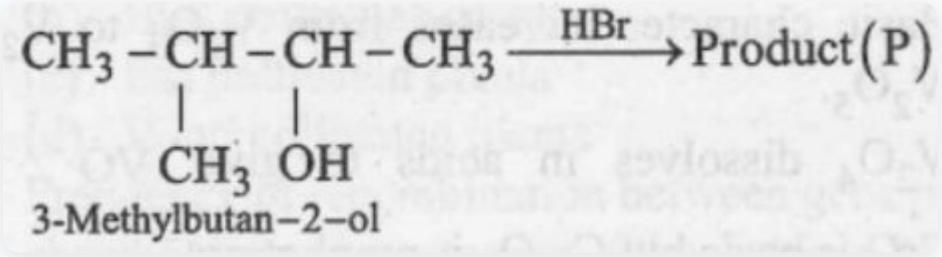
Explanation:

The value of Δ_rG depends on n value as per the equation $\Delta_rG = -nFE_{cell}$ So, assertion statement is correct E_{cell} is an intensive property while Δ_rG is an extensive thermodynamic property So, reason is correct but not explaining the assertion.

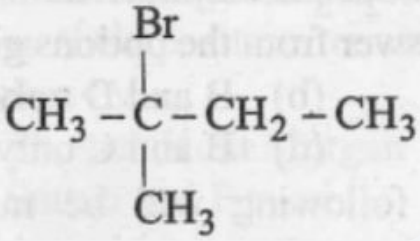
Question 84.

Consider the following reaction and identify the product (P).

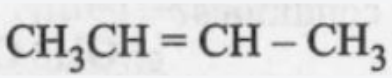
[4 Marks]



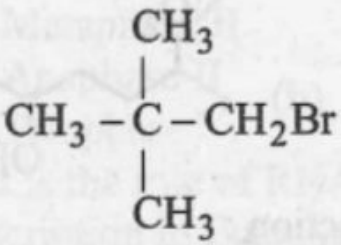
(A)



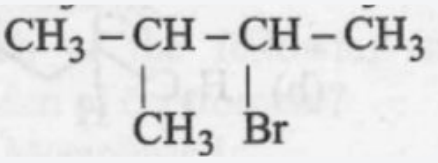
(B)



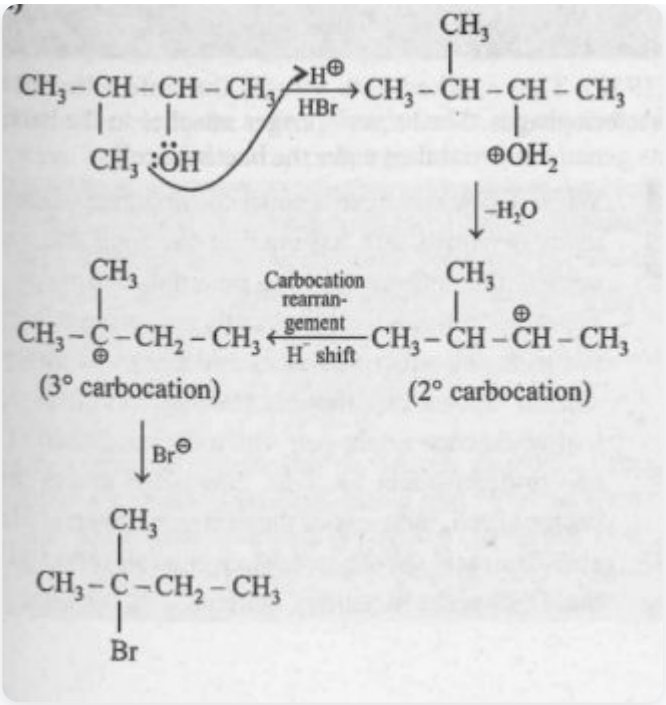
(C)



(D)



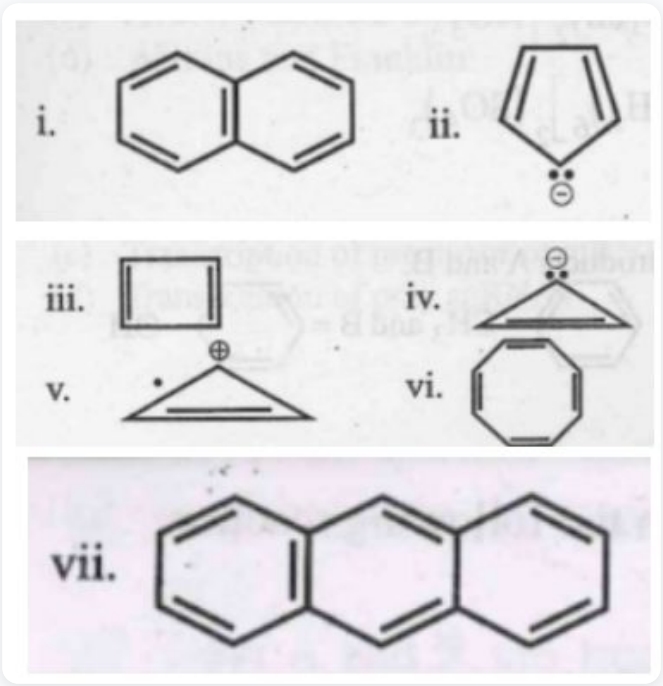
Explanation:



Question 85.

Consider the following compounds/species: The number of compounds/species which obey Huckel's rule is ____.

[4 Marks]



(A) 5

(B) 6

(C) 2

(D) 4

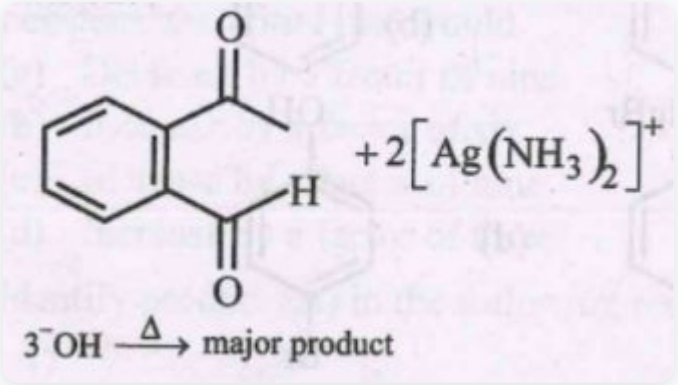
Explanation:

Criteria for Huckel's rule: Planarity Complete delocalisation of electrons Presence of (4n + 2)n electrons in ring where π is an integer (=0, 1,2, ..) The compounds which follow Huckel's rule are option (i), (ii), (iv), (vii).

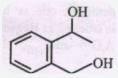
Question 86.

Identify the major product obtained in the following reaction:

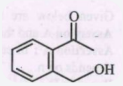
[4 Marks]



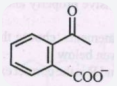
(A)



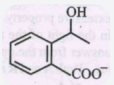
(B)



(C)

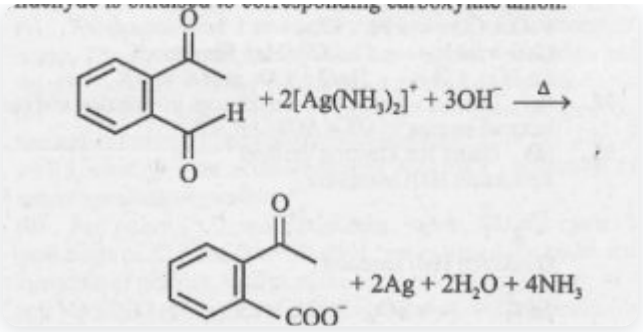


(D)



Explanation:

Ammoniacal silver nitrate solution is Tollens' reagent. Aldehyde upon warming with Tollens' reagent produces a silver mirror due to formation of silver metal in alkaline medium. Aldehyde is oxidised to corresponding carboxylate anion.



Question 87.

Which of the following statements are INCORRECT?

A. All the transition metals except scandium form MO oxides which are ionic.

B. The highest oxidation number corresponding to the group number in transition metal oxides is attained in Sc_2O_3 to Mn_2O_7.

C. Basic character increases from V_2O_3 to V_2O_4 to V_2O_5.

D. V_2O_4 dissolves in acids to give VO^{2+} salts.

E. CrO is basic but Cr_2O_3 is amphoteric.

Choose the correct answer from the options given below:

[4 Marks]

(A) A and E only

(B) B and D only

(C) C and D only

(D) B and C only

Explanation:

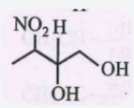
(C) Basic character decreases from V_2O_3 to V_2O_4 to V_2O_5. (D) V_2O_4 dissolves in acids to give VO^{2+}.

Question 88.

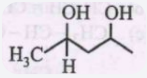
Which amongst the following will be most readily dehydrated under acidic conditions?

