NEET-UG EXAMINATION PAPER-2022

(Solved)

Time allowed : 3 hours | Maximum Marks : 794

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.

Two hollow conducting spheres of radii R_1 and R_2 ($R_1 >> R_2$) have equal charges. The potential would be :

[4 Marks]

(A) equal on both the spheres

(B) more on smaller sphere

(C) more on bigger sphere

(D) dependent on the material property of the sphere

Explanation:

Potential, = KQ / R ∵ Q = constant ∴ V ∝ 1/R $v_{smallsphere}$ > v_larger sphere

Question 2. The angular speed on a fly wheel moving with uniform angular acceleration changes from 1200 rpm to 3120 rpm in 16 seconds. The angular acceleration in rad/s²? is:

[4 Marks]

(A) 4π

(B) 12π

(C) 104π

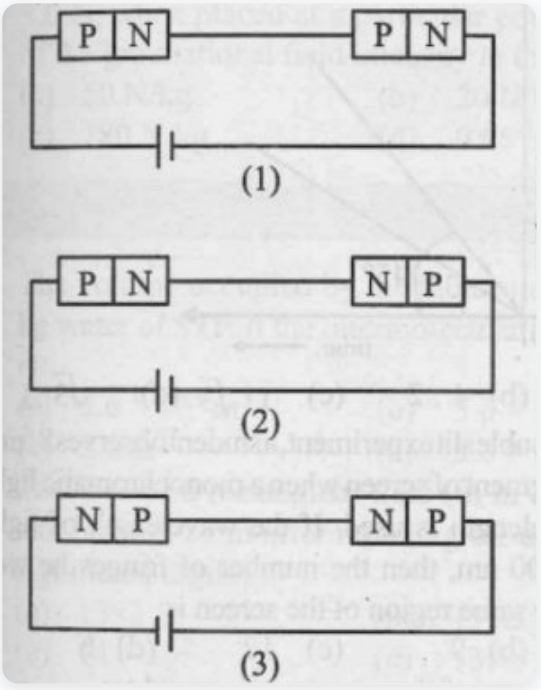
(D) 2π

Explanation: Angular acceleration, $\alpha = \Delta w/\Delta t = 2\pi(f_2 - f_1)/\Delta t = 2\pi(52 - 20)/16 = (2\pi \times 32)/16 = 4\pi$

Question 3.

In the given circuits (1), (2) and (3), the potential drop across the two p-n junctions are equal in:

[4 Marks]



(A) Circuit (2) only

(B) Both circuits (1) and (3)

(C) Circuit (1) only

(D) Circuit (3) only

Explanation:

Left P-N junction diode is forward biased whereas right one is reverse biased so obviously both will have different resistance.

Question 4.

Two objects of mass 10 kg and 20 kg respectively are connected to the two ends of a rigid rod of length 10 m with negligible mass. The distance of the center of mass of the system from the 10 kg mass is:

[4 Marks]

(A) 5 m

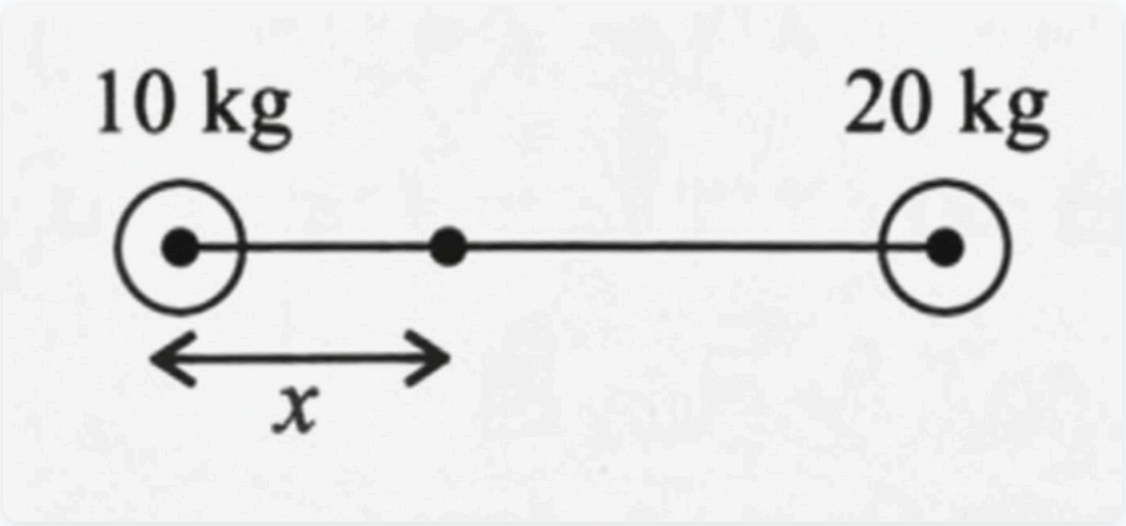
(B) 20 / 3 m

(C) 10 / 3 m

(D) 10 m

Explanation:

As, distance of COM from = $m_2r / m_1 + m_2$ Here, m_1 = 10 kg, m_2 = 20 kg and r = 10 m So, required distance = 20 × 10 / 20 + 10 = 20/3 m



Question 5.

A biconvex lens has radii of curvature, 20 cm each, if the refractive index of the material of the lens is 1.5, the power of the lens is:

[4 Marks]

(A) + 5D

(B) + 20D

(C) + 2D

(D) infinity

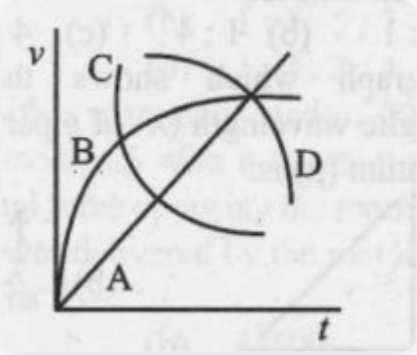
Explanation:

We have $P = 1/f = (\mu - 1)\left(1/R_1 - 1/R_2\right) = (1.5 - 1)\left(1/20 - (1/-20)\right) \times 1/(10^{-2}) = 0.5 \times 2/20 \times 100 = +5$ D

Question 6.

A spherical ball is dropped in a long column of a highly viscous liquid. The curve in the graph shown, which represents the speed of the ball (v) as a function of time (t) is:

[4 Marks]



(A) C

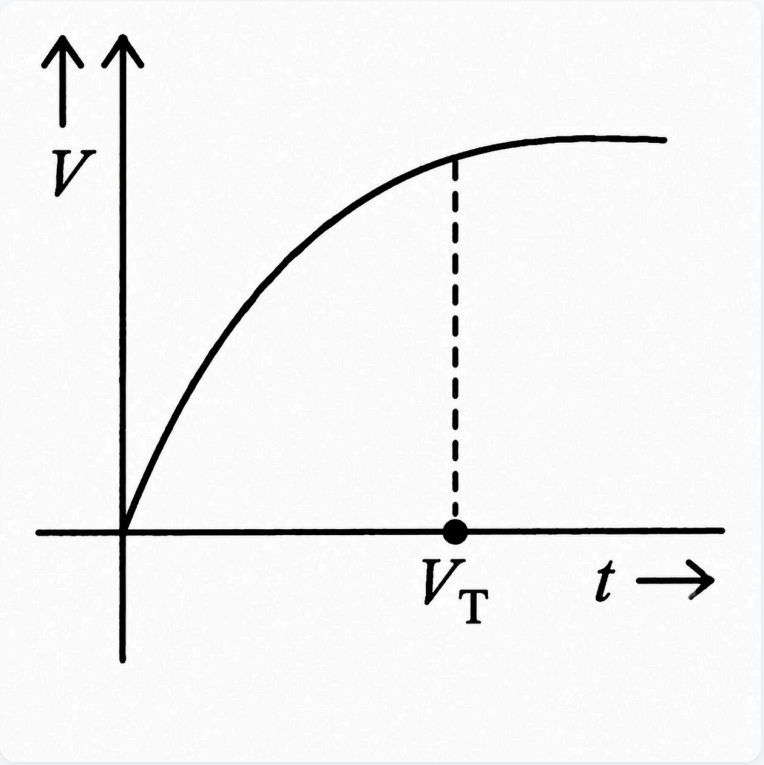
(B) A

(C) B

(D) D

Explanation:

When ball is dropped in highly viscous fluid, the ball's velocity will increase untill it becomes equal to terminal velocity it moves downward with constant velocity so, graph will be like as shown.



Question 7.

The ratio of the radius of gyration of a thin uniform disc about an axis passing through its centre and normal to its plane to the radius of gyration of the dis about its diameter is:

[4 Marks]

(A) √2 : 1

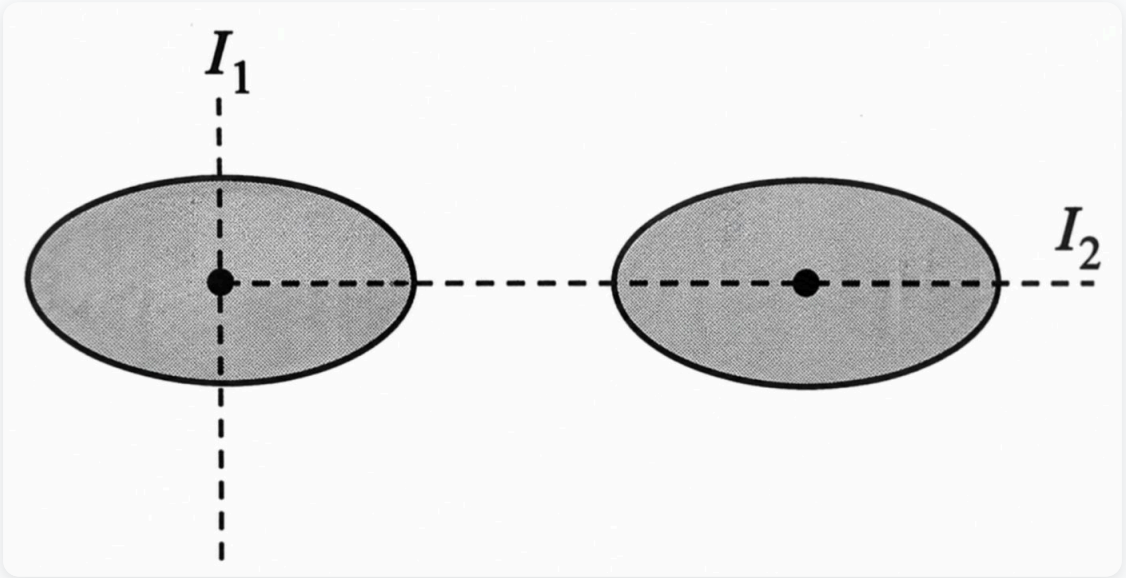
(B) 4 : 1

(C) 2 : 1

(D) 1 : √2

Explanation:

I_□□□□□□□ = I_1 = 1/2 MR^2 ⇒ I_Diameter = I_2 = 1/4 MR^2 ⇒ I_Center / I_Diameter = (1/2 MR^2) / (1/4 MR^2) ⇒ MK^2_C / MK^2_D = 2 ⇒ K_C / K_D = √2



Question 8.

A shell of mass m is at rest initially. It explodes into three fragments having mass in the ratio 2:2: 1. If the fragments having equal mass fly off along mutually perpendicular directions with speed v, the speed of the third (lighter) fragment is

[4 Marks]

(A) 2√2 v

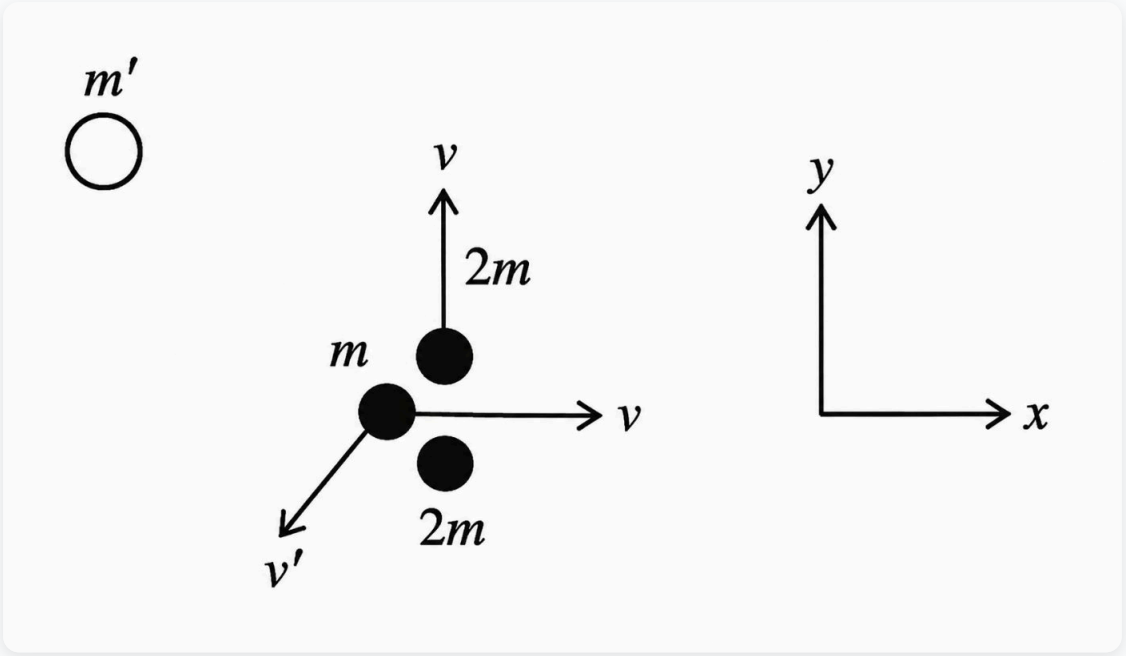
(B) 3 √2 v

(C) v

(D) √2 v

Explanation:

□□ᵢ = 0 □□_f = 2mvî + 2mvĵ + m□□ As, □□ᵢ = □□_f 0 = m□□ + 2mvî + 2mvĵ □□ = −2v(î + ĵ) ⇒ |□□| = 2v√(1² + 1²) = 2√2 v



Question 9.

A long solenoid of radius 1 mm has 100 turns per mm. If 1A current flows in the solenoid, the magnetic field strength at the centre of the solenoid is

[4 Marks]

(A) 12.56 × 10⁻² T

(B) 6.28 × 10⁻⁴ T

(C) 6.28 × 10⁻² T

(D) 12.56 × 10⁻⁴ T

Explanation:

Magnetic field B_centre = $\mu_0 nI = 4\pi \times 10^{-7} \times (100/10^{-3}) \times 1 = 4\pi \times 10^{-2} = 12.56 \times 10^{-2}$ T

Question 10.

Let T_1 and T_2 be the energy of an electron in the first and second excited states of hydrogen atom, respectively. According to the Bohr's model of an atom, the ratio T_1: T_2 is:

[4 Marks]

(A) 1 : 4

(B) 9 : 4

(C) 4 : 1

(D) 4 : 9

Explanation:

We have, $n_1 = 2$ and $n_2 = 3$ And, $T_n = -13.6/n^2$ So, $T_1/T_2 = (n_2/n_1)^2 = (3/2)^2 = 9/4$

Question 11.

A light ray falls on a glass surface of refractive index √3 at an angle 60°. The angle between the refracted and reflected rays would be:

[4 Marks]

(A) 30°

(B) 60°

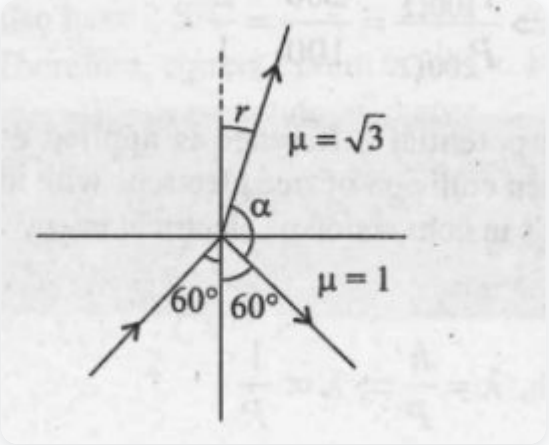
(C) 90°

(D) 120°

Explanation:

We have, $\mu_2/\mu_1 = \sin i / \sin r \Rightarrow \sqrt{3} = \sin 60° / \sin r \Rightarrow \sin r = \sqrt{3} / (2 \times \sqrt{3}) \Rightarrow \sin r = 1/2 \Rightarrow r = \sin^{-1}(1/2) = 30°$ Now, angle between refracted ray and reflected ray = $\alpha = (180 - 60 - 30)° = 90°$

NOTES
Snell's law for two media,
$_1\mu_2 = \mu_2/\mu_1 = \sin i / \sin r$
or, $\mu_1 \times \sin i = \mu_2 \times \sin r$
i.e., $\mu \sin \theta$ = constant



Question 12. If a soap bubble expands, the pressure inside the bubble:

[4 Marks]

(A) increases

(B) remains the same

(C) is equal to the atmospheric pressure

(D) decreases

Explanation: Pressure inside soap bubble, $P = P_0 + 4T/R$ Clearly, R ↑↑ ⇒ 4T/R ↓↓ ⇒ P ↓↓ So, if bubble expands, pressur decreases. Alternative method : Here, PV = cons. [∵ T remains same] $P \propto 1/V$, as R ↑↑ ⇒ V ↑↑ ⇒ P ↓↓

Question 13.