[4 Marks]

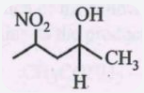
(A)



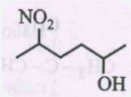
(B)



(C)

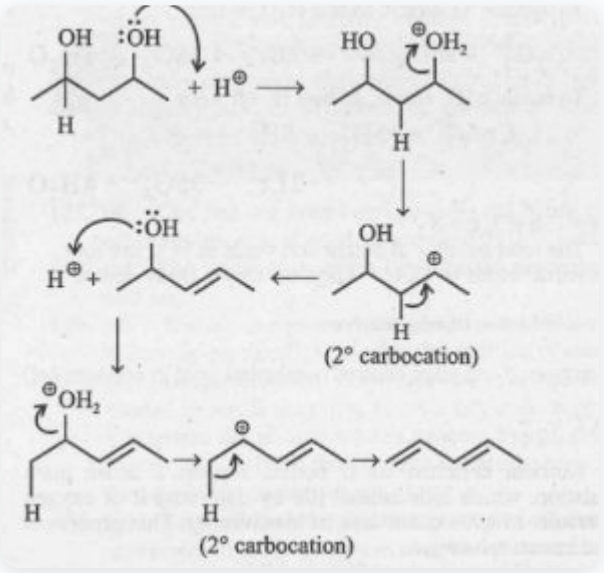


(D)



Explanation:

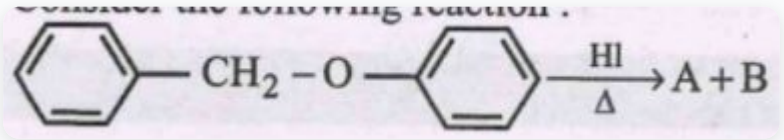
In other options carbocation formed destabilised by -I effect of $-NO_2$ group.



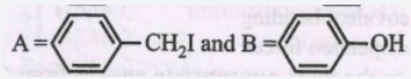
Question 89.

Consider the following reaction : Identify products A and B.

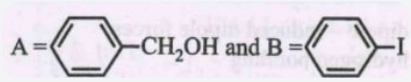
[4 Marks]



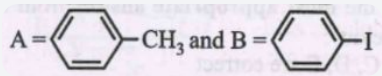
(A)



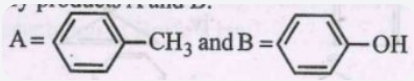
(B)



(C)

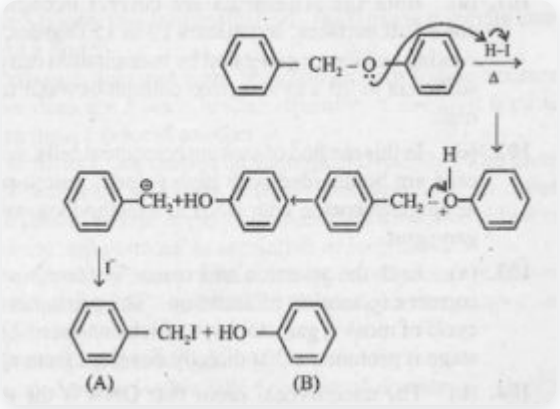


(D)



Explanation:

The bond between O - CH_2 - is weaker than the bond between O - C_6H_5 because the carbon of phenyl group is sp^2 hybridised and there is a partial double bond character. Therefore I^- ion breaks O - CH_2 - bond.



Question 90.

The reaction that does NOT take place in a blast furnace between 900 K to 1500 K temperature range during extraction of iron is :

[4 Marks]

(A) $C + CO_2 \longrightarrow 2CO$

(B) $CaO + SiO_2 \longrightarrow CaSiO_3$

(C) $FeO + CO \longrightarrow Fe + CO_2$

(D) $Fe_2O_3 + CO \longrightarrow 2FeO + CO_2$

Explanation:

At 900-1500 K (higher temperature range in the blast furnace) Reaction which take place are:

$C + CO_2 \longrightarrow 2CO$

$FeO + CO \longrightarrow Fe + CO_2$

$CaO + SiO_2 \longrightarrow CaSiO_3$ (Slag formation)

Fe_2O_3 + CO ——> 2FeO + CO_2 at 500-800 K.

Question 91.

Which amongst the following options is the correct relation between change in enthalpy and change in internal energy?

[4 Marks]

(A) ΔH + ΔU = Δn_g R

(B) ΔH = ΔU - Δn_g RT

(C) ΔH - ΔU = -Δn_g RT

(D) ΔH = ΔU + Δn_g RT

Explanation:

Correct relation between change in enthalpy and change in internal energy is ΔH = ΔU + Δn_g RT

Question 92.

On balancing the given redox reaction,

$aCr_2O_7^{2-}$ + bSO_3^{2-}(aq) + cH^+(aq) ——> $2aCr^{3+}$(aq) + bSO_4^{2-}(aq) + c/2 H_2O(l)

the coefficients a, b and c are found to be, respectively–

[4 Marks]

(A) 1, 8, 3

(B) 8, 1, 3

(C) 3, 8, 1

(D) 1, 3, 8

Explanation:

Using Ion electron method: Reduction Half reaction: $Cr_2O_7^{2-}$ + $6e^-$ ——> $2Cr^{3+}$ Oxidation

Half reaction:

SO_3^{2-} ——> SO_4^{2-} + $2e^-$ × 3

Overall reaction: $Cr_2O_7^{2-}$ + $3SO_3^{2-}$ ——> $2Cr^{3+}$ + $3SO_4^{2-}$

To balance 'H' atoms, adding H_2O on LHS $Cr_2O_7^{2-}$ + $3SO_3^{2-}$ ——> $2Cr^{3+}$ + $3SO_4^{2-}$ + $4H_2O$

To balance 'H' atoms, adding H^+ on RHS

$Cr_2O_7^{2-} + 3SO_3^{2-} + 8H^+ \longrightarrow 2Cr^{3+} + 3SO_4^{2-} + 4H_2O$

$\therefore a = 1, b = 3, c = 8$

Question 93. What fraction of one edge centred octahedral void lies in one unit cell of fcc?

[4 Marks]

(A) 1/2

(B) 1/3

(C) 1/12

(D) 1/4

Explanation: The total number of octahedral voids in FCC are four Octahedral voids in FCC = Edge centres + Body centre The contribution of edge centre = 1/4 $\therefore$ Fraction of one edge centred octahedral void in one unit cell of FCC = 1/4

Question 94.

Given below are two statements :

Statement I : The nutrient deficient water bodies lead to eutrophication

Statement II : Eutrophication leads to decrease in the level of oxygen in the water bodies. In the light of the above statements, choose the correct answer from the options given below:

[4 Marks]

(A) Statement I is incorrect but Statement II is true.

(B) Statement I is correct but Statement II is false.

(C) Both Statement I and Statement II are false.

(D) Both Statement I and Statement II are true.

Explanation:

Nutrient enriched water bodies support a dense plant population, which kills animal life by depriving it of oxygen and results in subsequent loss of biodiversity. This process is called as eutrophication. $\therefore$ Statement I is incorrect and Statement II is correct.

Question 95.

The equilibrium concentrations of the species in the reaction A + B ⇌ C + D are 2, 3, 10 and 6 mol L^{-1}, respectively at 300 K. ΔG° for the reaction is (R = 2 cal/mol K)

[4 Marks]

(A) -13.73 cal

(B) 1372.60 cal

(C) -1381.80 cal

(D) -137.26 cal

Explanation:

A + B ⇌ C + D k_eq = [C] [D] / [A] [B] k_eq = (10 × 6) / (2 × 3) = 10 ΔG° = -RT ln k_eq = -2.303 RT log k_eq = -2.303 × 2 × 300 × log 10 = -1381.8 cal

Question 96.

Which complex compound is most stable?

[4 Marks]

(A) $[CoCl_2(en)_2]NO_3$

(B) $[Co(NH_3)_6]_2(SO_4)_3$

(C) $[Co(NH_3)_3(NO_3)_3]$

(D) $Co(NH_3)_4(H_2O)Br_2$

Explanation:

Chelating ligands in general form more stable complexes ∴ The most stable complex is $[CoCl_2(en)_2]NO_3$

Question 97.

Match List-I with List-II: Choose the correct answer from the options given below.

[4 Marks]

	List-I (Oxoacids of Sulphur)		List-II (Bonds)
A.	Peroxodisulphuric	I.	Two S–OH, acid Four S=O, One S–O–S
B.	Sulphuric acid	II.	Two S–OH, One S=O
C.	Pyrosulphuric acid	III.	Two S–OH, Four S=O, One S–O– O–S
D.	Sulphurous acid	IV.	Two S–OH, Two S=O

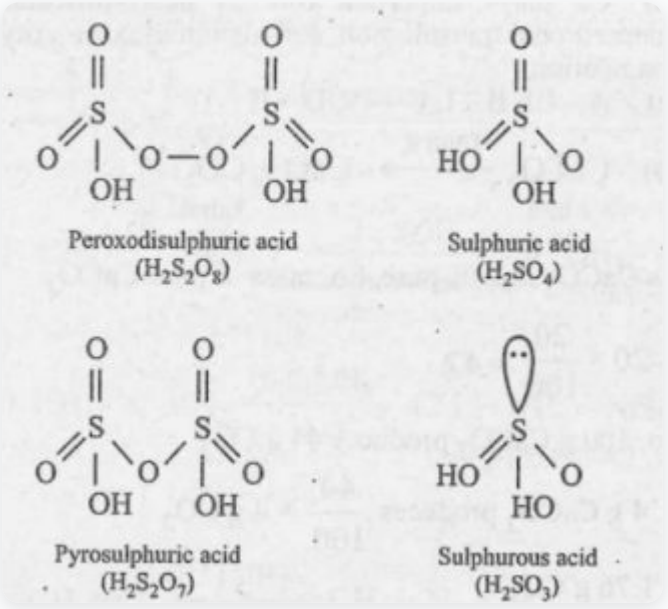
(A) A-I, B-III, C-II, D-IV

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

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

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

Explanation:



Question 98. Pumice stone is an example of

[4 Marks]

(A) Sol

(B) Gel

(C) Solid sol

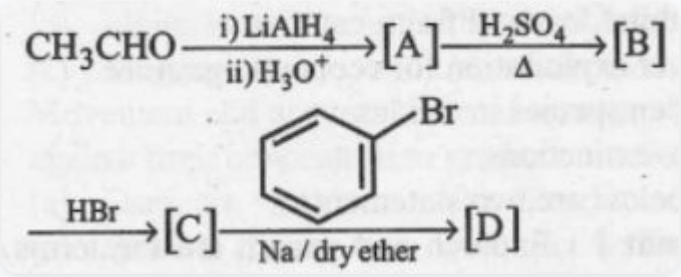
(D) Foam

Explanation: Pumice stone is a solid sol. Dispersed phase : Gas, Dispersed medium : Solid.

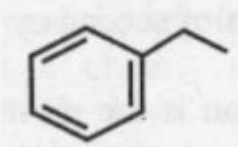
Question 99.

Identify the final product [D] obtained in the following sequence of reactions.

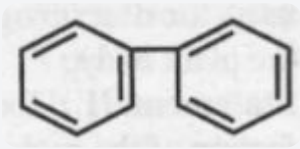
[4 Marks]



(A)



(B)



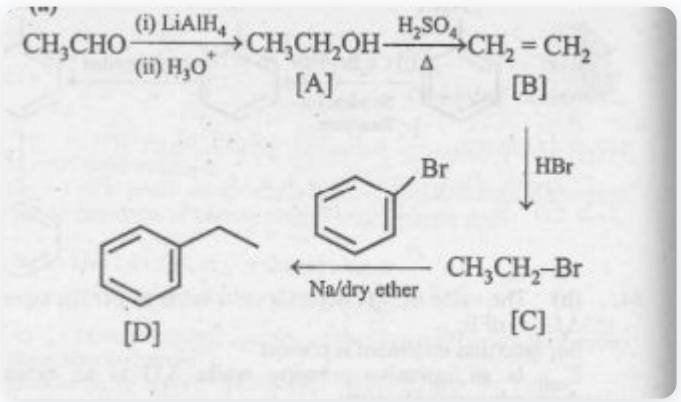
(C)

C_4H_{10}

(D)

$HC \equiv C^{\ominus}Na^{+}$

Explanation:



Question 100.

Given below are two statements :

Statement I: The forces generated transpiration can lift a xylem-sized column of water over 130 meters height.

Statement II : Transpiration cools leaf surfaces sometimes 10 to 15 degrees evaporative cooling. In the light of the above statements, choose the most appropriate answer from the options given below :

[4 Marks]

(A) Both Statement I and Statement II are correct

(B) Both Statement I and Statement II are incorrect

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

(D) Statement I is correct but Statement I is incorrect

Explanation:

Both the statements are correct because transpiration cools leaf surfaces, sometimes 10 to 15 degrees, by evaporative cooling and forces generated by transpiration can create pressures sufficient to lift a xylem sized column of water up to 130 meters high.

Question 101.

In gene gun method used to introduce alien DNA into host cells, microparticles of _____ metal are used.

[4 Marks]

(A) Zinc

(B) Copper

(C) Tungsten or gold

(D) Silver

Explanation:

In this method of making competent cells, suitable for plants, cells are bombarded with high velocity micro-particles of gold or tungsten coated with DNA in a method known as biolistics or gene gun.

Question 102.

Given below are two statements :

Assertion A : The first stage of gametophyte in the life cycle of moss is protonema stage.

Reason R : Protonema develops directly from spores produced in capsule. In the light of the above statements, choose the most appropriate answer from options given below:

[4 Marks]

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

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

(C) A is not correct but R is correct

(D) A is correct but R is not correct

Explanation:

Both the assertion and reason is correct and reason is the correct explanation of assertion. The predominant stage of life cycle of moss is gametophyte which consist of 2 stages. The first stage is protonema that directly develops from spore.

Question 103.

Unequivocal proof that DNA is the genetic material was first proposed by

[4 Marks]

(A) Avery, Macleoid and McCarthy

(B) Wilkins and Franklin

(C) Alfred Hershey and Martha Chase

(D) Frederick Griffith

Explanation:

The unequivocal proof that DNA is the genetic material came from the experiments of Alfred Hershey and Martha Chase (1952). They worked with viruses that infect bacteria called bacteriophages. The bacteriophages attaches to the bacteria and its genetic material then enter the bacterial cell.

Question 104. The thickness of ozone in a column of air in the atmosphere is measured in terms of

[4 Marks]

(A) Decibels

(B) Dobson units

(C) Kilobase

(D) Decamete

Explanation: Decibel (dB) is the unit to measure the intensity of sound. Dobson unit (DU) is used to measure the thickness of earth's here. E Kilobase is a unit of measurement used to help designate the length of DNA or RNA. Hence, thickness of ozone in column of air from ground to top of atmosphere is measured in terms of Dobson units. So, the correct answer is 'Dobson units'.

Question 105.

In tissue culture experiments, leaf mesophyll cells are put in a culture medium to form callus. This phenomenon may be called as

[4 Marks]

(A) Senescence

(B) Development

(C) Dedifferentiation

(D) Differentiation

Explanation:

Dedifferentiation is a phenomenon by which the living differentiated plant cells, that by now have lost the capacity to divide canregain the capacity of division under certain conditions. In tissue culture experiments, leaf mesophyll cells are put in a culture medium to form callus. This phenomenon may be called as dedifferentiation.

Question 106.

Large, colourful, fragrant flowers with nectar are seen in

[4 Marks]

(A) Wind pollinated plants

(B) Insect pollinated plants

(C) Bat pollinated plants

(D) Bird pollinated plants

Explanation:

Majority of insect pollinated flowers are large-sized. These flowers are colorful and possess fragrance to attract the insects.

Question 107.

Frequency of recombination between gene pairs on same chromosome as a measure of the distance between genes to map their position on chromosome, was used for the first time by

[4 Marks]

(A) Henking

(B) Alfred Sturtevant

(C) Thomas Hunt Morgan

(D) Sutton and Boveri

Explanation:

The frequency of recombination is the number of crossovers formed between any two genes. Alfred Sturtevant explained that the recombination frequency between gene pairs is the measure of distance between the genes.

Question 108. Which of the following stages of meiosis involves division of centromere?

[4 Marks]

(A) Metaphase I

(B) Metaphase II

(C) Anaphase II

(D) Telophase

Explanation: The division of the centromeres occur during anaphase. This allows for the separation of each sister chromatid into its respective daughter cell.

Question 109.

What is the role of RNA polymerase III in the process of transcription in Eukaryotes?

[4 Marks]

(A) Transcription of precursor of mRNA

(B) Transcription of only snRNAs

(C) Transcription of rRNAs (288, 18S and 5.8S)

(D) Transcription of tRNA, 5S rRNA and snRNA

Explanation:

In eukaryotes there are three major types of RNA polymerases are found that are RNA polymerase I, RNA polymerase II and RNA polymerase III. RNA polymerase III transcribes : tRNAs, ScRNA, 5S rRNA and snRNA.

Question 110.

Among 'The Evil Quartet', which one is considered the most important cause driving extinction of specie

[4 Marks]

(A) Co-extinctions

(B) Over exploitation for economic gain

(C) Alien species invasions

(D) Habitat loss and fragmentation

Explanation:

Habitat loss and fragmentation is the most important cause driving animals and plants to extinction.

Question 111.

Given below are two statements :

Statement I : Endarch and exarch are the terms often used for describing the position of secondary xylem in the plant body.

Statement II : Exarch condition is the most common feature of the root system. In the light of the above statements, choose the correct answer from the options given below:

[4 Marks]

(A) Statement I is correct but Statement II is false

(B) Statement I is incorrect but Statement II is true

(C) Both Statement I and Statement I are true

(D) Both Statement I and Statement II are false

Explanation:

Statement I is incorrect because endarch and exarch are the terms often used for describing the position of primary xylem in the plant body. Exarch condition is the most common feature of the root

system. Hence, statement I is incorrect and II is correct.

Question 112.

Axile placentation is observed in

[4 Marks]

(A) Tomato, Dianthus and Pea

(B) China rose, Beans and Lupin

(C) Mustard, Cucumber and Primrose

(D) China rose, Petunia and Lemon

Explanation:

Axile placentation occurs in syncarpous pistils. The ovary is partitioned into two or more chambers. Axile placentation is observed in China rose, Petunia and Lemon.

Question 113.

Expressed Sequence Tags (ESTS) refers to

[4 Marks]

(A) All genes that are expressed as proteins.

(B) Certain important expressed genes.

(C) All genes that are expressed as RNA.

(D) All genes whether expressed or unexpressed.

Explanation:

Expressed Sequence Tags or ESTs are genes that are expressed as RNA in the body. ESTs represent portions of expressed genes. They may be represented as either cDNA/mRNA sequence or as the reverse complement of the mRNA, the template strand.

Question 114.

What is the function of tassels in the corn cob?

[4 Marks]

(A) To trap pollen grains

(B) To protect seeds

(C) To disperse pollen grains

(D) To attract insects

Explanation:

Tassels in the com cob represents stigma and style which wave in the wind to trap pollen grains.

Question 115.

Spraying of which of the following phytohormone on juvenile conifers helps hastening the maturity period, that leads early seed production?

[4 Marks]

(A) Abscisic Acid

(B) Gibberellic Acid

(C) Indole-3-butyric Acid

(D) Zeatin

Explanation:

Spraying juvenile conifers with gibberellins hastens their maturity period, thus leading to early seed production.

Question 116.

In the equation [GPP - R = NPP| GPP is Gross Primary Productivity NPP is Net Primary Productivity R here is

[4 Marks]

(A) Reproductive allocation

(B) Respiratory loss

(C) Photosynthetically active radiation

(D) Respiratory quotient

Explanation:

The given equation represent Net primary productivity which is gross primary productivity minus respiration loss. In the given equation, R represent “Respiratory loss”.

Question 117.