Plane angle and solid angle have:

[4 Marks]

(A) Units but no dimensions

(B) Dimensions but no units

(C) No units and no dimensions

(D) Both units and dimensions

Explanation:

Plane angle unit is radian, whereas solid angle unit is steradian, but they don't have any dimensions.

Question 14.

When light propagates through a material medium of relative permittivity ε_r and relative permeability μ_r, the velocity of light, v is given by: (c-velocity of light in vacuum)

[4 Marks]

(A) v = c

(B) $v = \sqrt{(\mu_r/\varepsilon_r)}$

(C) $v = c/\sqrt{(\varepsilon_r \mu_r)}$

(D) $v = \sqrt{(\varepsilon_r/\mu_r)}$

Explanation:

We know that $V = 1/\sqrt{\mu\varepsilon}$ and $C = 1/\sqrt{\mu_0\varepsilon_0}$ So, $V/C = (\sqrt{\mu_0\varepsilon_0})/(\sqrt{\mu\varepsilon}) = (\sqrt{\mu_0\varepsilon_0})/(\sqrt{\mu_0\varepsilon_0\ \mu_r\varepsilon_r}) = 1/\sqrt{\mu_r\ \varepsilon_r}$ $V = C/\sqrt{\mu_r\ \varepsilon_r}$

Question 15.

Two resistors of resistance, 100 Ω and 200 Ω are connected in parallel in an electrical circuit. The ratio of the thermal energy developed in 100 Ω to that in 200 Ω in a given time is:

[4 Marks]

(A) 2 : 1

(B) 1 : 2

(C) 4 : 1

(D) 1 : 4

Explanation:

As power, $P = V^2/R$ $P_1/P_2 = R_2/R_1$ $P_{100_\Omega}/P_{200_\Omega} = 200/100 = 2/1$

Question 16.

The graph which shows the variation of the de Broglie wavelength (λ) of a particle and its associated momentum (p) is:

[4 Marks]

(A) a



(B) d



(C) b

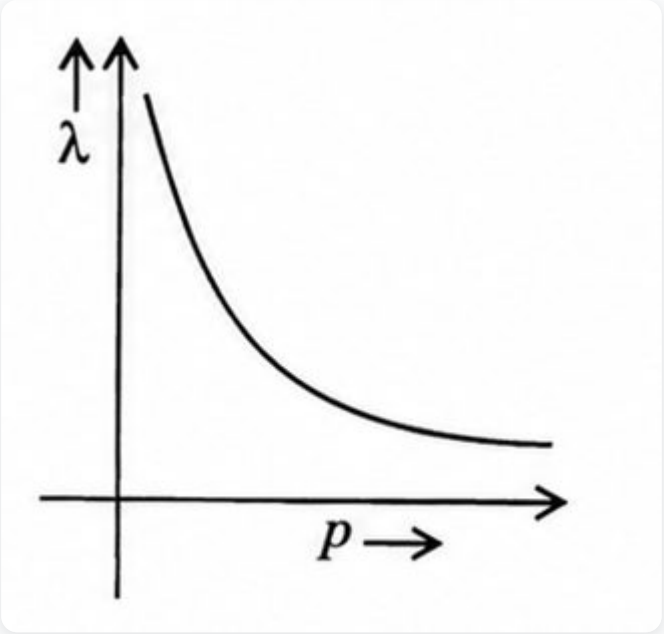


(D) c



Explanation:

Wavelength, $\lambda = h/P \Rightarrow \lambda \propto 1/P$ So graph will be rectangular hyperbola as shown above



Question 17.

A square loop of side 1 m and resistance 1 Ω is placed in a magnetic field of 0.5 T. If the plane of loop is perpendicular to the direction of magnetic field, the magnetic flux through the loop is:

[4 Marks]

(A) Zero weber

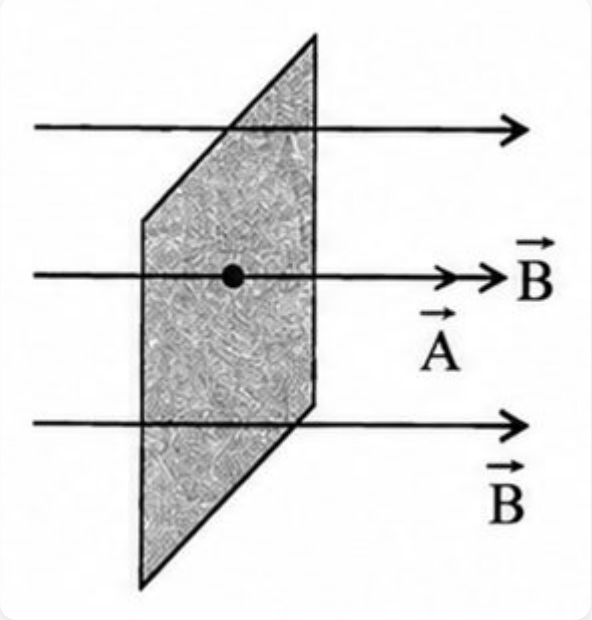
(B) 0.5 weber

(C) 2 weber

(D) 1 weber

Explanation:

Clearly angle between □□ and □□ is 0° so, ϕ (flux) = □□.□□ = BA cos 0° = BA = 0.5 × 1^2 = 0.5 weber



Question 18. The dimensions $[MLT^{-2} A^{-2}]$ belong to the:

[4 Marks]

(A) magnetic permeability

(B) self inductance

(C) electric permittivity

(D) magnetic flux

Explanation: For circular loop at centre, $B = \mu_0 i / 2r \Rightarrow \mu_0 = 2Br / I$ $[\mu_0] = [B][r] / [I] = [MLT^{-2}A^{-1}L^{-1}][L] / [A] = MLT^{-2}A^{-2}$

Question 19.

When two monochromatic lights of frequency, υ and υ/2 are incident on a photoelectric metal, their stopping potential becomes $V_s/2$ and V_s respectively. The threshold frequency for this metal is:

[4 Marks]

(A) 2 υ

(B) (2/3) υ

(C) (3/2) υ

(D) 3 υ

Explanation:

(None) By Einstein's photoelectric equation, hf = ϕ + eV_stopping when f = ν $h\nu = h\nu_0 + e V_s/2$ ..... (i) when f = ν/2 $h(\nu/2) = h\nu_0 + eV_s$ ..... (ii) $\Rightarrow 1/2 (h\nu_0 + e(V_s/2)) = h\nu_0 + eV_s$ [From (i)] $\Rightarrow -h\nu_0/2 = -3/4 eV_s \Rightarrow \phi = h\nu_0 = -3/2 eV_s$, which is −ve. So data given is incorrect because 'ϕ'can never be negative.

Question 20.

In half wave rectification, if the input frequency is 60 Hz, then the output frequency is would be:

[4 Marks]

(A) 30Hz

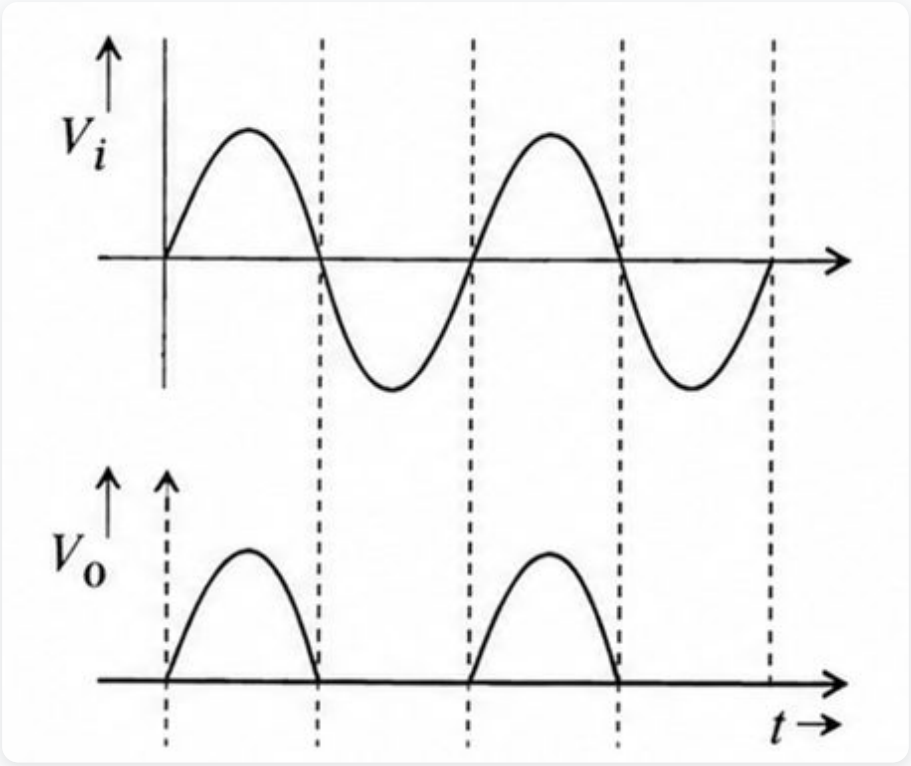
(B) 60Hz

(C) 120Hz

(D) Zero

Explanation:

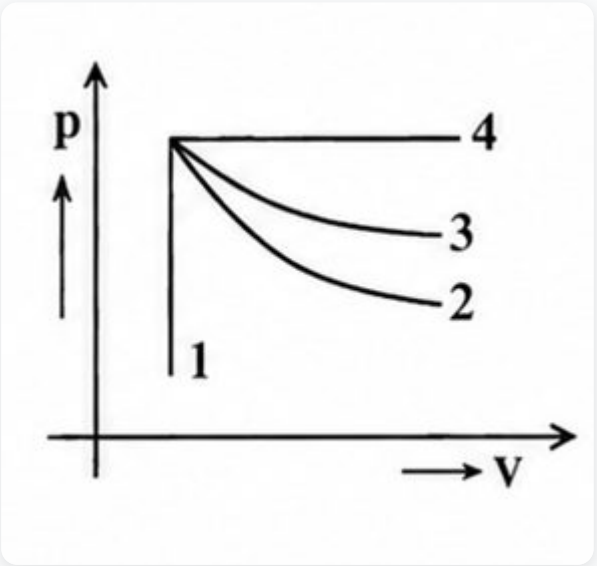
We can see from graph, of input and output of Half Wave Rectifier $T_{input} = T_{output} \Rightarrow f_{input} = f_{output}$ [$\because T = 1/f$]



Question 21.

An ideal gas undergoes four different processes from the same initial state as shown in the figure below. Those processes are adiabatic, isothermal, isobaric and isochoric. The curve which represents the adiabatic process among 1, 2, 3 and 4 is:

[4 Marks]



(A) 1

(B) 3

(C) 4

(D) 2

Explanation:

Curve 1 and curve 4 are isochoric and isobaric, whereas, slope of curve 3 is less than slope of curve 2. So curve 2 should be adiabatic and curve 3 should be isothermal because (slope) isothermal < (slope) adiabatic.

Question 22.

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

[4 Marks]

List-I (Electromagnetic waves)		List-II (Wavelength)	
(A)	AM radio waves	(i)	10^{-10}
(B)	Microwaves	(ii)	10^{2} m
(C)	Infared radiations	(iii)	10^{-2} m
(D)	X-rays	(iv)	10^{-4} m

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

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

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

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

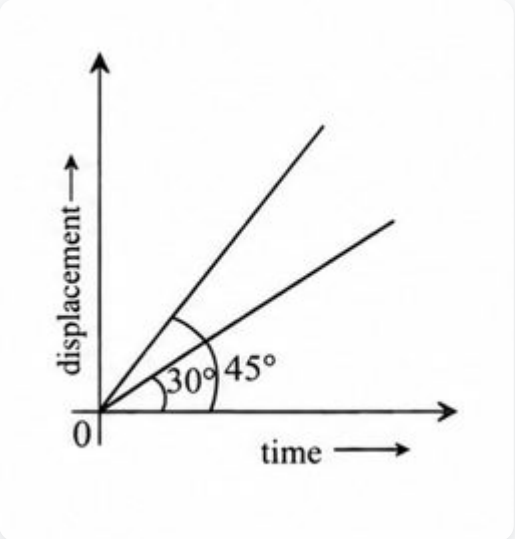
Explanation:

Radio waves has longest wavelength and x-rays have shortest wavelength, so correct A - ii; B - iii: C - iv; D - i.

Question 23.

The displacement-time graphs of two moving particles make angles of 30° and 45° with the x-axis as shown in the figure. The ratio of their respective velocity is:

[4 Marks]



(A) 1 : 1

(B) 1 : √ 3

(C) 1 : 2

(D) √ 3 : 1

Explanation:

V = ds/dt = slope of s − t curve = tan θ V_30°/V_45° = tan 30°/tan 45° = 1/√3

Question 24.

InaYoung's doubleslitexperiment, astudentobserves 8 fringes in a certain segment of screen when amonochromatic light of 600 nm wavelength is used. If the wavelength of light is changed to 400 nm, then the number of fringes he would observe in the same region of the screen is:

[4 Marks]

(A) 6

(B) 9

(C) 12

(D) 8

Explanation:

No. of fringes (n) = length of segment (x) / fringe width (β) ⇒ n = x/β ⇒ x = nβ = cons. $n_1\beta_1 = n_2\beta_2 \Rightarrow n_1 (\lambda_1 D/d) = n_2 (\lambda_2 D/d) \Rightarrow n_1\lambda_1 = n_2\lambda_2 \Rightarrow 8 \times 600 = 400 \times n_2 \Rightarrow n_2 = 12$

Question 25.

The peak voltage of the ac source is equal to:

[4 Marks]

(A) 1 /√2 times the rms values of the ac source

(B) the rms value of the ac source

(C) the value of voltage supplied to the circuit.

(D) √2 times the rms values of the ac source

Explanation:

We know that $V_{rms} = V_0/\sqrt{2} \Rightarrow V_0 = \sqrt{2}\, V_{rms}$

Question 26.

If the initial tension on a stretched string is doubled, then the ratio of the initial and final speeds of a transverse wave along the string is:

[4 Marks]

(A) 1 : √2

(B) 1 : 2

(C) 1 : 1

(D) √2 : 1

Explanation:

Speed $V = \sqrt{(T/\mu)} \Rightarrow V \alpha \sqrt{T}$ So, $V_1/V_2 = \sqrt{(T_1/T_2)} = 1/\sqrt{2}$

Question 27.

Given below are two statements:

Statement I: Biot-Savart's law gives us the expression for the magnetic field strength of an infinitesimal current element(Idl) of a current carrying conductor only.

statement II: Biot-Savart's law is analogous to Coulomb's inverse square law of charge g, with the former being related to the field produced by a scalar source, Idl while the latter being produced by a

vector source q.

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

[4 Marks]

(A) Both statement I and Statement II are correct

(B) Statement I is incorrect and Statement II is correct

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

(D) Both statement I and statement II are incorrect.

Explanation:

Coulomb's law and universal law of gravitation are analogous to each other, whereas Biot-savart's law is different from the above two laws as it is used to calculate magnetic produced by vector source, Idl. so statement II is incorrect and statement I is correct.

Question 28.

As the temperature increase, the electrical resistance:

[4 Marks]

(A) decreases for both conductors and semiconductors

(B) increases for conductors but decreases for semiconductors

(C) decreases for .conductors but increase for semiconductors

(D) increases for both conductors and semiconductors.

Explanation:

For conductors, R α T so, T↑↑ ⇒ R↑↑ For semiconductor, R α 1/T so T↑↑ ⇒ R↓↓

Question 29.

The energy that will be ideally rediated by a 100 kW transmitter in 1 hour is:

[4 Marks]

(A) 36×10^7 J

(B) 1×10^5 J

(C) 36×10^5 J

(D) 36×10^4 J

Explanation:

Energy radiated = Power × time = 100 kW × 1 hr = 100 kWh = $100 \times 3.6 \times 10^6$ J = 3.6×10^8 J = 36×10^7 J

Question 30.

A body of mass 60 g experiences a gravitational force of 3.0 N, when placed at a particular point. The magnitude of the gravitational field intensity at that point is:

[4 Marks]

(A) 0.05 N/kg

(B) 180 N/kg

(C) 50 N/kg

(D) 20 N/kg

Explanation:

□□ₘ = m □□ |□□| = □□ₘ / m = $3/(60 \times 10^{-3})$ = 50 N/kg

Question 31.