Family Fabaceae differs from Solanaceae and Liliaceae. With respect to the stamens, pick out the characteristics specific to family Fabaceae but not found in Solanaceae or Liliaceae.

[4 Marks]

(A) Monoadelphous and Monothecous anthers

(B) Polyadelphous and epipetalous stamens

(C) Epiphyllous and Dithecous anthers

(D) Diadelphous and Dithecous anthers

Explanation:

The characteristics specific to family Fabaceae but not found in Solanaceae or Liliaceae is Diadelphous and dithecous anther.

Question 118.

In angiosperm, the haploid, diploid and triploid structures of a fertilized embryo sac sequentially are :

[4 Marks]

(A) Synergids, Zygote and Primary endosperm nucleus

(B) Synergids, antipodals and Polar nuclei

(C) Synergids, Primary endosperm nucleus and zygote

(D) Antipodals, synergids, and primary endosperm nucleus

Explanation:

Primary endosperm nucleus is formed by the fusion of diploid secondary nucleus with a male gamete. Therefore, it is triploid. Zygote is formed by fusion of two gametes and thus it is diploid. Synergids are the cells of gametophyte and hence these are haploid.

Question 119.

Which hormone promotes internode/petiole elongation in deep water rice?

[4 Marks]

(A) 2, 4-D

(B) Kinetin

(C) Ethylene

(D) GA3

Explanation:

Ethylene promotes rapid internode/petiole elongation on deep water rice plants.

Question 120.

Given below are two statements :

Assertion A : Late wood has fewer xylary elements with narrow vessels.

Reason R : Cambium is less active in winters. In the light of the above statements, choose the correct answer from the options given below

[4 Marks]

(A) A is false but R is true

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

(C) A is true but R is false

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

Explanation:

Late wood is also known as autumn wood. It is a wood in a tree's growth ring which is produced later in the growing season when the growth is not rapid.

Question 121.

Given below are two statements :

Assertion A : ATP is used at two steps in glycolysis.

Reason R : First ATP is used in converting glucose into glucose—6-phosphate and second ATP is used in conversion of fructose—6—phosphate into fructose—1, 6— diphosphate. In the light of the above statements, choose the correct answer from the options given below :

[4 Marks]

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

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

(C) Ais false but R is true.

(D) Ais true but R is false.

Explanation:

Both assertion and reason are correct and reason is the correct explanation of assertion because ATP in glycolysis is used at two steps of conversion that are Glucose→ Glucose-6-phosphate Fructose-6-phosphate → Fructose-1, 6-bisphosphate

Question 122.

Identify the correct statements:

A. Detrivores perform fragmentation.

B. The humus is further degraded by some microbes during mineralization.

C Water soluble inorganic nutrients go down into the soil and get precipitated by a process called leaching.

D. The detritus food chain begins with living organisms.

E. Earthworms break down detritus into smaller particles by a process called catabolism.

Choose the correct answer from the options given below:

[4 Marks]

(A) B,C,D only

(B) C,D,E only

(C) A,B,C only

(D) D,E,A only

Explanation:

The detritus food chain begins with detritus that is dead organic matter. The saprotrophic bacteria and fungi breakdown detritus into simpler inorganic substances by a process called catabolism.

Question 123. The process of appearance of recombination nodules occurs at which sub stage of prophase I in meiosis?

[4 Marks]

(A) Pachytene

(B) Diplotene

(C) Zygotene

(D) Diakinesis

Explanation: The Pachytene stage of meiosis is characterized by the appearance of recombination nodules. It is the site at which crossing over occurs between non-sister chromatids of homologous chromosomes.

Question 124.

How many ATP and NADPH2 are required for the synthesis of one molecule of Glucose during Calvin cycle?

[4 Marks]

(A) 18 ATP and 16 $NADPH_2$

(B) 12 ATP and 12 $NADPH_2$

(C) 12 ATP and 16 $NADPH_2$

(D) 18 ATP and 12 $NADPH_2$

Explanation:

For every CO_2 molecule entering the Calvin cycle, 3 molecules of ATP and 2 of $NADPH_2$, are required. To make one molecule of glucose, 6 turns of the cycle are required. Thus, ATP and $NADPH_2$ molecules required for synthesis of one molecule of glucose during Calvin cycle will be: 6*3 = 18 ATP 6*2 = 12 $NADPH_2$

Question 125.

The phenomenon of pleiotropism refers to

[4 Marks]

(A) More than two genes affecting a single character

(B) A single ‘gene affecting multiple phenotypic expression

(C) Presence of two alleles, each of the two genes controlling a single trait

(D) Presence of several alleles of asingle gene controlling a single crossover

Explanation:

The phenomenon of pleiotropism refers to phenomenon where a single gene affecting multiple phenotypic expression.

Question 126. Upon exposure to UV radiation, DNA stained with ethidium bromide will show

[4 Marks]

(A) Bright red colour

(B) Bright blue colour

(C) Bright yellow colour

(D) Bright orange colour

Explanation: One can see bright orange coloured bands of DNA in an ethidium bromide stained gel exposed to U.V. light.

Question 127.

The reaction centre in PS II has an absorption maxima at

[4 Marks]

(A) 780 nm

(B) 660 nm

(C) 700 nm

(D) 680 nm

Explanation:

The reaction centre in PS II has an absorption maxima at 680 nm.

Question 128. During the purification process for recombinant DNA technology, addition of chilled ethanol precipitates out

[4 Marks]

(A) DNA

(B) Histones

(C) Polysaccharides

(D) RNA

Explanation: During isolation of the genetic material, purified DNA ultimately precipitates out after the addition of chilled ethanol

Question 129.

Which micronutrient is required for splitting of water molecule during photosynthesis?

[4 Marks]

(A) Manganese

(B) Molybdenum

(C) Magnesium

(D) Copper

Explanation:

Manganese (Mn) is an essential micronutrient that while needed in small amounts, plays a key role in photosynthesis. Mn sparks the photosynthesis process by splitting water after Photosytem II (PSII) fixes light to initiate the conversion of CO_2 and water into carbohydrates.

Question 130. Movement and accumulation of ions across a membrane against their concentration gradient can be explained by

[4 Marks]

(A) Osmosis

(B) Facilitated Diffusion

(C) Passive Transport

(D) Active Transport

Explanation: Active Transport is defined as a process that involves the movement of molecules from a region of lower concentration to a region of higher concentration against a gradient or an obstacle with the use of external energy

Question 131. Among eukaryotes, replication of DNA takes place in :

[4 Marks]

(A) M Phase

(B) S Phase

(C) G_1 Phase

(D) G_2 Phase

Explanation: DNA replication in most eukaryotic cells occurs, only during a specific part of the cell division cycle called the DNA synthesis phase or S phase. In a mammalian cell, the S phase typically

lasts for about 8 hours

Question 132. Cellulose does not form blue colour with Iodine because

[4 Marks]

(A) It is a disaccharide

(B) It is a helical molecule

(C) It breaks down when iodine reacts with it

(D) It does not contain complex helices and hence cannot hold iodine molecules

Explanation: Cellulose does not form blue colour with Iodine because cellulose does not have a helical structure, it does not bind to iodine to form a colored product.

Question 133.

The historic Convention on Biological Diversity, 'The Earth Summit' was held in Rio de Janeiro in the year

[4 Marks]

(A) 2002

(B) 1986

(C) 1992

(D) 1985

Explanation:

The historic convention on Biological Diversity, "The Earth Summit" was held in Rio de Janeiro in the year 1992. It called upon all nations to take appropriate measures for conservation of biodiversity and sustainable utilisation of its benefits.

Question 134.

Identify the pair of heterosporous pteridophytes among the following :

[4 Marks]

(A) Psilotum and Salvinia

(B) Equisetum and Salvinia

(C) Selaginella and Salvinia

(D) Lycopodium and Selaginella

Explanation:

Pteridophytes that produce two types of spores are known as heterosporous. Selaginella and Salvinia are heterosporous pteridophytes.

Question 135.

Match List I with List II : Choose the correct answer from the options given below :

[4 Marks]

List I		List II	
A.	M Phase	I.	Proteins are synthesized
B.	G_2 Phase	II.	Inactive phase
C.	Quiescent stage	III.	Interval between mitosis and initiation of DNA replication
D.	G_1 Phase	IV.	Equational division

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

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

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

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

Explanation:

The correct matching is: M phase or Mitosis is also called equational division. During G_2 phase DNA synthesis stops but cell synthesis RNA, proteins, etc. for next phase.

Quiescent stage is inactive phase in which non-dividing cells enters.

G1 phase is the interval between mitosis and initiation of DNA replication.

Question 136.

Match List I with List II : Choose the correct answer from the options given below:

[4 Marks]

List I		List II	
A.	Iron	I.	Synthesis of auxin
B.	Zinc nitrate reductase	II.	Component of
C.	Boron catalase	III.	Activator of
D.	Molybdenum and differentiation	IV.	Cell elongation

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

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

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

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

Explanation:

The correct matching is: Iron activates catalase enzyme. Zinc is needed in the synthesis of auxin. Boron is required for cell elongation and cell differentiation. Molybdenum is component of nitrogenase and nitrate reductase enzyme.

Question 137.

Match List I with List II : Choose the correct answer from the options given below:

[4 Marks]

List I		List II	
A.	Cohesion liquid phase	I.	More attraction in
B.	Adhesion among water molecules	II.	Mutual attraction
C.	Surface tension liquid phase	III.	Water loss in
D.	Guttation polar surfaces	IV.	Attraction towards

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

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

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

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

Explanation:

The correct matching is: Cohesion represents mutual attraction between water molecules. Adhesion represents attraction of water molecules to polar surfaces Surface tension represents water molecules are attracted to each other in the liquid phase more than to water in the gas phase., Guttation represent loss of water in liquid phase.