In the given nuclear reaction, the element X is : $^{22}_{11}Na \rightarrow X + e^+ + \nu$

[4 Marks]

(A) $^{23}_{11}Na$

(B) $^{22}_{12}Mg$

(C) $^{22}_{10}Ne$

(D) $^{23}_{10}Ne$

Explanation:

$^{22}_{11}Na \rightarrow {}^{A}_ZX + {}^{0}_{+1}e + \nu$ So, 22 = A + 0 ⇒ A = 22 ,

11 = Z + 1 ⇒ Z = 10 ⇒ Element is Neon Clearly, answer is $^{22}_{10}Ne$

Question 32.

The angle between the electric lines of force and the quintessential surface is:

[4 Marks]

(A) 0°

(B) 180°

(C) 90°

(D) 45°

Explanation:

Electric field vectors are always ⊥r to equipotential surface.

Question 33.

A copper wire of length 10 m and radius $(10^{-2}/\sqrt{\pi})$ m has electrical resistance of 10 Ω. The current density in the wire for an electric field strength of 10 (V/m) is :

[4 Marks]

(A) 10^6 A/m²

(B) 10^4 A/m²

(C) 10^5 A/m²

(D) 10^{-5} A/m²

Explanation:

We have $J = \sigma E$ $J = E/\rho \Rightarrow J = El/RA \Rightarrow J = (10 \times 10)/(10 \times \pi) \times (10^{-2}/\sqrt{\pi})^2 = 10^5$

Question 34.

The ratio of the distances travelled by a freely falling body in the 1st, 2nd, 3rd and 4th second:

[4 Marks]

(A) 1 : 4 : 9 : 16

(B) 1 : 2 : 3 : 4

(C) 1 : 3 : 5 : 7

(D) 1 : 1 : 1 : 1

Explanation:

$S_n = u + a/2\ (2n - 1)$ $S_1 : S_2 : S_3 : S_4 = (2 \times 1 - 1) : (2 \times 2 - 1) : (2 \times 3 - 1) : (2 \times 4 - 1) = 1 : 3 : 5 : 7$

Question 35.

An electric lift with a maximum load of 2000 kg (lift + passengers) is moving up with a constant speed of 1.5 ms^{-1}. The frictional force opposing the motion is 3000 N. The minimum power delivered by the motor to the lift in watts is :($g = 10ms^{-2}$)

[4 Marks]

(A) 23000

(B) 23500

(C) 34500

(D) 20000

Explanation:

Power = F × V = (2000 g + 3000) × 1.5 = 23000 × 1.5 = 34500 watt

Question 36.

The volume occupied by the molecules contained in 4.5 kg water of STP, if the intermolecular forces vanish away is:

[4 Marks]

(A) 5.6×10^6 m^3

(B) 5.6 m^3

(C) 5.6×10^{-3} m^3

(D) 5.6×10^3 m^3

Explanation:

Number of moles of water molecules (n) = Mass of water / Molecular weight = 4.5 / (18×10^{-3}) = 250
∴ PV = nRT V = nRT / P = (250 × 8.314 × 273) / 10^5 = 5.6 m^3 [at STP, T = 273 K, P = 10^5 Pa]

Question 37.

The area of a rectangular field (in m^2) of length 55.3 m and breadth 25 m after rounding off the value of correct significant digits is:

[4 Marks]

(A) 14×10^2

(B) 138×10^1

(C) 1382.5

(D) 1382

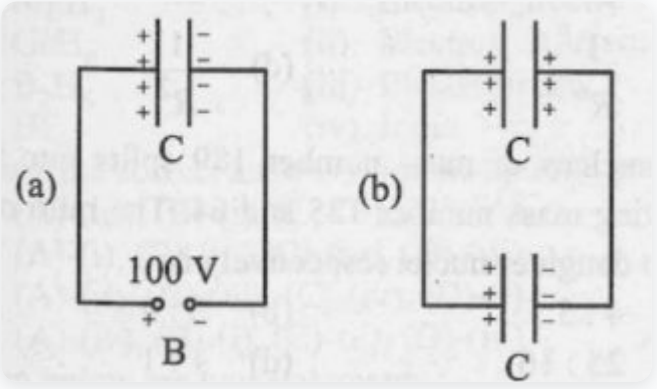
Explanation:

Area = length × breadth = 55.3 × 25 As, Answer of multiplication is rounded off to the same number of significant figure as present in least precise term. Here, 25 has least significant figure and it is 2 so, Answer will also be 2 SF. Therefore, correct option is (c) i.e. 14×10^2

Question 38.

A capacitor of capacitance C = 900 pF is charged fully by 100 V battery B as shown in figure (a). Then it is disconnected from the battery and connected to another uncharged capacitor of capacitance C = 900 pF as shown in figure (b). The electrostatic energy stored by the system (b) is

[4 Marks]



(A) 3.25×10^{-6} J

(B) 2.25×10^{-6} J

(C) 4.5×10^{-6} J

(D) 1.5×10^{-6} J

Explanation:

By conservation of charge $q_i = q_f \Rightarrow C \times 100 = CV' + CV' \Rightarrow V' = 50$ V So, $U_f = 1/2\ CV'^2 \times 2 = CV'^2 = 900 \times 10^{-12} \times 25 \times 10^2 = 225 \times 10^{-8} = 2.25 \times 10^{-6}$ J

Question 39.

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

[4 Marks]

	List-I		List-II
(A)	Gravitational constant (G)	(i)	$[L^2T^2]$
(B)	Gravitational potential energy	(ii)	$[M^{-1}L^3T^{-2}]$
(C)	Gravitational potential	(iii)	$[LT^{-2}]$
(D)	Gravitational intensity	(iv)	$[ML^2T^{-2}]$

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

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

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

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

Explanation:

$[G] = [Fr^2 / (m_1m_2)] = (MLT^{-2}L^2) / M^2 = M^{-1}L^3T^2$

$[U] = [W] = ML^2T^{-2}$ $[V] = [U/M] = (ML^2T^{-2}) / M = L^2T^{-2}$ $[I] = [F/M] = LT^{-2}$

Question 40.

Two pendulums of length 121 cm and 100 cm start vibrating in phase. At some instant, the two are at their mean position in the same phase. The minimum number of vibrations of the shorter pendulum after which the two are again in phase at the mean position is:

[4 Marks]

(A) 9

(B) 10

(C) 11

(D) 8

Explanation:

$T \propto \sqrt{\ell}$ $T\ell / T_s = \sqrt{121} / \sqrt{100} \Rightarrow T\ell / T_s = 11/10 \Rightarrow 11T_s = 10T_c$ Hence, smaller pendulum will make 1 oscillation more than longer pendulum.

If longer makes n oscillation, then smaller makes (n + 1) oscillation. For oscillating in same phase $(n + 1)T_S = nT_l \Rightarrow (n + 1) \cdot 2\pi \sqrt{(100/g)} = n \cdot 2\pi \sqrt{(121/g)} \Rightarrow (n + 1)10 = n \times 11$

$\Rightarrow n = 10$

Question 41.

Given below are two statements: One is labelled as Assertion (A) and the other is labelled as Reason (R). Assertion (A): The stretching of a spring is determined by the shear modulus of the material of the spring. Reason (R): A coil spring of copper has more tensile strength than a steel spring of same dimensions.

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

[4 Marks]

(A) Both (A) and (R).are triie and (R) is not the correct explanation of (A)

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

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

(D) (A) is true but (R) is false

Explanation:

By stretching coil's, shape changes whereas its length of wire remains same. Due to which shear modulus of elasticity is involved, so assertion is correct. Elasticity of steel is more than that of copper and also has more tensile stress. So reason is false.

Question 42.

A ball is projected with a velocity, 10 ms^{-1}, at an angle of 60° with the vertical direction. Its speed at the highest point of its trajectory will be:

[4 Marks]

(A) 10 ms^{-1}

(B) Zero

(C) 5 ms^{-1}

(D) 5√3 ms^{-1}

Explanation:

V_Horizontal = ucosθ = 10 sin 60° = (10 × √3)/2 = 5√3 As there is zero acceleration along horizontal direction, at highest point we will have same horizontal velocity also there is no vertical velocity at highest point. |□□| = |□□_horizontal| = 5√3 m/s

Question 43. Two transparent media A and B are separated by a plane boundary. The speed of light in those media are 1.5×10^8 m/s and 2.0×10^8 m/s, respectively. The critical angle for a ray of light for these two media is:

[4 Marks]

(A) $\tan^{-1}(0.500)$

(B) $\tan^{-1}(0.750)$

(C) $\sin^{-1}(0.500)$

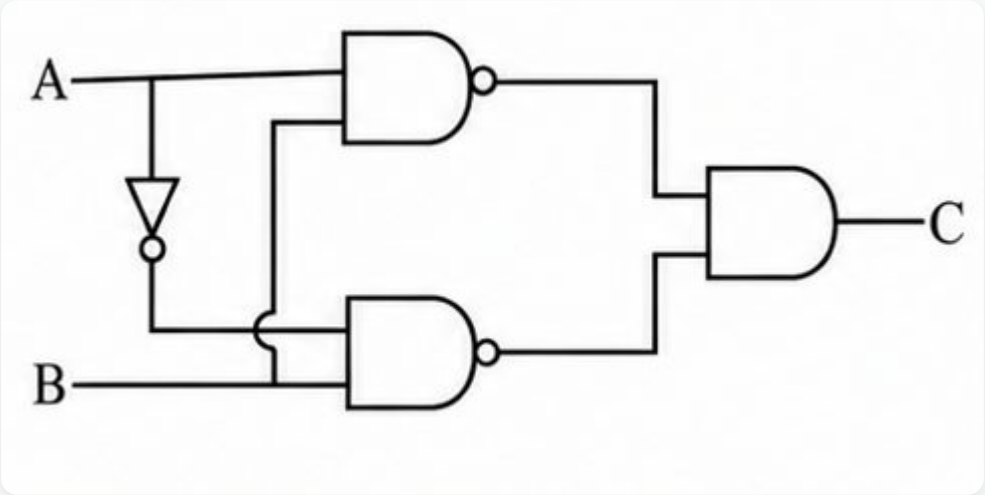
(D) $\sin^{-1}(0.750)$

Explanation: $\sin C = u_r / u_d$, and, $\mu \propto 1/v$ Therefore, $u_r / u_d = v_d / v_r \Rightarrow \sin C = v_d / v_r = (1.5 \times 10^8)/(2 \times 10^8) = 3/4$ so, $C = \sin^{-1}(3/4) = \sin^{-1}(0.750)$

Question 44.

The truth table for the given logic circuit is:

[4 Marks]



(A) a

A	B	C
0	0	1
0	1	0
1	0	0
1	1	1

(B) b

A	B	C
0	0	1
0	1	0
1	0	1
1	1	0

(C) d

A	B	C
0	0	0
0	1	1
1	0	1
1	1	0

(D) c

A	B	C
0	0	0
0	1	1
1	0	0
1	1	1

Explanation:

The truth table for this logic gate is given as Let A = 0 and B = 0. Then Similarly,

A = 0, B = 1 ⇒ C = 0

A = 1, B = 0 ⇒ C = 1

A = 1, B = 1 ⇒ C = 0

So, truth table is

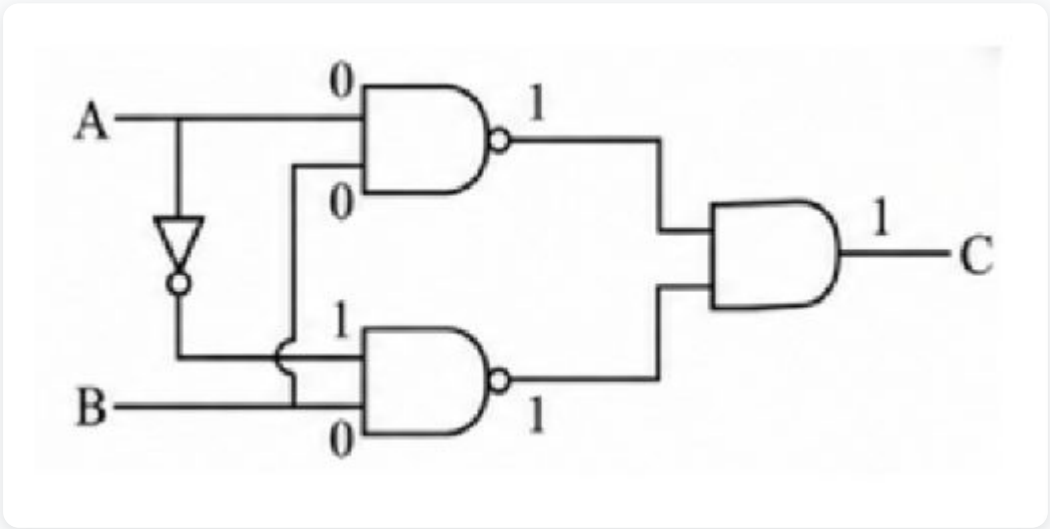
A | B | C

0 | 0 | 1

0 | 1 | 0

1 | 0 | 1

1 | 1 | 0



Question 45.

A series LCR circuit with inductance 10 H, capacitance 10 μF, resistance 50 Ω is connected to an ac source of voltage, V = 200 sin (100 t) volt. If the resonant frequency of the LCR circuit is ν_0 and the frequency of the ac source is ν, then

[4 Marks]

(A) ν = 100 Hz, ν_0 = (100/π) Hz

(B) $\nu_0 = (50/\pi)$ Hz, $\nu = 50$ Hz

(C) $\nu_0 = \nu = 50$ Hz

(D) $\nu_0 = \nu = (50/\pi)$ Hz

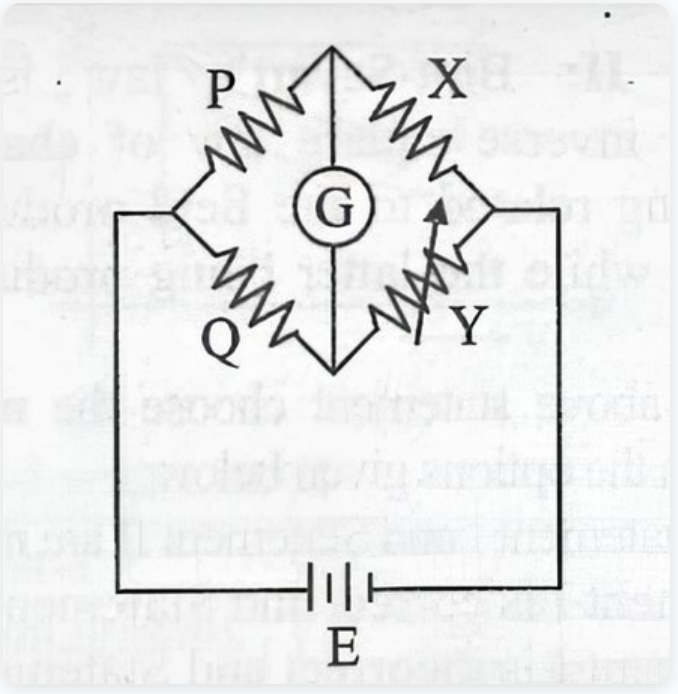
Explanation:

At resonance $X_L = X_c \Rightarrow \omega_r L = 1/(\omega_r C) \Rightarrow \omega_r = 1/\sqrt{LC} \Rightarrow f_r = 1/(2\pi\sqrt{LC}) \Rightarrow \nu_0 = 1/(2\pi\sqrt{(10 \times 10 \times 10^{-6})}) \Rightarrow \nu_0 = 10^3/(10 \times 2\pi) = 50/\pi$ So, if frequency of AC source is $50/\pi$ i.e. $\nu = 50/\pi$ then there will be only resonance.

Question 46.

A wheatstone bridge is used to determine the value of unknown resistance X by adjusting the variable resistance Y as shown in the figure. For the most precise measurement of X, the resistances P and Q:

[4 Marks]



(A) do not play any significant role

(B) should be approximately equal to 2X

(C) should be very large and unequal

(D) should be approximately equal and are small

Explanation:

For precise measurement, we always put P and Q approx. equal and small.

Question 47.

From Ampere's circuital law for a long straight wire of circular cross-section carrying a steady current, the variation of magnetic field in the inside and outside region of the wire is:

[4 Marks]

(A) a linearly increasing function of distance upto the boundary of the wire and then linearly decreasing for the outside region.

(B) uniform and remains constant for both the regions.

(C) a linearly decreasing function of distance upto the boundary of the wire and then a linearly increasing one for the outside region.

(D) a linearly increasing function of distance r upto the 'boundary of the wire and then decreasing one with 1/r dependence for the outside region.