Question 138.

Match List I with List II : Choose the correct answer from the options given below:

[4 Marks]

List I (Interaction)	List II (Species A and B)
A. Mutualism	I. +(A), 0(B)
B. Commensalism	II. –(A), 0(B)
C. Amensalism	III. +(A), –(B)
D. Parasitism	IV. +(A), +(B)

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

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

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

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

Explanation:

The correct matching is: (+,+) Mutualism : In this interaction, both the interacting species are benefitted. (+, 0) Commensalism : Only one species is benefitted and the other species remains unharmed (-, 0) Amensalism : Neither species is benefitted. One remains unharmed and the other is harmed. (+, -) Parasitism : One species is benefitted and other is negatively effected.

Question 139.

Match List I with List II : Choose the correct answer from the options given below:

[4 Marks]

	List I		List II
A.	Oxidative decarboxylation	I.	Citrate synthase
B.	Glycolysis dehydrogenase	II.	Pyruvate
C.	Oxidative phosphorylation	III.	Electron transport system
D.	Tricarboxylic acid cycle	IV.	EMP pathway

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

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

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

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

Explanation:

The correct matching is:

Pyruvate, which is formed by the glycolytic catabolism of carbohydrates in the cytosol, after it enters mitochondrial matrix undergoes oxidative decarboxylation by a complex set of reactions catalyzed by pyruvate dehydrogenase.

The scheme of glycolysis was given by Gustay Embden, Otto Meyrhof and J. Parnas, and is often referred to as the EMP pathway.

In electron transport system, the energy of oxidation-reduction is utilized for the production of proton gradient required for phosphorylation, thus, this process is also called oxidative phosphorylation.

The TCA (tricarboxylic acid cycle) starts with the condensation of acetyl group with oxaloacetic acid (OAA) and water to yield citric acid. The reaction is catalysed by the enzyme citrate synthase.

Question 140.

How many different proteins does the ribosome consist of?

[4 Marks]

(A) 20

(B) 40

(C) 80

(D) 60

Explanation:

The ribosome consists of 80 different proteins.

Question 141.

Main steps in the formation of Recombinant DNA are given below. Arrange these steps in a correct sequence.

A. Insertion of recombinant DNA into the host cell

B. Cutting of DNA at specific location by restriction enzyme

C. Isolation of desired DNA fragment

D. Amplification of gene of interest using PCR

Choose the correct answer from the options given below:

[4 Marks]

(A) B,C,D,A

(B) C,B,D,A

(C) B,D,A,C

(D) C,A,B,D

Explanation:

The correct sequence of formation of recombinant DNA is:

i. Cutting of DNA at specific location by restriction enzyme

ii. Isolation of desired DNA fragment

iii. Amplification of gene of interest using PCR

iv. Insertion of recombinant DNA into the host cell

NOTES: Recombinant DNA Technology is the joining together of DNA molecules from two different species. The recombinant DNA molecule is inserted into a host organism to produce new genetic combinations that are of value to science, medicine, agriculture, and industry.

Question 142.

Given below are two statements:

Statement I : Gause's 'Competitive Exclusion Principle' states that two closely related species competing for the same resources cannot co-exist indefinitely and competitively inferior one will be eliminated eventually.

Statement II : In general, carnivores are more adversely affected by competition than herbivores. In the light of the above statements, choose the correct answer from the options given below:

[4 Marks]

(A) Both Statement I and Statement II are true.

(B) Both Statement I and Statement II are false.

(C) Statement I is incorrect but Statement II is true.

(D) Statement I is correct Statement II is false.

Explanation:

Statement II is incorrect as in general, herbivores and plants appear to be more adversely affected by competition than carnivores. Statement I is correct.

Question 143.

Given below are two statements :

Assertion A : A flower is defined as modified shoot wherein the shoot apical meristem changes to floral meristem.

Reason R : Internode of the shoot gets condensed to produce different floral appendages laterally at successive node instead of leaves. In the light of the above statements, choose the correct answer from the options given below :

[4 Marks]

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

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

(C) A is true but R is false

(D) A is false but R is true

Explanation:

A flower is defined as the modification of shoot apical meristem into floral meristem. Internodes do not elongate and the axis gets condensed. The apex produces different kinds of floral appendages laterally at the successive nodes instead of leaves.

Question 144.

Which of the following statements are correct about Klinefelter's Syndrome?

A. This disorder was first described by Langdon Down (1866).

B. Such an individual has overall masculine development. However, the feminine development is also expressed.

C. The affected individual is short statured.

D. Physical, psychomotor and mental development is retarded.

E. Such individuals are sterile.

Choose the correct answer from the options given below:

[4 Marks]

(A) A and E only

(B) B and E only

(C) C and D only

(D) A and B only

Explanation:

Statement A, C and D are incorrect w.r.t. Klinefelter’s syndrome s they are associated with Down’s syndrome.

Question 145. Melonate inhibits the growth of pathogenic bacteria by inhibiting the activity of

[4 Marks]

(A) Amylase

(B) Succinic dehydrogenase

(C) Lipase

(D) Dinitrogenase

Explanation: Melonate inhibits the growth of pathogenic bacteria by inhibiting the activity of Succinic dehydrogenase because malonate is a competitive inhibitor of enzyme succinate dehydrogenase.

Question 146. Which one of the following statements is NOT correct?

[4 Marks]

(A) Algal blooms caused by excess of organic matter in ‘water improve water quality and promote fisheries

(B) The micro-organisms involved in biodegradation of organic matter in a sewage polluted water body consume a lot of oxygen causing the death of aquatic organisms.

(C) ‘Water hyacinth grows abundantly in eutrophic water bodies and leads to an imbalance in the ecosystem dynamics of the water body

(D) The amount of some toxic substances of industrial waste water increases in the organisms at successive trophic levels

Explanation: Statement b is incorrect because algal bloom causes deterioration of the water quantity and fish mortality.

Question 147.

Which of the following combinations is required for chemiosmosis?

[4 Marks]

(A) Proton pump, electron gradient, NADP synthase

(B) Proton pump, electron gradient, ATP synthase

(C) Membrane, proton pump, proton gradient, ATP synthase

(D) Membrane, proton pump, proton gradient, NADP synthase

Explanation:

The required components for chemiosmosis are proton gradient, proton pump, plasma membrane and ATP synthase.

Question 148.

Identify the correct statements:

A. Lenticels are the lens-shaped openings permitting the exchange of gases.

B. Bark formed early in the season is called hard bark.

C. Bark is a technical term that refers to all tissues exterior to vascular cambium.

D. Bark refers to periderm and secondary phloem.

E. Phellogen is single-layered in thickness.

Choose the correct answer from the options given below:

[4 Marks]

(A) B and C only

(B) A and D only

(C) B,C and E only

(D) A,B and D only

Explanation:

Statement B,C and E are incorrect because: Bark that is formed early in the season is called early or soft bark. Towards the end of the season late or hard bark is formed. Bark is non-technical term that refer to all tissues exterior to vascular cambium. Phellogen is couple of layers thick.

Question 149.

Given below are two statements

: Assertion A : In gymnosperms the pollen grains are released from the microsporangium and carried by air currents.

Reason R : Air currents carry the pollen grains to the mouth of the archegonia where the male gametes are discharged and pollen tube is not formed. In the light of the above statements, choose the correct answer from the options given below :

[4 Marks]

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

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

(C) A is true but R is false

(D) A is false but R is true

Explanation:

Assertion is correct but reason is false as in gymnosperms the pollen grains are released from the microsporangium they are carried in air currents. They come in constant with the opening of the ovules borne on megasporophylls. The pollen tube carrying the male gametes grows towards archegonia in the ovules and discharge their contents near the mouth of the archegonia.

Question 150. Which of the following is not a cloning vector?

[4 Marks]

(A) BAC

(B) YAC

(C) pBR322

(D) Probe

Explanation: Probe is not a cloning vector because probe is a single-stranded sequence of DNA or RNA used to search for its complementary sequence in a sample genome.

Question 151. Broad palm with single palm crease is visible in a person suffering from—

[4 Marks]

(A) Down's syndrome

(B) Turner's syndrome

(C) Klinefelter's syndrome

(D) Thalassemia

Explanation: Broad palm with single palm crease is visible in a person suffering from Down syndrome.

Question 152.

Which of the following are NOT considered as the part of endomembrane system?

A. Mitochondria

B. Endoplasmic reticulum

C. Chloroplasts

D. Golgi complex

E. Peroxisomes

Choose the most appropriate answer from the options given below:

[4 Marks]

(A) B and D only

(B) A, C and E only

(C) A, D and E only

(D) A and D only

Explanation:

The endomembrane system includes the nuclear envelope, lysosomes, vesicles, the ER, and Golgi apparatus, as well as the plasma membrane

Question 153. Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

	List I		List II
A.	Taenia	I.	Nephridia
B.	Paramoecium	II.	Contractile vacuole
C.	Periplaneta	III.	Flame cells
D.	Pheretima	IV.	Urecose gland

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

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

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

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

Explanation: The correct matching will be: Protonephridia or flame cells are the excretory structures in platyhelminthes. Nephridia are the tubular excretory structures of earthworms (Pheretima) and other annelids, Single celled organisms like Paramoecium have contractile vacuoles for excretion. Urecose glands are present in cockroach,

Question 154.

Given below are two statements:

Assertion A : Amniocentesis for sex determination is one of the strategies of Reproductive and Child Health Care Programme.

Reason R : Ban on amniocentesis checks increasing menace of female foeticide. In the light of the above statements, choose the correct answer from the options given below.

[4 Marks]

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

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

(C) A is false but R is true.

(D) A is true but R is false.