Explanation:

For long straight wire $B = (\mu_0 i r)/(2\pi R^2) \Rightarrow B \propto r, r < R$

and $B = (\mu_0 I)/(2\pi r) \Rightarrow B \propto 1/r$

Question 48. A big circular coil of 1000 turns and average radius 10 m is rotating about its horizontal diameter at 2 rad s^{-1}. If the vertical component of earth's magnetic field at that place is 2×10^{-5} T and electrical resistance of the coil is 12.56 Ω , then the maximum induced current in the coil will be:

[4 Marks]

(A) 1.5 A

(B) 2 A

(C) 0.25 A

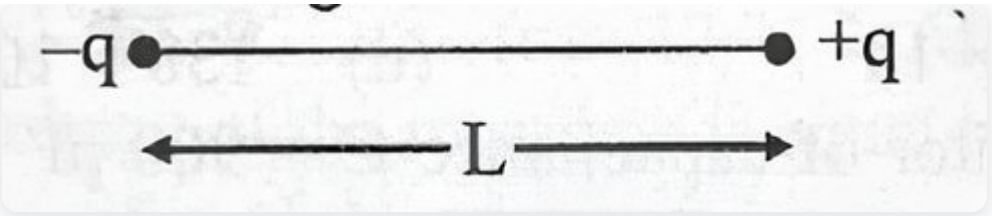
(D) 1 A

Explanation: $e = N d\varphi/dt = Nd/dt (BA \cos \omega t) = NBA\omega \sin \omega t$ $i_0 = Ne_0/R = NBA\omega/R = ((2 \times 10^{-5} \times \pi \times 100 \times 2)/(4\pi)) \times 1000 = 1$ A

Question 49.

Two point charges —q and +q are placed at a distance of L, as shown in the figure. The magnitude of electric field intensity at a distance R(R>>L) varies as:

[4 Marks]



(A) 1 /R^3

(B) 1 / R^4

(C) 1 / R^6

(D) 1 / R^2

Explanation:

If R >> L_1, it will behave like a dipole and in dipole we have, $E \propto 1/r^3$

NOTES The magnitude of electric field intensity due to dipole at large distances varies as $1/r^3$ and can never be zero unless $r \rightarrow \infty$ and $p \rightarrow 0$. Here, p is dipole moment.

Question 50.

Given below are two statements:

Statement I: In the coagulation of a negative sol, the flocculating power of the three given ions is in the order: $Al^{3+} > Ba^{2+} > Na^{+}$

Statement II: In the coagulation of a positive sol, the flocculating power of the three given salts is in the order: $NaCl > Na_2SO_4 > Na_3PO_4$

In the light of 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:

According to Hardy Schulze rule statement I is correct. For coagulation of a positive sol the flocculating power is in the order: $PO_4^{3-} > SO_4^{2-} > Cl^{-}$ Hence, statement II is incorrect.

Question 51. Which statement regarding polymers is not correct?

[4 Marks]

(A) Fibers possess high tensile strength.

(B) Thermoplastic polymers are capable of repeatedly softening and hardening on heating and cooling respectively.

(C) Thermosetting polymers are reusable.

(D) Elastomers have polymer chains held together by weak intermolecular forces.

Explanation: Upon heating, thermosetting plastics decompose before reaching the melting point. Hence, these are not reusable.

Question 52.

The incorrect statement regarding chirality is:

[4 Marks]

(A) S_N1 reaction yields 1 : 1 mixture of both enantiomers.

(B) A racemic mixture shows zero optical rotation.

(C) Enantiomers are superimposable mirror images of each other.

(D) The product obtained by S_N2 reaction of haloalkane having chirality at the reactive site shows inversion of configuration.

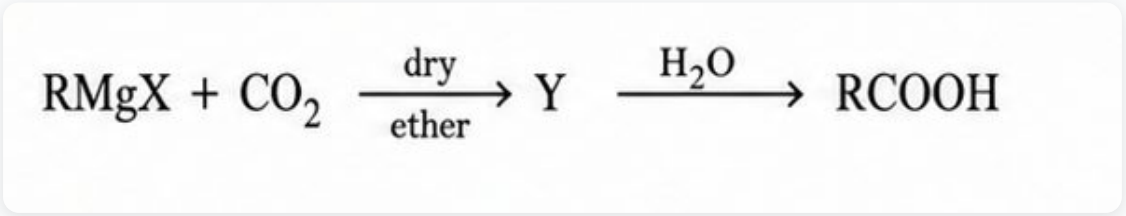
Explanation:

Enantiomers are non superimposable mirror images of each other.

Question 53.

What is Y in the above reaction:

[4 Marks]



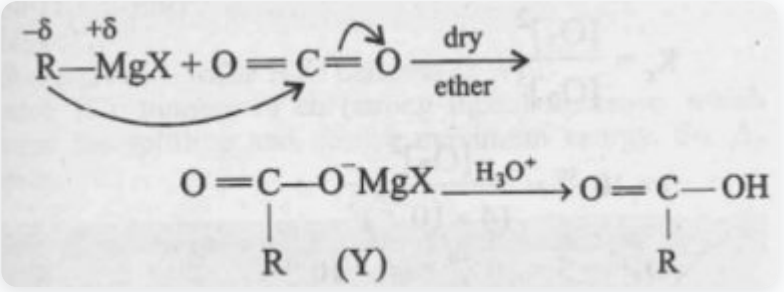
(A) $(RCOO)_2Mg$

(B) $RCOO^-Mg^+X$

(C) $RCOO^-X^+$

(D) $R_3CO^-Mg^+X$

Explanation:



Question 54. In one molal solution that contains 0.5 mole of a solute, there is

[4 Marks]

(A) 500 g of solvent

(B) 100 mL of solvent

(C) 500 mL of solvent

(D) 1000 g of solvent

Explanation: For one molal solution, 1 mol of solute should be present in 1000 g of solvent. Or we can say that 0.5 mol of solute should be present in 500g of solvent.

Question 55.

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

[4 Marks]

List-I (Hydrides)	List-II (Nature)
(A) MgH_2	(i) Electron precise
(B) GeH_4	(ii) Electron deficient
(C) B_2H_6	(iii) Electron rich
(D) HF	(iv) Ionic

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

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

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

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

Explanation:

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

Question 56.

Given below are two statements : -

Statement I : The boiling points of aldehydes and ketones are higher than hydrocarbons of comparable molecular masses because of weak molecular association in aldehydes and ketones due to dipole - dipole interactions.

Statements II : The boiling points aldehydes and ketones are lower than the alcohols of similar molecular masses due to the absence of H-bonding. In the light of the statements, choose the most appropriate answer from the options given below:

[4 Marks]

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

(B) Both statements I and statement II are incorrect.

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

(D) Both statement I and statement II are correct.

Explanation:

Due to hydrogen bonding in alcohol and non-polar nature of alkane, the boiling point of aldehydes and ketones are in- - between of these two. B.P. order:

Alcohol > Aldehyde/Ketone > Alkane

Question 57.

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

[4 Marks]

List-I (Products formed)	List-II (Reaction of carbonyl compound with)
(A) Cyanohydrin	(i) NH_2OH
(B) Acetal	(ii) RNH_2
(C) Schiff's base	(iii) alcohol
(D) Oxime	(iv) HCN

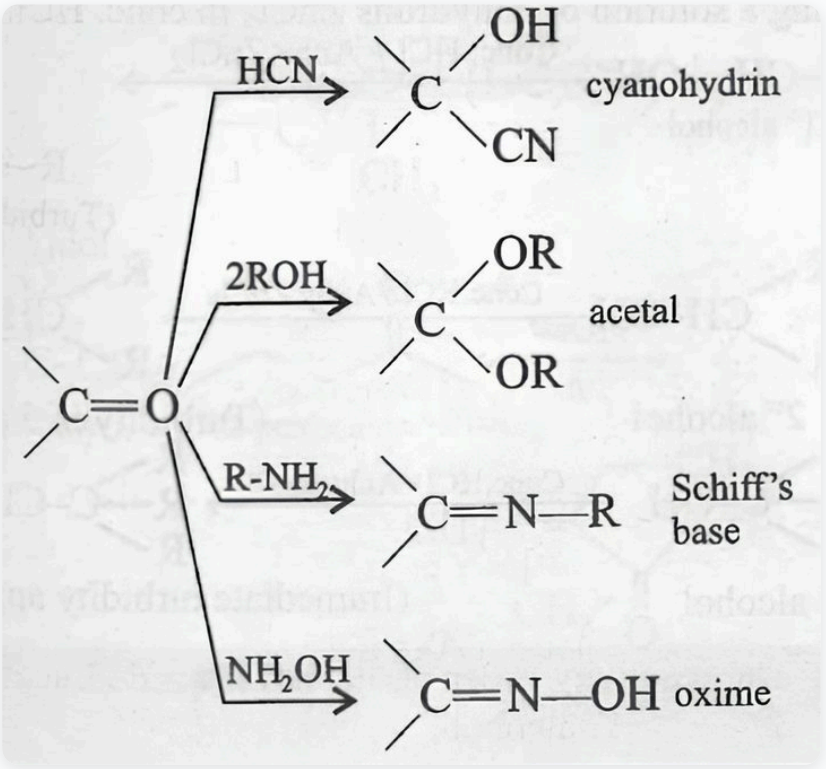
(A) (A) - (iv), (B) - (iii), (C) - (ii), (D) - (i)

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

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

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

Explanation:



Question 58.

Which one is not correct mathematical equation for Dalton's Law of partial pressure? Here p = total pressure of gaseous mixture

[4 Marks]

(A) $p_i = x_i p$, where p_i = (partial pressure of i^{th} gas) x_i = mole fraction of i^{th} gas in gaseous mixture

(B) $p = p_1 + p_2 + p_3$

(C) $p_i = x_i p_i°$, where (x_i = mole fraction of i^{th} gas in gaseous mixture) ($p_i°$ = pressure of i^{th} gas in pure state)

(D) $P = n_1(RT / V) + n_2(RT / V) + n_3(RT / V)$

Explanation:

Partial pressure of gas = Mole fraction of gas x Total pressure $p_i = x_i .p$

Question 59.

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

[4 Marks]

List-I (Drug class)	List-II (Drug molecule)
(A) Antacids	(i) Salvarsan
(B) Antihistamines	(ii) Morphine
(C) Analgesics	(iii) Cimetidine
(D) Antimicrobials	(iv) Seldane

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

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

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

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

Explanation:

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

Question 60.

Given below are two statements:

Statement I: The boiling points of the following hydrides of group 16 elements increases in the order —$H_2O < H_2S < H_2Se < H_2Te$

Statement II: The boiling points of these hydrides increase with increase in molar mass.

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 incorrect.

(B) Statement I is correct but statement II is incorrect.

(C) Both statement I and statement II are correct.

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

Explanation:

It is true that generally b.p. increases with increase in 'molar mass but due to H-bonding in H_2O the correct order of b.p. is: $H_2S < H_2Se < H_2Te < H_2O$

Question 61.

The IUPAC name of the complex $[Ag(H_2O)][Ag(CN)_2]$ is :

[4 Marks]

(A) dicyanidosilver(I) diaquaargentate(I)

(B) diaquasilver (II) dicyanidoargentate (II)

(C) dicyanidosilver (Il) diaquaargentate (II)

(D) diaquasilver (I) dicyanidoargentate (I)

Explanation:

$[^{+1}Ag(OH_2)_2][^{+1}Ag(^{-1}CN)_2]$

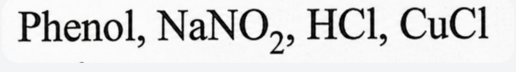
diaquasilver (I) diicyanidoargentate(I)

Question 62.

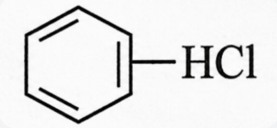
Which of the following is suitable to synthesize chlorobenzene ?

[4 Marks]

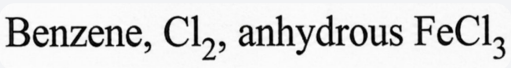
(A) a



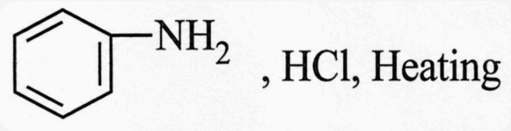
(B) b



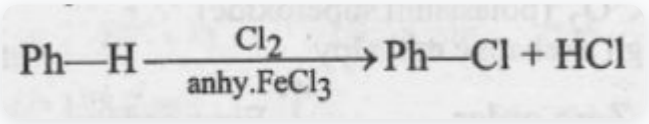
(C) d



(D) c



Explanation:



Question 63.

Given below are two statements; one is labelled as Assertion (A) and the other is labelled as Reason (R). Assertion (A) : ICl is more reactive than I_2.

Reason (R) : I-Cl bond is weaker than I-I bond.

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

[4 Marks]

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

(B) (A) is correct but (R) is not correct.

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

(D) (A) isnot correct but (R) is correct.

Explanation:

Due to weak I - Cl bond it is more reactive than I - I. F_2 is more reactive than most of the interhalogen compounds due to weak F - F bond.

Question 64.

The IUPAC name of an element with atomic number 119 is

[4 Marks]

(A) ununennium

(B) ununoctium

(C) unnilennium

(D) unununnium

Explanation:

119 = un - un - enn - ium

Question 65. At 298 K, the standard electrode potentials of Cu^{2+}/Cu, Zn^{2+}/Zn, Fe^{2+}/Fe and Ag^{+}/Ag are 0.34 V, –0.76 V, –0.44 V and 0.80 V, respectively. On the basis of standard electrode potential, predict which of the following reaction can not occur?

[4 Marks]

(A) $CuSO_4(aq) + Fe(s) \rightarrow FeSO_4(aq) + Cu(s)$

(B) $FeSO_4(aq) + Zn(s) \rightarrow ZnSO_4(aq) + Fe(s)$

(C) $CuSO_4(aq) + Zn(s) \rightarrow ZnSO_4(aq) + Cu(s)$

(D) $2CuSO_4(aq) + 2Ag(s) \rightarrow 2Cu(s) + Ag_2SO_4(aq)$

Explanation: $Cu^{2+} + Ag \rightarrow Cu + Ag^{+}$ For a feasible reaction, E° should be positive E° + E°_cathode - E°_anode = 0.34 V - 0.80 V = -ve. Hence, this reaction is not possible.

Question 66.

Which compound amongst the following is not an aromatic compound?

[4 Marks]

(A) A



(B) C



(C) B



(D) D



Explanation:

The molecule is not conjugated, hence it is not an aromatic compound.

Question 67.

Choose the correct statement:

[4 Marks]

(A) Diamond is sp^3 hybridised and graphite is sp^2 hybridized.

(B) Diamond and graphite have two dimensional network.

(C) Both diamond and graphite are used as dry lubricants.

(D) Diamond is covalent and graphite is ionic.

Explanation:

(a) Diamond and graphite both are covalent. (c) Only graphite can be used as dry Lubricant. (d) Both diamond and graphite have 3-Dimensional structure.

Question 68.

Given below are two statements:

Statement I: Primary aliphatic amines react with HNO_2 to give unstable diazonium salts. Statement II: Primary aromatic amines react with HNO_2 to form diazonium salts which are stable even above 300 K.

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

[4 Marks]

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

(B) Both statement I and statement II are correct.

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

(D) Statement I is incorrect but statement II is correct,

Explanation:

Aryl diazonium salts are stable at low temperature due to resonating structure

Question 69.

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

Assertion (A): In a particular point defect, an ionic solid is electrically neutral, even if few of its cations are missing from its unit cells.

Reason (R): In an ionic solid, Frenkel defect arises due to dislocation of cation from its lattice site to interstitial site, maintaining overall electrical neutrality.

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

[4 Marks]

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

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

(C) (A) is not correct but (R) is correct.

(D) (A) is correct but (R) is not correct.

Explanation:

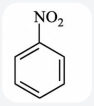
Assertion: For any kind of point defect, electrical neutrality is an essential condition, e.g., metal deficiency defect. Reason: This is correct but it does not explain the given assertion.

Question 70.

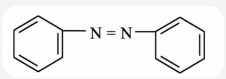
The Kjeldahl's method for the estimation of nitrogen can be used to estimate the amount of nitrogen in which one of the following compounds?

[4 Marks]

(A) D



(B) C



(C) A



(D) B



Explanation:

Only the nitrogen of amine from the given options can be changed to ammonium sulphate under Kjeldahl's method.

Question 71.

Which of the following p-V curve represents maximum work done?

[4 Marks]

(A) d



(B) c



(C) a



(D) b



Explanation:

Area under the p-V curve is maximum in the first option, which is equal to work done.

Question 72.

Which of the following statement is not correct about diborane ?

[4 Marks]

(A) There are two 3-centre-2-electron bonds.

(B) Both the Boron atoms are sp^2 hybridised.

(C) The four terminal Hydrogen atoms and the two Boron atoms lie in one plane.

(D) The four terminal B-H bonds are two centre two electron bonds.

Explanation:

Boran atoms are sp^3 hybridised.

Question 73.

The pH of the solution containing 50 mL each of 0.10 M sodium acetate and 0.01 M acetic acid is [Given pK_a of CH_3COOH = 4.57]

[4 Marks]

(A) 4.57

(B) 3.57

(C) 2.57

(D) 5.57

Explanation:

For acidic buffer pH = p_K^a + log [Salt] / [Acid] = 4.57 + log (0.1 + 0.01) = 5.57

Question 74. Which amongst following is incorrect statement?

[4 Marks]

(A) H_2^+ ion has one electron.