Explanation:

Amniocentesis can lead to female foeticide as it detects the sex of the foetus which decreases the gender ratio. So, it has a Statutory ban to avoid female.

Question 155.

Given below are two statements:

Statement I: Ligaments are dense irregular tissue.

Statement II: Cartilage is dense regular tissue. In the light of the above statements, choose the correct answer from the options given below:

[4 Marks]

(A) Both Statement I and Statement II are false

(B) Both Statement I and Statement II are true

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

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

Explanation:

Both the statement are false because ligaments is an example of dense regular connective tissue. Cartilage is an example of specialized connective tissue.

Question 156.

Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

	List I		List II
A.	P–wave	I.	Beginning of systole
B.	Q–wave	II.	Repolarisation of ventricles
C.	QRS complex	III.	Depolarisation of atria
D.	T–wave	IV.	Depolarisation of ventricles

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

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

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

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

Explanation:

The correct matching is: P-wave represents the electrical excitation (or depolarisation) of the atria which leads to the contraction of both the atria, QRS complex represents the depolarisation of ventricles which initiates the ventricular contraction. T-wave represents the return of the ventricles from excited to normal state.

Question 157.

Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

	List I		List II
A.	Vasectomy	I.	Oral method
B.	Coitus interruptus	II.	Barrier method
C.	Cervical caps	III.	Surgical method
D.	Saheli	IV.	Natural method

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

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

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

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

Explanation:

the correct matching is: Vasectomy is a surgical method of contraception Coitus interruptus is a natural method of contraception Cervical cap is a barrier method of contraception Saheli is an oral

method of contraception which is a non-steroidal pill

Question 158. Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

List I (Cells)	List II (Secretion)
A. Peptic cells	I. Mucus
B. Goblet cells	II. Bile juice
C. Oxyntic cells	III. Proenzyme pepsinogen
D. Hepatic cells	IV. HCl and intrinsic factor for absorption of vitamin B_{12}

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

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

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

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

Explanation: The correct matching will be: Mucus neck cells which secrete mucus Peptic or chief cells which secrete the proenzyme pepsinogen Parietal or oxyntic cells which secrete HCI and intrinsic factor for absorption of vitamin B12.

Question 159.

Given below are two statements: Statement I: Vas deferens receives a duct from seminal vesicle and opens into urethra as the ejaculatory duct. Statement II: The cavity of the cervix is called cervical canal which along with vagina forms birth canal, In the light of the above statements, choose the correct answer from the options given below:

[4 Marks]

(A) Statement I is incorrect but Statement I is true.

(B) Both Statement I and Statement II are false.

(C) Both Statement I and Statement II are true.

(D) Statement I is correct but Statement II is false.

Explanation:

Both the statements are correct. Vas deferens receives a duct from seminal vesicle and opens into urethra as the ejaculatory duct, The cavity of the cervix is called cervical canal which along with vagina forms birth canal.

Question 160.

Given below are two statements:

Assertion A: Nephrons are of two types: Cortical & Juxta medullary, based on their relative position in cortex and medulla.

Reason R: Juxta medullary nephrons have short loop of Henle whereas, cortical nephrons have longer loop of Henle. In the light of the above statements, choose the correct answer from the options given below:

[4 Marks]

(A) Ais false but R is true.

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

(C) Adis true but R is false.

(D) Both A and R are true and R is the correct explanation ofA.

Explanation:

Assertion is true as there are two types of nephrons, i.e., cortical nephrons and juxtamedullary nephrons based on their relative position in the cortex and medulla. Reason is not correct as loop of Henle in juxtamedullary nephrons is very long and runs deep into the medulla.

Question 161. Given below are two statements: Statement I : Low temperature preserves the enzyme in a temporarily inactive state whereas high temperature destroys enzymatic activity because proteins are denatured by heat. Statement II: When the inhibitor closely resembles the substrate in its molecular structure and inhibits the activity of the enzyme, it is known as competitive inhibitor. In the light of the above statements, choose the correct answer from the options given below:

[4 Marks]

(A) Both Statement I and Statement II are true.

(B) Both Statement I and Statement II are false.

(C) Statement I is true but Statement II is false.

(D) Statement I is false but Statement II is true.

Explanation: Both Statement I and Statement II are true. This is because low temperature preserves the enzyme in a temporarily inactive state whereas high temperature destroys enzymatic activity

because proteins are denatured by heat. Competitive inhibitor due to its close structural similarity with the substrate, competes with the substrate for the substrate-binding site of the enzyme.

Question 162.

Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

List I		List II	
A.	Gene 'a'	I.	β-galactosidase
B.	Gene 'y'	II.	Transacetylase
C.	Gene 'i'	III.	Permease
D.	Gene 'z'	IV.	Repressor protein

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

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

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

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

Explanation:

The correct matching is following:

Gene a codes for enzyme transacetylase.

Gene y codes for enzyme permease.

Gene i codes for repressor protein

Gene z codes for enzyme -galactosidase.

Question 163.

Match List I with List II. Choose the correct answer from the options given below:

[4 Marks]

List I		List II	
A.	Ringworm	I.	*Haemophilus influenzae*
B.	Filariasis	II.	*Trichophyton*
C.	Malaria	III.	*Wuchereria bancrofti*
D.	Pneumonia	IV.	*Plasmodium vivax*

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

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

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

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

Explanation:

The correct matching will be:

Ringworm is caused by Trichophyton.

Filariasis is caused by Wuchereria bancrofti.

Malaria is caused by Plasmodium species.

Pneumonia is caused by Haemophilus influenzae.

Question 164.

Which of the following functions is carried out by cytoskeleton in a cell?

[4 Marks]

(A) Transportation

(B) Motility

(C) Protein synthesis

(D) Nuclear division

Explanation:

Cytoskeleton in a cell involved in many functions such as mechanical support, motility, maintenance of the shape of the cell

Question 165.

Which of the following statements is correct?

[4 Marks]

(A) Biomagnification refers to increase in concentration of the toxicant at successive trophic levels.

(B) Eutrophication refers to increase in domestic sewage and waste water in lakes.

(C) Presence of large amount of nutrients in water restricts ‘Algal Bloom’

(D) Algal Bloom decreases fish mortality

Explanation:

Large amount of nutrients in water promotes growth of algal bloom. Algal bloom increases fish mortality. Eutrophication result due to natural ageing of lakes

Question 166.

Match List I with List II.

Choose the correct answer from the options given below:

[4 Marks]

	List I		List II
A.	Heroin	I.	Effect on cardiovascular system
B.	Marijuana	II.	Slow down body function
C.	Cocaine	III.	Painkiller
D.	Morphine	IV.	Interfere with transport of dopamine

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

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

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

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

Explanation:

The correct matching will be: Heroin belongs to the category of opioids, and it is a depressant

that slows down body functions. Marijuana is known for its effect on the cardiovascular system of the body.

Cocaine interferes with the transport of the neurotransmitter dopamine.

Morphine is used is a sedative and painkiller.

Question 167.

Radial symmetry is NOT found in adults of phylum ____.

[4 Marks]

(A) Ctenophora

(B) Hemichordata

(C) Coelenterata

(D) Echinodermata

Explanation:

Radial symmetry is found in adults of phylum of ctenophore,

coelenterate and Echinodermata.

Question 168.

Given below are two statements:

Statement I: In prokaryotes, the positively charged DNA is held with some negatively charged proteins in a region called nucleoid.

Statement II: In eukaryotes, the negatively charged DNA is wrapped around the positively charged histone octamer to form nucleosome.

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

[4 Marks]

(A) Statement I is incorrect but Statement IT is true.

(B) Both Statement I and Statement II are false.

(C) Statement I is correct but Statement I is false.

(D) Both Statement I and Statement II are true.

Explanation:

In prokaryotes, the negatively charged DNA is held with some positively charged proteins in a region termed as nucleoid. In eukaryotes, the negatively charged DNA is wrapped around

the positively charged histone octamer to form a structure called nucleosome.

Question 169.

Which of the following statements are correct regarding female reproductive cycle?

A. In non-primate mammal's cyclical changes during reproduction are called oestrus cycle.

B. First menstrual cycle begins at puberty and is called menopause.

C. Lack of menstruation may be indicative of pregnancy.

D. Cyclic menstruation extends between menarche and menopause.

Choose the most appropriate answer from the options given below.

[4 Marks]

(A) A, C and D only

(B) A, B and C only

(C) A and B only

(D) A and D only

Explanation:

The incorrect answer is option (d) as incorrect statement is:

First menstrual cycle that begins at puberty is called menarche. Rest other statements are incorrect.

Question 170.

Select the correct group/set of Australian Marsupials exhibiting adaptive radiation.

[4 Marks]

(A) Tasmanian wolf, Bobcat, Marsupial mole

(B) Lemur, Anteater, Wolf

(C) Numbat, Spotted cuscus, Flying phalanger

(D) Mole, Flying squirrel, Tasmanian tiger cat

Explanation:

Mole and flying squirrel are placental mammals. Lemur and wolf are placental mammals.

Bobcat is a placental mammal

Therefore only option Numbat, Spotted cuscus, Flying phalanger is correct.

Question 171.

Which one of the following techniques does not serve the purpose of early diagnosis of a disease for its early treatment?

[4 Marks]

(A) Recombinant DNA Technology

(B) Serum and Urine analysis

(C) Enzyme Linked Immuno-Sorbent Assay (ELISA) technique

(D) Polymerase Chain Reaction (PCR) technique

Explanation:

The correct answer is Serum and Urine analysis

because using conventional

methods of diagnosis like serum and urine analysis, etc, do not help in early diagnosis. Recombinant DNA technology, Polymerase Chain Reaction and Enzyme Linked Immuno-Sorbent

Assay (ELISA) are some of the techniques that serve the purpose of early diagnosis.

Question 172.

Match List I with List II.

Choose the correct answer from the options given below:

[4 Marks]

	List I (Type of Joint)		List II (Found between)
A.	Cartilaginous Joint	I.	Between flat skull bones
B.	Ball and Socket Joint	II.	Between adjacent vertebrae in vertebral column
C.	Fibrous Joint	III.	Between carpal and metacarpal of thumb
D.	Saddle Joint	IV.	Between Humerus and Pectoral girdle

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

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

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

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

Explanation:

The correct matching will be:

Cartilaginous joint is present between the adjacent vertebrae in the vertebral column.

Ball and socket joint is present between between Humerus and Pectoral girdle

Fibrous Joint is present between between flat skull bones Saddle Joint is present between between carpal and metacarpal

of thumb

Question 173.

Match List I with List II.

Choose the correct answer from the options given below:

[4 Marks]

	List I (Interacting species)		List II (Name of interaction)
A.	A Leopard and a Lion in a forest/ grassland	I.	Competition
B.	A Cuckoo laying egg in a Crow's nest	II.	Brood parasitism
C.	Fungi and root of a higher plant in Mycorrhizae	III.	Mutualism
D.	A cattle egret and a Cattle in a field	IV.	Commensalism

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

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

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

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

Explanation:

The correct matching is: A leopard and a lion in a forest/grassland exemplify competition where both the species are competing for the same resources. Fungi and root of a higher plant in mycorrhizae exemplify mutualism where both the species are benefitted. The fungi help the plant in the absorption of essential nutrients from the soil while the plant in turn provides the fungi with energy yielding carbohydrates

A cattle egret and a cattle in a field exemplify commensalism where one species benefits and the other remains unaffected. The egrets always forage close to where cattle are grazing because the cattle, as they move, stir up and flush out insects from the vegetation that otherwise might be difficult for the egrets to find and catch.

Question 174.

Vital capacity of lung is ____.

[4 Marks]

(A) IRV + ERV + TV - RV

(B) IRV + ERV

(C) IRV + ERV + TV + RV

(D) IRV + ERV + TV

Explanation:

Vital capacity is the maximum volume of air a person can breathe in after forced expiration. Vital capacity includes ERV, TV and IRV.

Question 175.

Match List I with List II.

Choose the correct answer from the options given below:

[4 Marks]

	List I		List II
A.	Fovea portion of eye that regulates diameter of pupil.	I.	Visible coloured
B.	Iris eye formed of dense connective tissue.	II.	External layer of
C.	Blind spot visual acuity or resolution.	III.	Point of greatest
D.	Sclera optic nerve leaves the eyeball and photoreceptor cells are absent.	IV.	Point where

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

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

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

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

Explanation:

The correct matching is:

(i) Fovea is the point of greatest visual acuity or resolution.

(ii) Iris is the visible coloured portion of the eye that regulates diameter of pupil.

(iii) Blind spot is the point where optic nerve leaves the eye-ball and photoreceptor cells are absent.

(iv) Sclerais the extenal layer of eye formed of dense connective tissue.

Question 176.

Once the undigested and unabsorbed substances enter the caecum, their backflow is prevented by

[4 Marks]

(A) Sphincter of Oddi

(B) Ileo-caecal valve

(C) Gastro-oesophageal sphincter

(D) Pyloric sphincter

Explanation:

Once the undigested and unabsorbed substances enter the caecum, their backflow is prevented by Ileo-caecal valve

Question 177.

Which one of the following common sexually transmitted diseases is completely curable when detected early and treated properly?

[4 Marks]

(A) HIV Infection

(B) Hepatitis-B

(C) Gonorrhoea

(D) Genital herpes

Explanation:

Gonorrhoea is a bacterial disease which can be treated with the help of antibiotics and cured completely. Rest other diseases are not completely cured as other mentioned options are viral diseases.

Question 178.

Given below are two statements:

Statement I: A protein is imagined as a line, the left end represented by first amino acid (C-terminal) and the right end represented by last amino acid (N=terminal).

Statement II: Adult human haemoglobin, consists of 4 subunits (two subunits of a type and two sub-units of b type.)

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

[4 Marks]

(A) Both Statement I and Statement I are true

(B) Statement I is true but Statement IT is false.

(C) Statement I is true but Statement IT is false.

(D) Both Statement I and Statement I are true

Explanation:

Statement I is incorrect because left-hand represented by first amino acid is N terminal and right-hand by C terminal

Question 179.

Given below are two statements:

Statement I: Electrostatic precipitator is most widely used in thermal power plant.

Statement II : Electrostatic precipitator in thermal power plant removes ionising radiations.

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

[4 Marks]

(A) Both Statement I and Statement IT are correct.

(B) Both Statement I and Statement II are incorrect.

(C) Statement I is correct but Statement II is incorrect.

(D) Statement I is incorrect but Statement II is correct.

Explanation:

Statement II is incorrect because it can particulate matter present in the exhaust from a thermal power plant.

Question 180.

In which blood corpuscles, the HIV undergoes replication and produces progeny viruses?

[4 Marks]

(A) TH cells

(B) B-lymphocytes

(C) Basophils

(D) Eosinophils

Explanation:

HIV enters into helper T-lymphocytes (TH), replicates and produces progeny viruses. The progeny viruses released into blood attack other helper lymphocyte.

Question 181.

Given below are two statements:

Statement I: RNA mutates at a faster rate.

Statement II: Viruses having RNA genome and shorter life span mutate and evolve faster.

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

[4 Marks]

(A) Both Statement I and Statement II are true.

(B) Statement I is false but Statement II is true.

(C) Both Statement I and Statement II are false.

(D) Statement I is true but Statement II is false.

Explanation:

Both the statements are correct. RNA mutate at much higher rate as compare to DNA because RNA has higher mutation rate that DNA because DNA has deoxyribose pentose sugar in it's configuration whereas RNA has extra oxygen in its ribose sugar which makes it more reactive. As oxygen has got lone pair it will have tendency to react.

Question 182.

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

Assertion A: Endometrium is necessary for implantation of blastocyst.

Reason R: In the absence of fertilization, the corpus luteum degenerates that causes disintegration of endometrium.

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

[4 Marks]

(A) A is true but R is false.

(B) A is false but R is true.

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

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

Explanation:

Both assertion and reason are correct but reason is not the correct explanation of assertion. Corpus luteum secretes large amount of progesterone which is essential for maintenance of endometrium of uterus. In absence of fertilisation, the corpus luteum degenerates hence the decrease in the level of progesterone hormone will cause disintegration of endometrium leading to menstruation.

Question 183.

Match List I with List II.

Choose the correct answer from the options given below:

[4 Marks]

List I		List II	
A.	CCK	I.	Kidney
B.	GIP	II.	Heart
C.	ANF	III.	Gastric gland
D.	ADH	IV.	Pancreas

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

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

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

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

Explanation:

The correct matching is:

Cholecystokinin (CCK) acts on both gall bladder and pancreas and stimulates the secretion of bile juice and pancreatic enzymes respectively.

GIP inhibits gastric secretion and motility.

Atrial Natriuretic Factor (ANF) is released from the atrial wall of our heart.

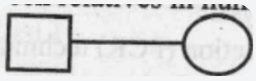
Anti-diuretic hormone (ADH) acts mainly on the kidney and stimulates resorption of water and electrolytes by the distal tubules.

Question 184.

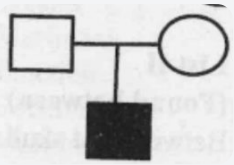
Which one of the following symbols represents mating between relatives in human pedigree analysis?

[4 Marks]

(A)



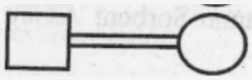
(B)



(C)



(D)



Explanation:

Consanguineous marriage is matrimony between individuals who are closely related. In a clinical sense, marriage between £wo family members who are second cousins or closer qualify as having a consanguineous marriage.

So the correct option is mating between relatives.

Question 185.

The unique mammalian characteristics are:

[4 Marks]

(A) hairs, tympanic membrane and mammary glands

(B) hairs, pinna and mammary glands

(C) pinna, monocondylic skull and mammary glands

(D) hairs, pinna and indirect development

Explanation:

The unique mammalian characteristics are presence of hairs, pinna and mammary gland. Presence of tympanic membrane is present in amphibians too and monocondylic skull is present in reptiles and aves.

Question 186.

Which of the following statements are correct?

A. Basophils are most abundant cells of the total WBCs

B. Basophils secrete histamine, serotonin and heparin

C. Basophils are involved in inflammatory response

D. Basophils have kidney shaped nucleus

Choose the correct answer from the options given below:

[4 Marks]

(A) A and B only

(B) B and C only

(C) C and E only

(D) D and E only

Explanation:

Basophils are one of three granulocytes, along with neutrophils and eosinophils. Basophils are the smallest in number of granulocytes but the largest in cell size. Neutrophils are most abundant. Monocytes have kidney shape nucleus.

Question 187.

Select the correct statements with reference to chordates.

A. Presence of a mid-dorsal, solid and double nerve cord.

B. Presence of closed circulatory system.

C. Presence of paired pharyngeal gill slits.

D. Presence of dorsal heart

E. Triploblastic pseudocoelomate animals.

Choose the correct answer from the options given below:

[4 Marks]

(A) A, C and D only

(B) B and C only

(C) C, D and E only

(D) B, D and E only

Explanation:

The correct statement regarding chordates are b and c. The chordate characters are presence of closed circulatory system and presence of pharyngeal gill slits. Nerve cord is dorsal, hollow and single. Heart is ventral. They are triploblastic and coelomate.