(B) C_2 molecule has four electrons in its two degenerate π molecular orbitals.

(C) O_2^+ ion has diamagnetic.

(D) The bond orders of O_2^+, O_2, O_2^- and O_2^{2-} are 2.5, 2, 1.5 and 1, respectively.

Explanation: We know that in O_2 molecule, there are two unpaired e^-, thus, in O_2^+, there will be one unpaired e^-.

Question 75.

Amongst the following which one will have maximum ‘lone pair-lone pair” electron repulsions?

[4 Marks]

(A) IF_5

(B) XeF_2

(C) ClF_3

(D) SF_4

Explanation:

:XeF_2, due to 3 lone pairs, the lp-lp repulsions are maximum.

Question 76.

What mass of 95% pure $CaCO_3$ will be required to neutralise 50 mL of 0.5 M HCl solution according to the following reaction? $CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + CO_2(g) + H_2O(l)$ [Calculate upto second place of decimal point]

[1 Marks]

(A) 9.50 g

(B) 1.32 g

(C) 3.65 g

(D) 1.25 g

Explanation:

From the given reaction, No. of moles of $CaCO_3$ = 1 / 2 × HCl of Solution = 1 / 2 × 0.5 × 50 / 1000 = 0.0125 Mass of pure $CaCO_3$ =0.0125 ×100 =1.25g Mass of impure sample 1.25 × 100 / 95 = 1.32 g

Question 77. Identify the incorrect statement from the following :

[4 Marks]

(A) The oxidation number of K in KO_2 is + 4.

(B) Ionisation enthalpy of alkali metals decreases from top to bottom in the group.

(C) Alkali metals react with water to form their hydroxides.

(D) Lithium is the strongest reducing agent among the alkali metals.

Explanation: The O.N. of K is always +1. $KO_2 \equiv K^+O_2^-$ (potassium superoxide)

Question 78.

Gadolinium has a low value of third ionisation enthalpy because of

[4 Marks]

(A) small size

(B) high basic character

(C) high exchange enthalpy

(D) high electronegativity

Explanation:

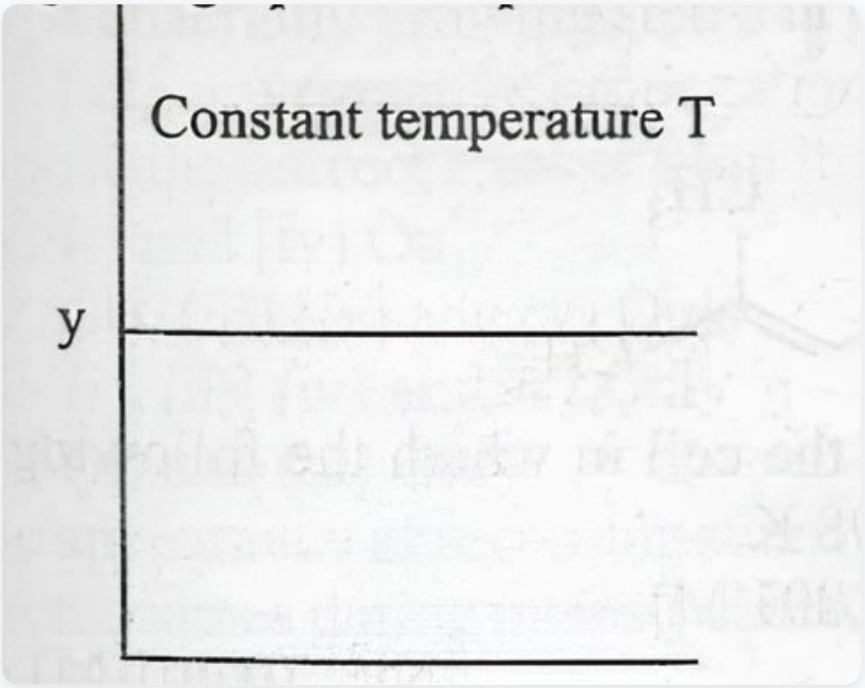
High exchange enthalpy

Question 79.

The given graph is a representation of kinetics of a reaction.

The y and x axes for zero and first order reactions, respectively are

[4 Marks]



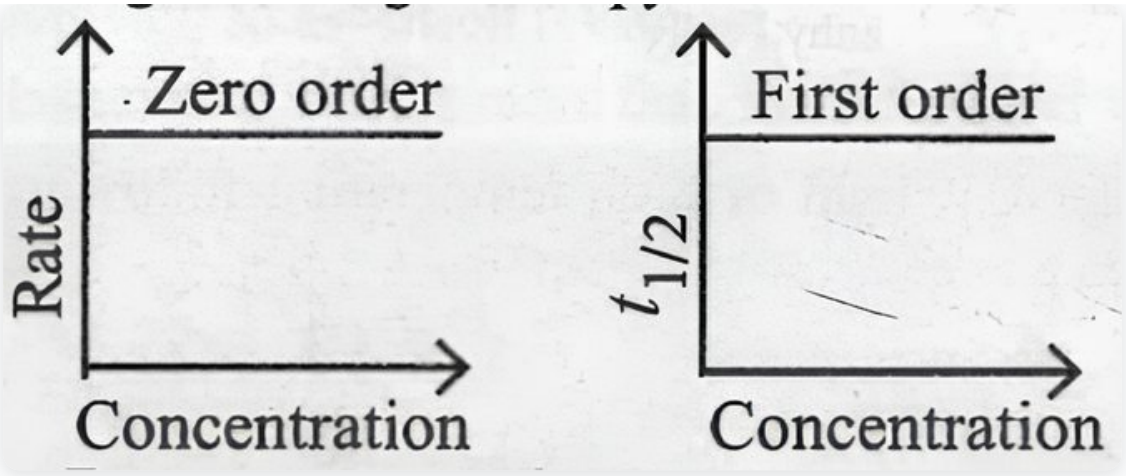
(A) zero order (y = concentration and x = time), first order (y =t_1/2 and x = concentration)

(B) zero order (y = rate and x = concentration), first order (y = t_1/2, and x = concentration)

(C) zero order (y = concentration and x = time), first order (y = rate constant and x = concentration)

(D) zero order (y = rate and x = concentration), first order (y =rate and x =t_1/2)

Explanation:



Question 80. The incorrect statement regarding enzymes is:

[4 Marks]

(A) Like chemical catalysts enzymes reduce the activation energy of bio processes

(B) Enzymes are polysaccharides.

(C) Enzymes are biocatalysts.

(D) Enzymes are very specific for a particular reaction and substrate.

Explanation: Enzymes are protein.

Question 81. Identify the incorrect statement from the following.

[4 Marks]

(A) In an atom,all the five 3d orbitals are equal in energy in free state.

(B) All the five 4d orbitals have shapes similar to the respective 3d orbitals.

(C) The shapes of d_xy, d_yz, and d_zx orbitals are similar to each other; and and $d_{x^2 - y^2}$ and d_{z^2} are similar to each other.

(D) All the five 5d orbitals are different in size when compared to the respective 4d orbitals.

Explanation: The shapes of d_xy, d_yz, and d_zx and $d_{x^2 - y^2}$ and d_{z^2} are similar to each other and that of d_{z^2} is different.

Question 82.

Given below are half cell reactions:

$MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O$, $E°_{Mn^{2+} / mno_4^-} = -1.510V$ $(1/2)O_2 + 2H^+ + 2e^- \rightarrow H_2O$

$E°_{o_2 / H_2O} = +1.223V$

Will the permanganate ion, MnO_4^- liberate O_2 from water in the presence of an acid ?

[4 Marks]

(A) Yes, because E°_cell = +2.733V

(B) No, because E°_cell = -0.287 V

(C) Yes, because E°_cell = +0.287V

(D) No, because E°_cell = -2.733V

Explanation:

$[MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O] \times 2$

$E°_MnO_4^-/Mn^{2+} = +1.510$ V

$[H_2O \rightarrow (½)O_2 + 2H^+ + 2e^-] \times 5$

$E°_H_2O/O_2 = -1.223$ V

$2MnO_4^- + 6H^+ \rightarrow 2Mn^{2+} + (5/2)\ O_2 + 3H_2O$

E°_cell = +1.510 V − 1.223 V = 0.287 V

Question 83.

Match List-I with List-II.

[4 Marks]

	List-I		List-II
(A)	Li	(i)	absorbent for carbon dioxide
(B)	Na	(ii)	electrochemical cells
(C)	KOH	(iii)	coolant in fast breeder reactors
(D)	Cs	(iv)	photoelectric cell

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

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

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

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

Explanation:

(a) Li is used in electrochemical cells. (b) Na is used as a coolant in fast breeder reactors because liquid metal atoms are weak neutron moderators. (c) KOH can absorb CO_2 to form K_2CO_3. (d) Cs is

used in photoelectric cell due to low ionisation enthalpy.

Question 84.

Given below are two statements:

Statement I: The acidic strength of monosubstituted nitrophenol is higher than phenol because of electron withdrawing nitro group.

Statement II: o-nitrophenol, m-nitrophenol and p-nitophenol will have same acidic strength as they have one nitro group attached to the phenolic ring.

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

[4 Marks]

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

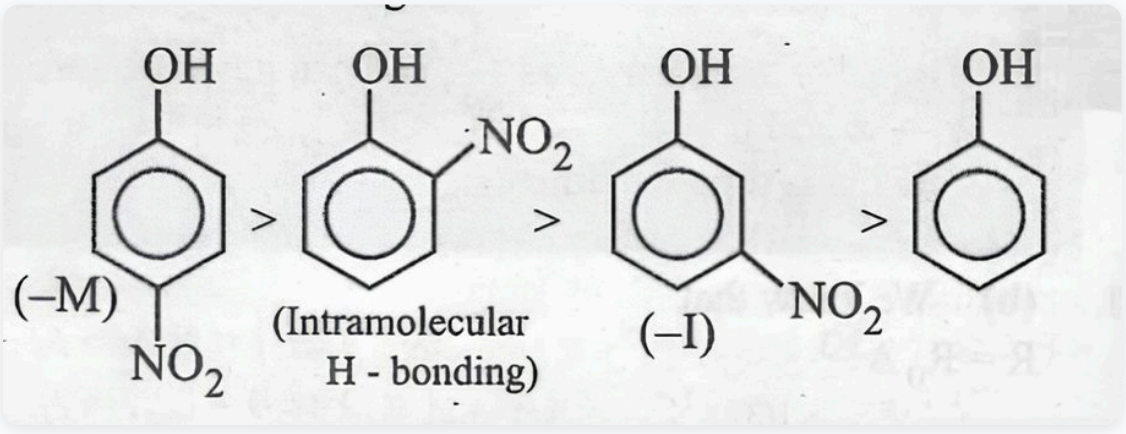
(B) Both Statement I and Statement II are incorrect.

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

(D) Both statement I and statement II are correct.

Explanation:

Electron withdrawing group increases the acidic character while electron donating group decreases the acidic character, More the number of electron withdrawing group, more will be acidic strength. Order of acidic strength



Question 85.

The pollution due to oxides of sulphur gets enhanced due to the presence of:

(A) particulate matter

(B) ozone

(C) hydrocarbons

(D) hydrogen peroxide Choose the most appropriate answer from the options given below:

[4 Marks]

(A) (a), (d) only

(B) (a), (c), (d) only

(C) (a),(b),(d) only

(D) (b), (c), (d) only

Explanation:

The presence of particulate matter in polluted air catalyses the oxidation of sulphurdioxide to sulphur trioxide.

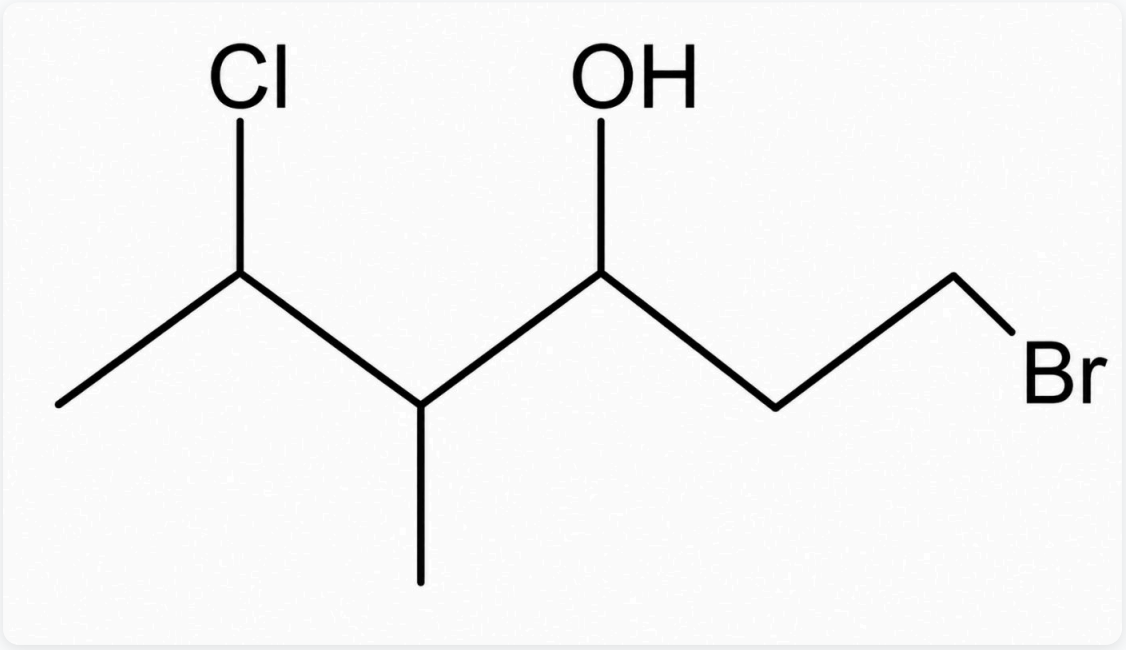
$2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$

The reaction can also be promoted by ozone and hydrogen peroxide. $SO_2(g) + O_3(g) \rightarrow SO_3(g) + O_2(g)$ $SO_2(g) + H_2O_2(l) \rightarrow H_2SO_4(aq)$

Question 86.

The correct IUPAC name of the following compound is:

[4 Marks]



(A) 1-bromo-4-methyl-5-chlorohexan-3-ol

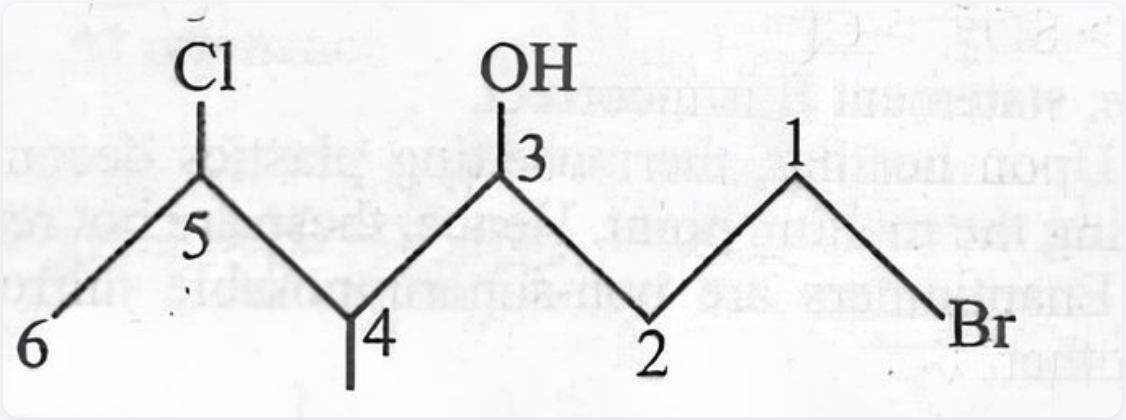
(B) 6 bromo-2-chloro-4 methylhexan-4-ol

(C) 6-bromo-4-methyl-2-chlorohexan-4-ol

(D) 1-bromo-5-chloro-4-methylhexan-3-ol

Explanation:

IUPAC name: 1-Bromo-5-chloro-4-methylhexan-3-ol



Question 87.

$3O_2(g) \rightleftharpoons 2O_3(g)$ for the above reaction at 298 K, K_C is found to be 3.0×10^{-59}. If the concentration of O_2 at equilibrium is 0.040 M then concentration of O_3 in M is

[4 Marks]

(A) 1.2×10^{21}

(B) 4.38×10^{-32}

(C) 1.9×10^{-63}

(D) 2.4×10^{31}

Explanation:

he given reaction is: $3O_2(g) \rightleftharpoons 2O_3(g)$ $K_c = [O_3]^2 / [O_2]^3$ $3 \times 10^{-59} = [O_3]^2 / (4 \times 10^{-2})^3$ $[O_3]^2 = 3 \times 10^{-59} \times 64 \times 10^{-6}$ $[O_3] = \sqrt{(19.2 \times 10^{-64})}$ $[O_3] = 4.38 \times 10^{-32}$ M

Question 88.

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

[4 Marks]

Match List-I with List-II

	List-I (Ores)		List-II (Composition)
(A)	Haematite	(i)	Fe_3O_4
(B)	Magnetite	(ii)	$ZnCO_3$
(C)	Calamine	(iii)	Fe_2O_3
(D)	Kaolinite	(iv)	$[Al_2(OH)_4Si_2O_5]$

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

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

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

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

Explanation:

The chemical composition of Haematite is Fe_2O_3 The chemical composition of Magnetite is Fe_3O_4 The chemical composition of Calamine is $ZnCO_3$ The chemical composition of Kaolinito is $[Al_2(OH)_4Si_2O_5]$

Question 89.

Given below are two statements:

Statement I: In Lucas test, primary, secondary and tertiary alcohols are distinguished on the basis of their reactivity with cone. HCI + $ZnCl_2$, known as Lucas Reagent.

Statement II: Primary alcohols are most reactive and immediately produce turbidity at room temperature on reaction with Lucas Reagent.

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.

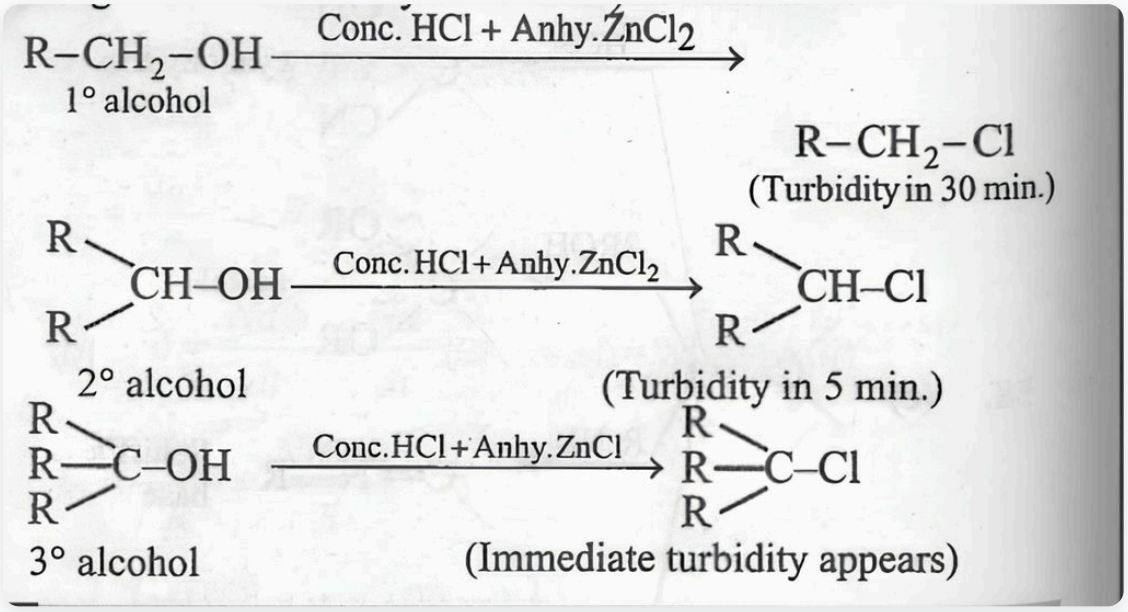
(B) Statement I is incorrect but statement II is correct.

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

(D) Both statement I and statement II are incorrect.

Explanation:

Lucas test is used to distinguished between 1°, 2° and 3° alcohol on the basis of time taken for turbidity to appear by using a solution of anhydrous $ZnCl_2$ in cone. HCl.



Question 90.

In the neutral or faintly alkaline medium, $KMnO_4$ oxidises iodide into iodate. The change in oxidation state of manganese in this reaction is from

[4 Marks]

(A) + 7 to + 4

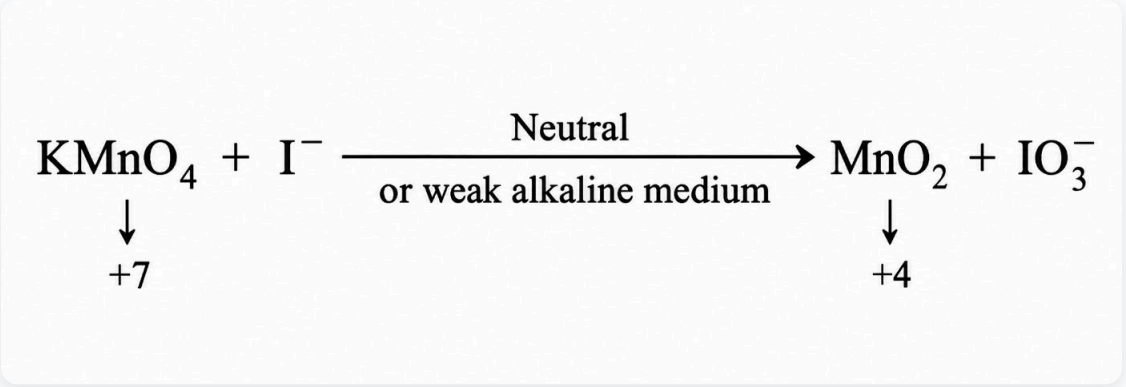
(B) + 7 to + 3

(C) + 6 to + 4

(D) + 6 to + 5

Explanation:

The reaction of potassium permanganate in neutral or weak alkaline medium is $KMnO_4$ oxidises iodide to iodate in neutral or weak alkaline medium so, the O.S. of Mn changes from + 7 to + 4.



Question 91.

For a first order reaction A → Products, initial concentration of A is 0.1 M, which becomes 0.001 M after 5 minutes. Rate constant for the reaction in min^{-1} is

[4 Marks]

(A) 0.4606

(B) 0.9212

(C) 0.2303

(D) 1.3818

Explanation:

A → Products Given: Initial conc.

$[A_0]$ =0.1 M

Con. After 5 min $[A_t]$ = 0.001 M

t = 5 min. For first order reaction

k = (2.303 / t) log

$[A_0] / [A_t]$ = (2.303 / 5)log (0.1 /0.001) k = 0.9212 min^{-1}

Question 92.

Compound X on reaction with O_3 followed by Zn/H_2O gives formaldehyde and 2-methyl propanal as products. The compound X is:

[4 Marks]

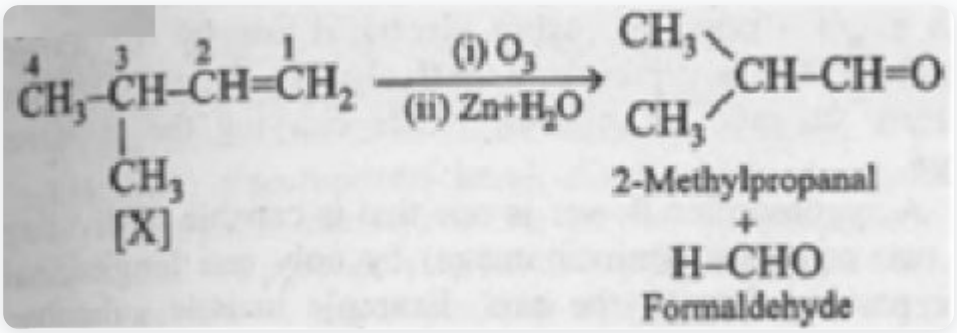
(A) 3-Methylbut-1-ene

(B) Pent-2-ene

(C) 3-Methylbut-2-ene

(D) 2-Methylbut-1-ene

Explanation:



Question 93.

A 10.0 L flask contains 64 g of oxygen at 27°C. (Assume O_3 gas is behaving ideally). The pressure inside the flask in bar is (Given R =0.0831 L bar K^{-1} mol^{-1})

[4 Marks]

(A) 2.5

(B) 4.9

(C) 49.8

(D) 498.6

Explanation:

Given: V=10.0L W_{o_2} = 64g

n_{o_2} = 2 mol

L bar $K^{-1}mol^{-1}$

T = 27°C

R = 0.0831

Ideal gas equation; PV =nRT

P = 2 × 0.0831 × 300 / 10.0

P = 4.9 bar

Question 94.

The order of energy absorbed which is responsible for the colour of complexes

(A) $[Ni(H_2O)_2(en)_2]^{2+}$

(B) $[Ni(H_2O)_4(en)]^{2+}$

(C) $[Ni(en)_3]^{2+}$

[4 Marks]

(A) (C)>(B)>(A)

(B) (A)>(B)>)C)

(C) (B)>(A)>(C)

(D) (C)>(A)>(B)

Explanation:

(A) $[Ni(H_2O)_2(en)_2]^{2+}$

(B) $[Ni(H_2O)_4(en)]^{2+}$

(C) $[Ni(en)_3]^{2+}$

en behaves as SFL while H_2O behaves as WFL In option (C); number of en (strong ligand) increase, which increases the splitting and absorb maximum eenrgy. So, Δ_0 increases.

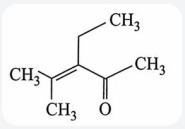
Notes SFL increases the splitting and abosrb maximum energy while WFL decreases the splitting energy.

Question 95.

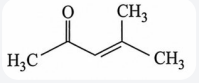
Which one of the following is not formed when acetone reacts with 2-pentanone in the presence of dilute NaOH followed by heating?

[4 Marks]

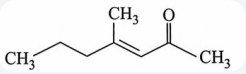
(A) c



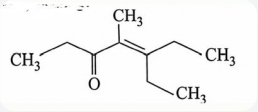
(B) d



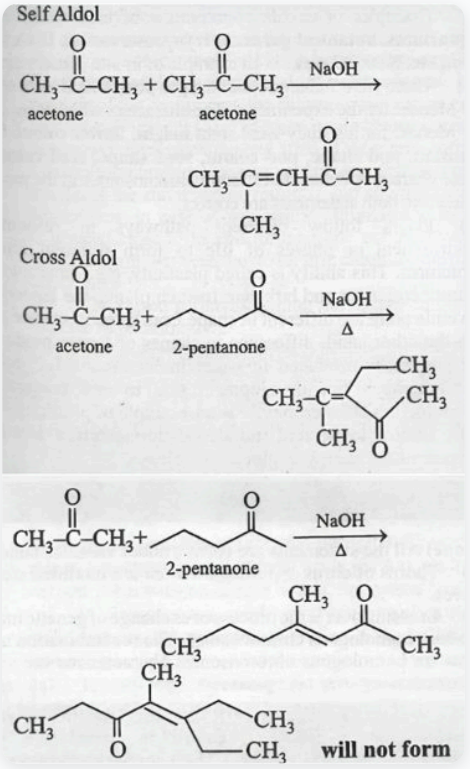
(C) b



(D) a



Explanation:



Question 96.

Find the emf of the cell in which the following reaction takes place at 298 K. Ni(s) + $2Ag^{+}$(0.001M) → Ni^{2+}(0.001 M) + 2Ag(s)

(Given that E°_cell = 10.5V, 2.303RT / F = 0.059 at 298 K)

[4 Marks]

(A) 1.385 V

(B) 0.9615 V

(C) 1.05 V

(D) 1.0385 V

Explanation:

(None) Ni(s) + $2Ag^{+}$ (0.001 M) → Ni^{2+} (0.001 M) + 2Ag(s)

$E_{cell} = E°_{cell} - 0.059 / n \log [Ni^{2+}] / [Ag^{+}]^2$

$E_{cell} = 10.5 - 0.059 \log (10^{-3}) / (10^{-3})^2$

$= 10.5 - 0.059 \log 10^{+3} =$

$= 10.5 - 0.059/2 \times 3 = 10.4115$ V

(Calculated answer is not given in options)

Question 97.

If radius of second Bohr orbit of the He^+ ion is 105.8 pm, what is the radius of third Bohr orbit of Li^{2+} ion?

[4 Marks]

(A) 158.7 pm

(B) 158. 7 Å

(C) 15.87 pm

(D) 1.587 pm

Explanation:

According to Bohr's atomic model $r \propto n^2 / z$ 3rd orbit of Li^{2+} $n_1 = 3$

$z_1 = 3 \Rightarrow 2^{nd}$ orbit of He^+ $n_2 = 2$

$z_2 = 2$

$(r_3)_{Li^{2+}} / (r_2)He^+ (n_1^2 / n_2^2) \times z_2 / z_1$

$(r_3)_{Li^{2+}} / 105.8$ pm$= (3)^2 / (2)^2 \times 2 / 3$

$(r_3)_{Li^{2+}} = 158.7$ pm

Question 98.

Copper crystallises in fec unit cell with cell edge length of 3.608×10^{-8} cm. The density of copperis 8.92 g cm^{-3} Calculate the atomic mass of copper.

[4 Marks]

(A) 63.1 u

(B) 60 u

(C) 31.55 u

(D) 65 u

Explanation:

Given: Edge Length (a) = 3.608×10^{-8} cm Density of copper (d) = 8.92

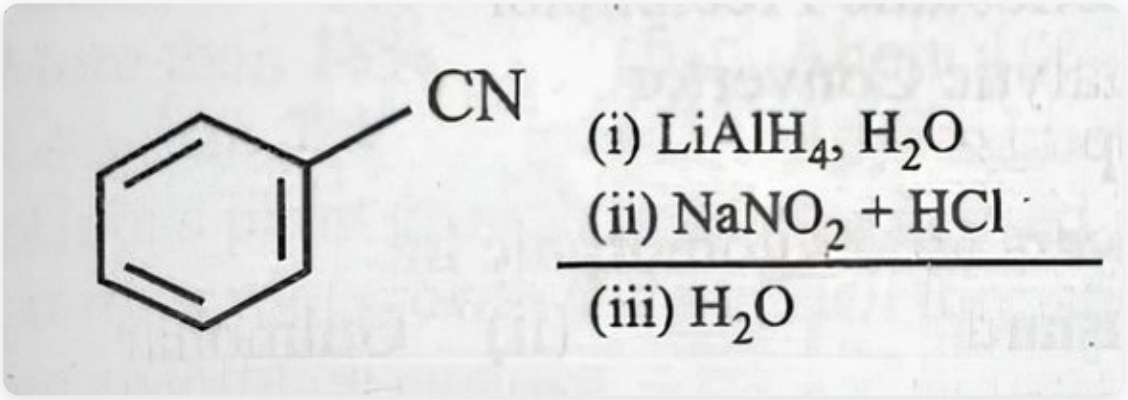
In fcc crystal structure, the value of z is 4. $d = z \times M / N_A \times a^3$

$8.92 = 4 \times M / 6.022 \times 10^{23} \times (3.608 \times 10^{-8})^3$ $M = (8.92 \times 6.022 \times 10^{23} / 4) \times 46.96 \times 10^{-24}$ M = 63.1 g/mol (Molar Atomic Mass) M = 63.1 u (Atomic Mass)

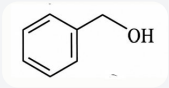
Question 99.

The product formed from the following reaction sequence is

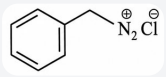
[4 Marks]



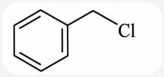
(A) c



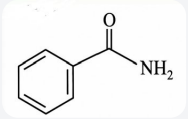
(B) a



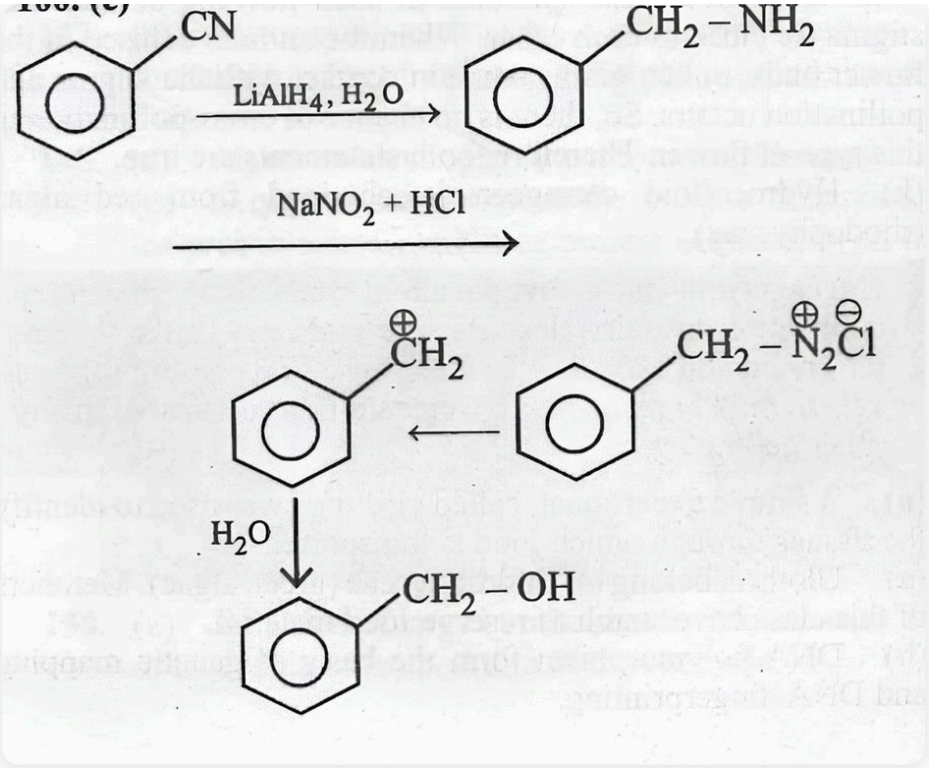
(C) b



(D) d



Explanation:



Question 100.