Question 188.

Which of the following are NOT under the control of thyroid hormone?

A. Maintenance of water and electrolyte balance

B. Regulation of basal metabolic rate

C. Normal rhythm of sleep-wake cycle

D. Development of immune system

E. Support the process of RBCs formation

Choose the correct answer from the options given below:

[4 Marks]

(A) A and D only

(B) B and C only

(C) C and D only

(D) D and E only

Explanation:

Thyroid hormone is involved in maintaining water and electrolytes balance, help in process of RBC production and maintaining basal metabolic rate.

Question 189.

In cockroach, excretion is brought about by —

A. Phallic gland

B. Urecose gland

C. Nephrocytes

D. Fatbody

E. Collaterial glands

Choose the correct answer from the options given below:

[4 Marks]

(A) Band D only

(B) B ,C and D only

(C) A, B and E Only

(D) A and E only

Explanation:

The chordate characters are presence of closed circulatory system and presence of pharyngeal gill slits. Nerve cord s dorsal, hollow and single. Heart is ventral. They are triploblastic and coelomate.

Question 190.

The parts of human brain that helps in regulation of sexual behaviour, expression of excitement, pleasure, rage, fear etc. are:

[4 Marks]

(A) Corpus callosum and thalamus

(B) Brain stem and epithalamus

(C) Corpora quadrigemina and hippocampus

(D) Limbic system and hypothalamus

Explanation:

The parts of human brain that helps in regulation of sexual behaviour, expression of excitement, pleasure, rage, fear etc. are Limbic system and hypothalamus,

Question 191.

Match List I with List II.

Choose the correct answer from the options given below:

[4 Marks]

	List I		List II
A.	Mast cells	I.	Ciliated epithelium
B.	Inner surface of bronchiole	II.	Areolar connective tissue
C.	Blood epithelium	III.	Cuboidal
D.	Tubular parts of nephron	IV.	Specialised connective tissue

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

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

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

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

Explanation:

The correct matching will be: Areolar connective tissue contains fibroblasts (cells that produce and secrete fibres), macrophages and mast cells, Inner surface of bronchioles is lined by ciliated epithelium. Blood is a specialised connective tissue. Tubular parts of nephron are lined by cuboidal epithelium.

Question 192.

Match List I with List II.

Choose the correct answer from the options given below:

[4 Marks]

	List I		List II
A.	Logistic growth availability condition	I.	Unlimited resource
B.	Exponential growth condition	II.	Limited resource availability
C.	Expanding age pyramid of pre-reproductive age is largest followed by reproductive and post reproductive age groups	III.	The percent individuals
D.	Stable age pyramid prc-rcproductives and reproductive age group are same	IV.	The percent individuals of

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

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

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

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

Explanation:

The correct matching will be: Exponential growth occurs when there is unlimited resource availability condition. Expanding age pyramid reflects growing population where the percent individuals of pre-reproductive age is largest followed by reproductive and post-reproductive age groups. Stable age pyramid shows stable population where the percent individuals of pre-reproductive and reproductive age group are same.

Question 193.

Which of the following statements are correct?

A. An excessive loss of body fluid from the body switches off osmoreceptors.

B. ADH facilitates water reabsorption to prevent diuresis.

C. ANF causes vasodilation.

D. ADH causes increase in blood pressure.

E. ADH is responsible for decrease in GFR.

Choose the correct answer from the options given below:

[4 Marks]

(A) A and B only

(B) B, C and D only

(C) A, B and E only

(D) C, D and E only

Explanation:

Statement A and E are incorrect because excessive loss of body fluid from the body switches on osmoreceptors and ADH is responsible for increasing in GER.

Question 194.

Given below are two statements:

Statement I : During GO phase of cell cycle, the cell is metabolically inactive.

Statement II : The centrosome undergoes duplication during S phase of interphase

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

[4 Marks]

(A) Both Statement I and Statement I are correct

(B) Both Statement I and Statement II are incorrect.

(C) Both Statement I and Statement II are incorrect.

(D) Statement I is incorrect but Statement II is correct.

Explanation:

Statement I is not correct because During GO phase of cell cycle, the cell is metabolically active but do not divide.

Question 195.

Select the correct statements.

A. Tetrad formation is seen during Leptotene.

B. During Anaphase, the centromeres split and chromatids separate.

C. Terminalization takes place during Pachytene.

D. Nucleolus, Golgi complex and ER are reformed during Telophase.

E. Crossing over takes place between sister chromatids of homologous chromosome.

Choose the correct answer from the options given below:

[4 Marks]

(A) A and C only

(B) B and D only

(C) A, C and E only

(D) B and E only

Explanation:

Tetrad formation is seen during zygotene stage. Terminalisation of chiasmata takes place during diakinesis, Crossing over takes place between non-sister chromatids of homologus chromosomes.

Question 196.

Which one of the following is NOT an advantage of inbreeding?

[4 Marks]

(A) It exposes harmful recessive genes butare eliminated by selection.

(B) It decreases the productivity of inbred population, after continuous inbreeding.

(C) Elimination of less desirable genes and accumulation of superior genes takes place due to it.

(D) It decreases homozygosity.

Explanation:

Inbreeding decreases the productivity of inbred population, after continuous inbreeding is not an advantage of inbreeding

Question 197.

Which of the following is characteristic feature of cockroach regarding sexual dimorphism?

[4 Marks]

(A) Presence of anal cerci

(B) Presence of sclerites

(C) Dark brown body colour and anal cerci

(D) Presence of anal styles

Explanation:

Anal style is present only in male cockroach, so it show sexual dimorphism.

Question 198.

Which one of the following is the sequence on corresponding coding strand, if the sequence on mRNA formed is as follows

5’ AUCGAUCGAUCGAUCGAUCGAUCGAUCG 3'?

[4 Marks]

(A) 5’ ATCGATCGATCGATCGATCGATCG 3’

(B) 3’ ATCGATCGATCGATCGATCGATCG 5'

(C) 5 ’GCUAGCUAGCUAGCUAGCUAGC 3'

(D) 3’ GCUAGCUAGCUAGCUAGCUAGC 5’

Explanation:

The template strand serves in mRNA synthesis while the other strand is called coding strand as its base sequence is same as that of newly synthesized mRNA. So, the sequence of mRNA will be identical to the given sequence of coding strand except for the presence of uracil in place of thymine in mRNA

Question 199.

Which of the following statements are correct regarding skeletal muscle?

A. Muscle bundles are held together by collagenous connective tissue layer called fascicle.

B. Sarcoplasmic reticulum of muscle fibre is a store house of calcium ions.

C. Striated appearance of skeletal muscle fibre is due to distribution pattern of actin and myosin proteins.

D. Mline is considered as functional unit of contraction called sarcomere.

Choose the most appropriate answer from the options given below:

[4 Marks]

(A) B and C only

(B) C and D only

(C) A, C and D only

(D) A, B and C only

Explanation:

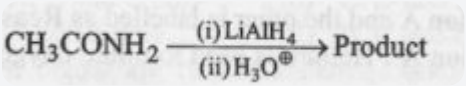
Muscle bundles are held together by collagenous connective tissue layer called fascia. Muscle bundles are called fascicles. The portion of the myofibril between two functional unit of contraction called sarcomere.

Question 200.

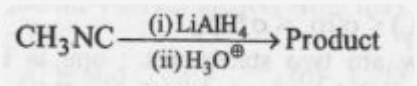
'Which of the following reactions will NOT give primary amine as the product?

[4 Marks]

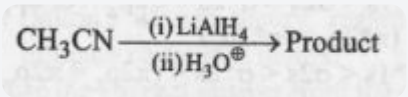
(A)



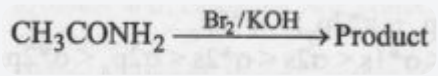
(B)



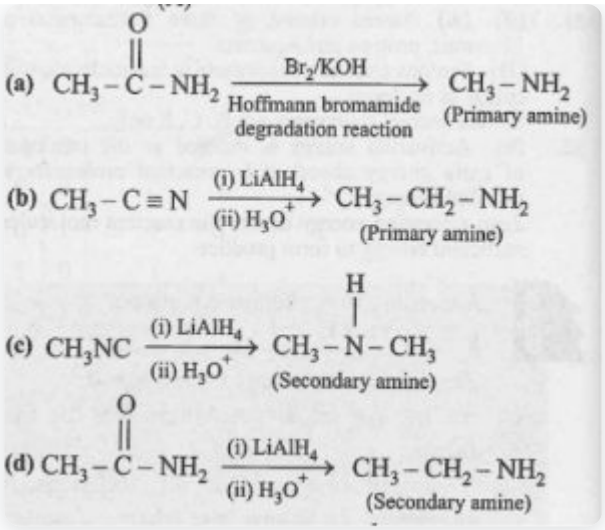
(C)



(D)



Explanation:


(a) $CH_3-\overset{\overset{O}{\|}}{C}-NH_2 \xrightarrow[\text{Hoffmann bromamide degradation reaction}]{Br_2/KOH} CH_3-NH_2$ (Primary amine)
(b) $CH_3-C\equiv N \xrightarrow[(ii)\ H_3O^+]{(i)\ LiAlH_4} CH_3-CH_2-NH_2$ (Primary amine)
(c) $CH_3NC \xrightarrow[(ii)\ H_3O^+]{(i)\ LiAlH_4} CH_3-\overset{\overset{H}{|}}{N}-CH_3$ (Secondary amine)
(d) $CH_3-\overset{\overset{O}{\|}}{C}-NH_2 \xrightarrow[(ii)\ H_3O^+]{(i)\ LiAlH_4} CH_3-CH_2-NH_2$ (Secondary amine)