Read the following statements about the vascular bundles:

(i) In roots, xylem and phloem in a vascular bundle are arranged in an altenate manner along the different radii.

(ii) Conjoint closed vascular bundles do not possess cambium

(iii) In open vascular bundles, cambium is present in between xylem and phloem

(iv) The vascular bundles of dicotyledonous stem possess endarch protoxylem

(v) In monocotyledonous root, usually there are more than six xylem bundles present Choose the correct answer from the options given below :

[4 Marks]

(A) (i), (ii) and (iv) only

(B) (i), (ii), (iii) and (iv) only

(C) (i), (ii), (iv) and (v) only

(D) (ii), (iii), (iv) and (v) only

Explanation:

All the statements are correct about vascular bundles.

Question 101.

Identify the correct set of statements:

(i) The leaflets are modified into pointed hard thorns in Citrus and Bougainvillea

(ii) Axillary buds form slender and spirally coiled tendrils in cucumber and pumpkin

(iii) Stem is flattened and fleshy in Opuntia and modified to perform the function of leaves

(iv) Rhizophora shows vertically upward growing roots that help to get oxygen for respiration

(v) . Subaerially growing stems in grasses and strawberry help in vegetative propagation Choose the correct answer from the options given below:

[4 Marks]

(A) (i) and (iv) Only

(B) (ii), (iii),(iv) and (v) Only

(C) (ii) and (iii) Only

(D) (i), (ii), (iv) and (v) Only

Explanation:

Thorns of citrus and Bougainvillea are modified stem not leaves.

Question 102. The appearance of recombination nodules on homologous chromosomes during meiosis characterizes:

[4 Marks]

(A) Bivalent

(B) Sites at which crossing over occurs

(C) Terminalization

(D) Synaptonemal complex

Explanation: Crossing over is the process of exchange of genetic material between homologous chromosomes. The recombination nodule show on homologous chromosomes characterizes the sites at which crossing over take place.

Question 103.

Read the following statements and choose the set of correct statements:

(i) Euchromatin is loosely packed chromatin

(ii) Heterochromatin is transcriptionally active

(iii) Histone octomer is wrapped by negatively charged DNA in nucleosome

(iv) Histones are rich in lysine and arginine

(v) Atypical nucleosome contains 400 by of DNA helix

Choose the correct answer from the options given below:

[4 Marks]

(A) (i), (iii), (iv) only

(B) (ii),(v) Only

(C) (i), (iii), (v) only

(D) (ii), (iv) , (v) only

Explanation:

Heterochromatin is highly condensed, gene-poor, and transcriptionally silent, whereas euchromatin is less condensed, gene-rich, and more easily transcribed. So, option b is not correct. A typical nucleosome contains 200 bp of DNA helix. So, option e is not correct.

Question 104.

Given below are two statements :

Statement I: The primary CO_2 acceptor in C_4 plants is phosphoenolpyruvate and is found in the mesophyll cells.

Statement II: Mesophyll cells of C_4 plants lack RuBisCo enzyme.

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

[4 Marks]

(A) Statement Iis incorrect but Statement II is correct

(B) Both Statement I and Statement II are correct

(C) Both Statement I and Statement II are incorrect

(D) Both Statement I and Statement II are incorrect

Explanation:

The primary CO_2 acceptor is a 3-carbon molecule phosphoenol pyruvate (PEP) and is present in the mesophyll cells. The enzyme responsible for this fixation is PEP carboxylase or PEPcase. It is important to register that the mesophyll cells lack RuBisCO enzyme. The C4 acid OAA is formed in the mesophyll cells. Therefore, both the statements are correct.

Question 105.

Identify the incorrect statement related to Pollination:

[4 Marks]

(A) Pollination by water is quite rare in flowering plants

(B) Moths and butterflies are the most dominant pollinating agents among insects

(C) Pollination by wind is more common amongst abiotic pollination

(D) Flowers produce foul odours to attract flies and beetles to get pollinated

Explanation:

Bees are the most common pollination agent. Therefore, Moths and butterflies are the most dominant pollinating agents among insects

Question 106.

Which one of the following statement is not true regarding get electrophoresis technique?

[4 Marks]

(A) Bright orange coloured bands of DNA can be observed in the gel when exposed to UV light.

(B) The process of extraction of separated DNA strands from gel is called elution.

(C) The presence of chromogenic substrate gives blue coloured DNA bands on the gel.

(D) The separated DNA fragments are stained by using ethidium bromide

Explanation:

The separated DNA fragments can be visualised only after staining the DNA with a compound known as ethidium bromide followed by exposure to UV radiation. So, The presence of chromogenic substrate gives blue coloured DNA bands on the gel is not correct.

Question 107.

Habitat loss and fragmentation, over exploitation, alien species invasion and co-extinction are causes for:

[4 Marks]

(A) Population explosion

(B) Natality

(C) Competition

(D) Biodiversity loss

Explanation:

Habitat loss and fragmentation, over-exploitation are the causes for loss in biodiversity.

Question 108.

Production of Cucumber has increased manifold in recent years. Application of which of the following phytohormones has resulted in this increased yield as the hormone is known to produce female flowers in the plants:

[4 Marks]

(A) Ethylene

(B) Gibberellin

(C) Cytokinin

(D) ABA

Explanation:

Ethephon is the compound which is the source of Ethylene hormone. The ethehone promotes female flowers in cucumbers thereby increasing their yield. So, ethylene is correct answer.

Question 109.

What is the net gain of ATP when each molecule of glucose is converted to two molecules of pyruvic acid ?

[4 Marks]

(A) Eight

(B) Six

(C) Two

(D) Four

Explanation:

During glycolysis 2 ATP molecules are used up and four ATP molecules are generated. So, there are only 2 ATPs net gain when each molecule of glucose is converted into 2 molecules of plyruvic acid.

Question 110.

Given below are two statements:

Statement I: Cleistogamous flowers are invariably autogamous

Statement II: Cleistogamy is disadvantageous as there is no chance for cross pollination.

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 correct

(B) Both Statement I and Statement II are incorrect

(C) Both Statement I and Statement II are correct

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

Explanation:

Cleistogamy is the phenomenon, where flowers never open and in such flowers, only self-pollination occurs within the bud (unopened flower). Bisexual flowers which do not open at all are called cleistogamous. In such flowers, anthers and stigma lie close to each other. When the anthers dehisce in the flower buds, pollen grains come in contact with the stigma and pollination occurs. So, there is no chance of cross-pollination in this type of flower. Therefore, both statements are true.

Question 111.

Hydrocolloid carrageen is obtained from

[4 Marks]

(A) Rhodophyceae only

(B) Phaeophyceae and Rhodophyceae

(C) Phaeophyceae only

(D) Chlorophyceae and Phaeophyceae

Explanation:

Hydrocolloid carrageen is obtained from red algae (rhodophyceae).

Question 112.

"Girdling Experiment" was performed by Plant Physiologists to identify the plant tissue through which:

[4 Marks]

(A) food is transported

(B) osmosis is observed

(C) water is transported

(D) for both water and food transportation

Explanation:

A simple experiment called girdling, was used to identify the tissues through which food is transported.

Question 113.

Which of the following is incorrectly matched?

[4 Marks]

(A) Ectocarpus - Fucoxanthin

(B) Volvox - Starch

(C) Ulothrix - Mannitol

(D) Porphyra - Floridian Starch

Explanation:

Ulothrix belong to Chlorophyceae (green algae). Members of this class have starch as reserve food material.

Question 114.

DNA polymorphism forms the basis of:

[4 Marks]

(A) Both genetic mapping and DNA finger printing

(B) Genetic mapping

(C) Translation

(D) DNA finger printing

Explanation:

DNA polymorphism form the basis of genetic mapping and DNA fingerprinting.

Question 115.

Match List-I with List-II.

[4 Marks]

List-I		List-II	
(A)	Manganese	(i)	Activates the enzyme catalase
(B)	Magnesium	(ii)	Required for pollen germination
(C)	Boron	(iii)	Activates enzymes of respiration
(D)	Iron	(iv)	Functions in splitting of water during photosynthesis

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

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

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

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

Explanation:

Manganese help in splitting of water during photosynthesis.
Magnesium activates the enzyme of respiration. Boron is required for pollen germination. Iron activates the catalase enzyme.

Question 116.

The process of translation of mRNA to proteins begins as soon as :

[4 Marks]

(A) Both the subunits join together to bind with mRNA

(B) The larger subunit of ribosome encounters mRNA

(C) The tRNA is activated and the larger subunit of ribosome encounters mRNA

(D) The small subunit of ribosome encounters mRNA

Explanation:

The process of translation of mRNA to protein begins as soon small unit of ribosome encounters Mrna.

Question 117.

The device which can remove particulate matter present in the exhaust from a thermal power plant is:

[4 Marks]

(A) Incinerator

(B) Electrostatic Precipitator

(C) Catalytic Convertor

(D) STP

Explanation:

An electrostatic precipitator (ESP) removes particles from a gas stream by using electrical energy to charge particles either positively or negatively. The charged particles are then attracted to collector plates carrying the opposite charge.

Question 118.

The flowers are Zygomorphic in:
(i) Mustard (ii) Gulmohar
(iii) Cassia (iv) Datura
(v) Chilly
Choose correct answer from the options given below

[4 Marks]

(A) (iii), (iv), (v) Only

(B) (i), (ii), (iii) Only

(C) (iv), (v) Only

(D) (ii), (iii) Only

Explanation:

A zygomorphic flower is one that is capable of dividing into two equal parts (mirror image) by only one longitudinal plane passing through the axis. Example include gulmohar, Cassia.

Question 119.

Given below are two statements; one is labelled as Assertion (A) and the other is labelled as Reason (R).
Assertion (A): Polymerase chain reaction is used in DNA amplification.
Reason (R): The ampicillin resistant gene is used as a selectable marker to check transformation.
In the light of the above statements, choose the correct answer from the options given below:

[4 Marks]

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

(B) (A) is not correct but (R) is correct

(C) (A) is correct but (R) is not correct

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

Explanation:

PCR (polymerase chain reaction) is used in DNA amplification. So, this is true. Ampicillin resistant gene is used as a selectable marker. Therefore, both A and R are correct, but R is not the correct explanation of A.

NOTES
Polymerase chain reaction (abbreviated PCR) is a laboratory technique for rapidly producing (amplifying) millions to billions of copies of a specific segment of DNA, which can then be studied in greater detail. PCR involves using short synthetic DNA fragments called primers to select a segment of the genome to be amplified, and then multiple rounds of DNA synthesis to amplify that segment.

Question 120.

Which one of the following statements cannot be connected to Predation?

[4 Marks]

(A) It is necessitated by nature to maintain the ecological balance

(B) It might lead to extinction of a species

(C) It helps in maintaining species diversity in a community

(D) Both the interacting species are negatively impacted

Explanation:

Predation is a biological interaction where one organism, the predator, kills and eats another organism, its prey. In predation, one species is benefitted and other is harmed.

Question 121.

Which one of the following never occurs during mitotic cell division?

[4 Marks]

(A) Spindle fibres attach to kinetochores of chromosomes

(B) Pairing of homologous chromosomes

(C) Coiling and condensation of the chromatids

(D) Movement of centrioles towards opposite poles

Explanation:

Mitosis occurs in somatic cells; this means that it takes place in all types of cells that are not involved in the production of gametes. Prior to each mitotic division, a copy of every chromosome is created; thus, following division, a complete set of chromosomes is found in the nucleus of each new cell. So, it do not include pairing of homologous chromosomes.

Question 122.

Which of the following is not a method of ex situ conservation?

[4 Marks]

(A) In vitro fertilization

(B) Cryopreservation

(C) Micropropagation

(D) National Parks

Explanation:

Examples of ex-situ conservation of biodiversity include aquariums, botanical gardens, cryopreservation, DNA banks, zoos, etc. National parks is an example of in-situ conservation.

Question 123.

Given below are two statements:

Statement I: Mendel studied seven pairs of contrasting traits in pea plants and proposed the Laws of Inheritance

Statement II: Seven characters examined by Mendel in his experiment on pea plants were seed shape and colour, flower colour, pod shape and colour, flower position and stem height

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 incorrect

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

(C) Both Statement I and Statement II are incorrect

(D) Both Statement I and Statement II are correct

Explanation:

There were 7 characters of the pea plant which were selected by Mendel for the experiments. The characters which were chosen by Mendel for his study were stem height, flower colour, flower position, pod shape, pod colour, seed shape, seed colour. All these characters belong to different chromosomes in the pea plant. Therefore both statements are correct.

Question 124.

Which one of the following plants does not show plasticity?

[4 Marks]

(A) Maize

(B) Buttercup

(C) Cotton

(D) Coriander

Explanation:

Plants follow different pathways in response to environment or phases of life to form different kinds of structures. This ability is called plasticity, e.g., heterophylly in cotton, coriander and larkspur. In such plants, the leaves of the juvenile plant are different in shape from those in mature plants. On the other hand, difference in shapes of leaves produced in air and those produced in water in buttercup also represent the heterophyllous development due to environment. This phenomenon of heterophylly is an example of plasticity.

Question 125.

What amount of energy is released from glucose during lactic acid fermentation?

[4 Marks]

(A) More than 18%

(B) Approximately 15%

(C) About 10%

(D) Less than 7%

Explanation:

In both lactic acid and alcohol fermentation, less than 7 percent of the energy in glucose is released.

NOTES
Lactic acid fermentation is a metabolic process by which glucose or other six-carbon sugars (also, disaccharides of six-carbon sugars, e.g. sucrose or lactose) are converted into cellular energy and the metabolite lactate, which is lactic acid in solution.

Question 126.

The gaseous plant growth regulator is used in plants to :

[4 Marks]

(A) promote root growth and root hair formation to increase the absorption surface

(B) kill dicotyledonous weeds in the fields

(C) speed up the malting process

(D) help overcome apical dominance

Explanation:

Ethylene is the gaseous hormone that promotes root growth and root hair formation.

Question 127.

Which of the following is not observed during apoplastic pathway?

[4 Marks]

(A) The movement does not involve crossing of cell membrane

(B) The movement is aided by cytoplasmic streaming

(C) Apoplastic is continuous and does not provide any barrier to water movement

(D) Movement of water occurs through intercellular spaces and wall of the cells.

Explanation:

In the apoplast pathway, water is transported from root hair to xylem through the cell wall of intervening cells. Apoplastic water movement beyond the cortex is blocked by the Casparian strip of endodermal cells. Cytoplasmic streaming is involved symplast pathway.

Question 128.

Which one of the following is not true regarding the release of energy during ATP synthesis through chemiosmosis? It involves :

[4 Marks]

(A) Reduction of NADP to NADFI, on the stroma side of the membrane

(B) Breakdown of proton gradient

(C) Breakdown of electron gradient

(D) Movement of protons across the membrane to the stroma

Explanation:

Breakdown of electron gradient does not take place in chemiosmosis.

Question 129.

Which one of the following plants shows vexillary aestivation and diadelphous stamens?

[4 Marks]

(A) Solanum nigrum

(B) Pisum sativum

(C) Allium cepa

(D) Colchicum autumnale

Explanation:

Pisum Sativum show Vexillary aestivation and diadelphous stamens.

Question 130.

Given below are two statements:

Statement I: Decomposition is a process in which the detritus is degraded into simpler substances by microbes.

Statement II: Decomposition is faster if the detritus is rich in lignin and chitin

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 incorrect

(B) Both Statement I and Statement II are correct

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

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

Explanation:

decomposers break down complex organic matter into inorganic substances like carbon dioxide, water and nutrients and the process is called decomposition. In a particular climatic condition, decomposition rate is slower if detritus is rich in lignin and chitin, and quicker, if detritus is rich in nitrogen and water-soluble substances like sugars. So, statement (Statement I is correct but Statement II is incorrect) is not correct.

Question 131.

Which one of the following produces nitrogen fixing nodules on the root of Alnus?

[4 Marks]

(A) Frankia

(B) Beijerinckia

(C) Rhodospirillum

(D) Rhizobium

Explanation:

Frankia alni is a Gram-positive species of actinomycete filamentous bacterium that lives in symbiosis with actinorhizal plants in the genus Alnus. It is a nitrogen-fixing bacterium and forms nodules on the roots of alder trees.

Question 132.

Exoskeleton of arthropods is composed of:

[4 Marks]

(A) Cellulose

(B) Cutin

(C) Chitin

(D) Glucosamine

Explanation:

Exoskeleton of arthropods is made up of chitin.

Question 133.

XO type of sex determination can be found in:

[4 Marks]

(A) Birds

(B) Drosophila

(C) Grasshoppers

(D) Monkeys

Explanation:

XO type of sex-determination is found in grass-hoppers.

Question 134.

In old trees the greater part of secondary xylem is dark brown and resistant to insect attack due to:
(i) secretion of secondary metabolites and their deposition in the lumen of vessels.
(ii) deposition of organic compounds like tannins and resins in the central layers of stem.
(iii) deposition of suberin and aromatic substances in the outer layer of stem.
(iv) deposition of tannins, gum, resin and aromatic substances in the peripheral layers of stem.
(v) presence of parenchyma cells, functionally active xylem elements and essential oils
Choose the correct answer from the options given below:

[4 Marks]

(A) (i) and (ii) Only

(B) (ii) and (iv) only

(C) (iv) and (v) only

(D) (iii) and (iv) only

Explanation:

In old trees, greater part of secondary xylem is dark brown and resistant to insect is because of secretion of secondary metabolites and deposition of organic compounds.

Question 135.

Match List-I with List-II

[4 Marks]

List-I	List-II
(A) Metacentric	(i) Centromere situated close chromosome to the end forming one extremely short and one very long arms
(B) Acrocentric	(ii) Centromere at the terminal chromosome end
(C) Sub-metacentric	(iii) Centromere in the middle forming two equal arms of chromosomes
(D) Telocentric	(iv) Centromere slightly away chromosome from the middle forming one shorter arm and one longer arm

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

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

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

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

Explanation:

Every chromosome (visible only in dividing cells) essentially has a primary constriction or the centromere on the sides of which disc shaped structures called kinetochores are present (Figure 8.12). Centromere holds two chromatids of a chromosome. Based on the position of the centromere, the chromosomes can be classified into four types (Figure 8.13). The metacentric chromosome has middle centromere forming two equal arms of the chromosome. The sub- metacentric chromosome has centromere slightly away from the middle of the chromosome resulting into one shorter arm and one longer arm. In case of acrocentric chromosome the centromere is situated close to its end forming one extremely short and one very long arm, whereas the telocentric chromosome has a terminal centromere.

Question 136.

The entire fleet of buses in Delhi were converted to CNG from diesel. In reference to this, which one of the following statements is false?

[4 Marks]

(A) It is cheaper than diesel

(B) The same diesel engine is used in CNG buses making the cost of conversion low

(C) It can not be adulterated like diesel

(D) CNG burns more efficiently than diesel

Explanation:

CNG used different engine not diesel engine as it uses expensive technology.

Question 137.

Read the following statements on lipids and find out correct set of statements:
(i) Lecithin found in the plasma membrane is a glycolipid
(ii) Saturated fatty acids possess one or more C = C bonds
(iii) Gingely oil has lower melting point, hence remains as oil in winter
(iv) Lipids are generally insoluble in water but soluble in some organic solvents
(v) When fatty acid is esterified with glycerol, monoglycerides are formed

Choose the correct answer from the options given below:

[4 Marks]

(A) (i), (ii) and (iv) only

(B) (iii), (iv) and (v) only

(C) (i), (ii) and (iii) only

(D) (i), (iv) and (v) only

Explanation:

Lecithins are mixtures of glycerophospholipids including phosphatidylcholine, phosphatidylethanolamine, phosphatidyl-inositol, phosphatidylserine and phosphatidic acid. So, option a is not correct. Saturated fatty acids (SFAs) are made up of a carbon chain with no double bonds. So, option (iii), (iv) and (v) only is not correct.

Question 138.

The anatomy of springwood shows some peculiar features.
Identify the correct set of statements about springwood.
(i) It is also called as the earlywood
(ii) In spring season cambium produces xylem elements with narrow vessels
(iii) It is lighter in colour
(iv) The springwood along with autumnwood shows alternate concentric rings forming annual rings
(v) It has lower density
Choose the correct answer from the options given below:

[4 Marks]

(A) (i), (ii) and (iv) only

(B) (i), (iii), (iv) and (v) only

(C) (iii), (iv) and (v) only

(D) (i), (ii), (iv) and (v) only

Explanation:

In spring season, cambium produces xylem elements with wider vessels. So, option b is not correct. Rest all statements are
correct.

Question 139.

Transposons can be used during which one of the following?

[4 Marks]

(A) Gene silencing

(B) Autoradiography

(C) Gene-sequencing

(D) Polymerase Chain Reaction

Explanation:

Transposon silencing is a form of transcriptional gene silencing targeting transposons. Transcriptional gene silencing is a product of histone modifications that prevent the transcription of a particular area of DNA. Transcriptional silencing of transposons is crucial to the maintenance of a genome.

Question 140.

Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
Assertion (A): Mendel's law of independent assortment does not hold good for the genes that are located closely on the same chromosome.
Reason (R): Closely located genes assort independently.
In the light of the above statements, choose the most appropriate answer from the options given below:

[4 Marks]

(A) (A) is not correct but (R) is correct

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

(C) (A) is correct but (R) is not correct

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

Explanation:

Mendel's law of independent assortment states that the alleles of two (or more) different genes get sorted into gametes independently of one another. In other words, the allele a gamete receives for one gene does not influence the allele received for another gene. This law does not hold good for the genes that are closely located. Therefore, assertion is correct and reason is not correct.

Question 141.

The following palindromic base sequences of DNA, which one can be cut easily by particular restriction enzyme?

[4 Marks]

(A) 5'GAATTC3' ; 3'CTTAAG5'

(B) 5'CTCAGT3' ; 3'GAGTCA5'

(C) 5'GATCAT3' ; 3'CTATGA5'

(D) 5'GTATTC3' ; 3'CATAAG5'

Explanation:

Restriction enzymes, also called restriction endonucleases, cut double stranded DNA molecules by cleaving phosphodiester bonds at palindromic sequences. This means that the majority of the restriction enzymes cut the DNA into fragments that are characterized by a twofold rotational symmetry. As in the first option, both the sequence are palindromic, so it will be the correct answer.

Question 142.

Which one of the following will accelerate phosphorus cycle?

[4 Marks]

(A) Volcanic activity

(B) Weathering of rocks

(C) Rai fall and storms

(D) Burning of fossil fuels

Explanation:

Phosphorus moves in a cycle through rocks, water, soil and sediments and organisms. Over time, rain and weathering cause rocks to release phosphate ions and other minerals. This inorganic phosphate is then distributed in soils and water. Plants take up inorganic phosphate from the soil.

Question 143.

Match the plant with the kind of life cycle it exhibits:

Choose the correct answer from the options given below:

[4 Marks]

4. Match the plant with the kind of life cycle it exhibits.

List-I		List-II	
(A)	Spirogyra	(i)	Dominant diploid sporophyte vascular plant, with highly reduced male or female gametophyte
(B)	Fern	(ii)	Dominant haploid free-living gametophyte
(C)	Funaria	(iii)	Dominant diploid sporophyte alternating with reduced gametophyte called prothallus
(D)	Cycas	(iv)	Dominant haploid leafy gametophyte alternating with partially dependent multicellular sporophyte

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

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

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

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

Explanation:

Spirogyra is a green algae which have dominant haploid – free living gametophyte. Fern is a pteridophyte having dominant sporophyte alternating with reduced gametophyte.

Question 144.

While explaining interspecific interaction of population, (+) sign is assigned for beneficial interaction, (−) sign is assigned for detrimental interaction and (0) for neutral interaction. Which of the following interactions can be assigned (+) for one species and (−) for another species involved in the interaction?

[4 Marks]

(A) Amensalism

(B) Commensalism

(C) Competition

(D) Predation

Explanation:

Predation, a “+/-” interaction, includes predator-prey, herbivore-plant, and parasitoid host interactions. These linkages are the prime movers of energy through food chains and are an important factor in the ecology of populations, determining mortality of prey and birth of new predators.

Question 145.

Addition of more solutes in a given solution will:

[4 Marks]

(A) lower its water potential

(B) make its water potential zero

(C) not affect the water potential at all

(D) raise its water potential

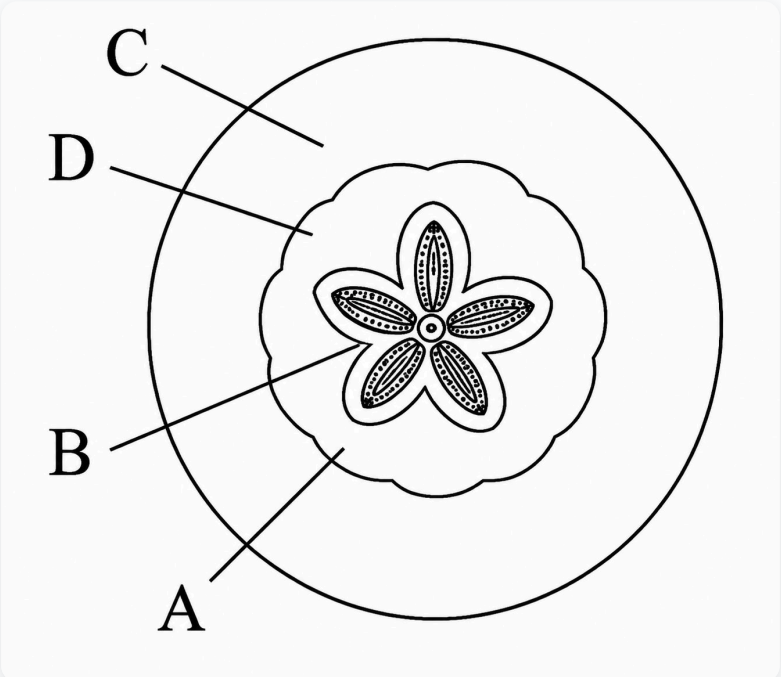
Explanation:

Addition of more solutes in a given solution will lower its water potential.

Question 146.

Which part of the fruit, labelled in the given figure makes it a false fruit?

[4 Marks]



(A) C → Thalamus

(B) B → Endocarp

(C) A → Mesocarp

(D) D → Seed

Explanation:

In few species, such as apple, strawberry, cashew, thalamus contribute to fruit formation and these fruits are known as false fruit.

Question 147.

Which of the following occurs due to the presence of autosome linked dominant trait?

[4 Marks]

(A) Thalessemia

(B) Sickle cell anaemia

(C) Haemophilia

(D) Myotonic dystrophy

Explanation:

Myotonic dystrophy is a autosomal dominant trait.

Question 148.

If a geneticist uses the blind approach for sequencing the whole genome of an organism, followed by assignment of function to different segments, the methodology adopted by him is called as:

[4 Marks]

(A) Expressed sequence tags

(B) Gene mapping

(C) Bioinformatics

(D) Sequence annotation

Explanation:

Sequence annotation is the process of marking specific features in a DNA, RNA or protein sequence with descriptive information about structure or function.

Question 149.

What is the role of large bundle shealth cells found around the vascular bundles in C_4 plants?

[4 Marks]

(A) To increase the number of chloroplast for the operation of Calvin cycle

(B) To provide the site for photorespiratory pathway (1)

(C) To protect the vascular tissue from high light intensity

(D) To enable the plant to tolerate high temperature

Explanation:

Function of large bundle sheath is to increase the number of chloroplast for operation of Calvin cycle.

Question 150.

Nitrogenous waste is excreted in the form of pellet or paste by:

[1 Marks]

(A) Hippocampus

(B) Pavo

(C) Ornithorhynchus

(D) Salamandra

Explanation:

Reptiles, birds, land snails and insects excrete nitrogenous wastes as uric acid in the form of pellet or paste with a minimum loss of water and are called uricotelic animals. Hence correct option is Pavo contains uric acid and excrete uric acid.

NOTES

Of the four major macromolecules in biological systems, both proteins and nucleic acids contain nitrogen. Excess nitrogen is excreted from the body. Nitrogenous wastes tend to form toxic ammonia, which raises the pH of body fluids. The formation of ammonia itself requires energy in the form of ATP and large quantities of water to dilute it out of a biological system. Animals that live in aquatic environments tend to release ammonia into the water. Animals that excrete ammonia are said to be ammonotelic. Terrestrial organisms have evolved other mechanisms to excrete nitrogenous wastes. The animals must detoxify ammonia by converting it into a relatively nontoxic form such as urea or uric acid. Mammals including humans, produce urea, whereas reptiles and many terrestrial

invertebrates produce uric acid. Animals that secrete urea as the primary nitrogenous waste are called ureotelic animals.

Question 151.

Select the incorrect statement with reference to mitosis:

[4 Marks]

(A) Spindle fibres attach to centromere of chromosome

(B) Chromosomes decondense at telophase.

(C) Splitting of centromere occurs at anaphase.

(D) All the chromosomes lie at the equator at metaphase.

Explanation:

Spindle fibres attach to kinetochores of chromosomes.

Question 152.

Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
Assertion (A): Osteoporosis is characterised by decreased bone mass and increased chances of fractures.
Reason (R): Common cause of osteoporosis is increased levels of estrogen.
In the light of the above statements, choose the most appropriate answer from the options given below:

[4 Marks]

(A) (A) is not correct but (R) is correct

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

(C) (A) is correct but (R) is not correct

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

Explanation:

Osteoporosis is a age-related disorder characterised by decreased bone mass and increased chances of fractures.
Common cause of osteoporosis is due to decreased levels of estrogen.

Question 153.

Under normal physiological conditions in human being every 100 ml of oxygenated blood can deliver _____ ml of O_2 to the tissues.

[4 Marks]

(A) 10 ml

(B) 2 ml

(C) 4 ml

(D) 5 ml

Explanation:

Every 100 ml of oxygenated blood can deliver around 5 ml of O_2 to the tissues under normal physiological conditions.

Question 154.

A dehydration reaction links two glucose molecules to produce maltose. If the formula for glucose is $C_6H_{12}O_6$, then what is the formula for maltose?

[4 Marks]

(A) $C_{12}H_{24}O_{12}$

(B) $C_{12}H_{22}O_{11}$

(C) $C_{12}H_{20}O_{10}$

(D) $C_{12}H_{24}O_{11}$

Explanation:

2 molecule of glucose is considered as maltose i.e. $C_{12}H_{24}O_{12}$. If water (H_2O) molecule is dehydrated from maltose then molecules of maltose considered as $C_{12}H_{22}O_{11}$.

Question 155.

In which of the following animals digestive tract has additional chambers like crop and gizzard?

[4 Marks]

(A) Corvus, Columba, Chameleon

(B) Pavo, Psittacula, Corvus

(C) Bufo, Balaenoptera, Bangarus

(D) Catla, Columba, Crocodilus

Explanation:

The digestive tract of birds has additional chambers, the crop and gizzard. Example: Corvus (Crow), Columba (Pigeon), Psittacula (Parrot), Struthio (Ostrich), Pavo (Peacock), Aptenodytes (Penguin), Neophron (Vulture).

Question 156.

Given below are two statements:
Statement I: The release of sperms into the seminiferous tubules is called spermiation.
Statement II: Spermiogenesis is the process of formation of sperms from spermatogonia.
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) Statement I is correct but Statement II is incorrect

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

(D) Both Statement I and Statement II are incorrect

Explanation:

The spermatids are transformed into spermatozoa (sperms) by the process called spermiogenesis. After spermiogenesis, sperms heads become embedded in the Sertoli cells, and are finally release from the seminiferous tubules by the process called spermiation.

Question 157.

Natural selection where more individuals acquire specific character value other than the mean character value, leads to:

[4 Marks]

(A) Disruptive change

(B) Random change

(C) Directional change

(D) Stabilising change

Explanation:

Natural selection can lead to stabilisation (in which more individuals acquire mean character value), directional change (more individuals acquire value other than the mean character value) or disruption (more individuals acquire peripheral character value at both ends of the distribution curve).

Question 158.

Which of the following statements with respect to Endoplasmic Reticulum is incorrect?

[4 Marks]

(A) In prokaryotes only RER are present

(B) SER are the sites for lipid synthesis

(C) RER has ribosomes attached to ER

(D) SER is devoid of ribosomes

Explanation:

The eukaryotic cells reveal the presence of a network or reticulum called the endoplasmic reticulum. The ER often shows ribosomes attached to their outer surface refer to the rough endoplasmic reticulum.

Question 159.

Which of the following is present between the adjacent bones of the vertebral column?

[4 Marks]

(A) Intercalated discs

(B) Areolar tissue

(C) Smooth muscle

(D) Cartilage

Explanation:

Cartilage is present between the adjacent bones of the vertebral column.

Question 160.

Which of the following functions is not performed by secretions from salivary glands?

[4 Marks]

(A) Control bacterial population in mouth

(B) Lubrication of oral cavity

(C) Digestion of disaccharides

(D) Digestion of complex carbohydrates

Explanation:

About 30 per cent of starch is hydrolysed here by this enzyme (optimum pH 6.8) into a disaccharide (in the form of maltose). Rest of the disaccharides are digested in stomach and small intestine. Lysozyme present in saliva acts as an antibacterial agent that prevents infections.

Question 161.

In an E.coli strain i gene gets mutated and its product can not bind the inducer molecule. If growth medium is provided with lactose, what will be the outcome?

[4 Marks]

(A) z, y, a genes will not be translated

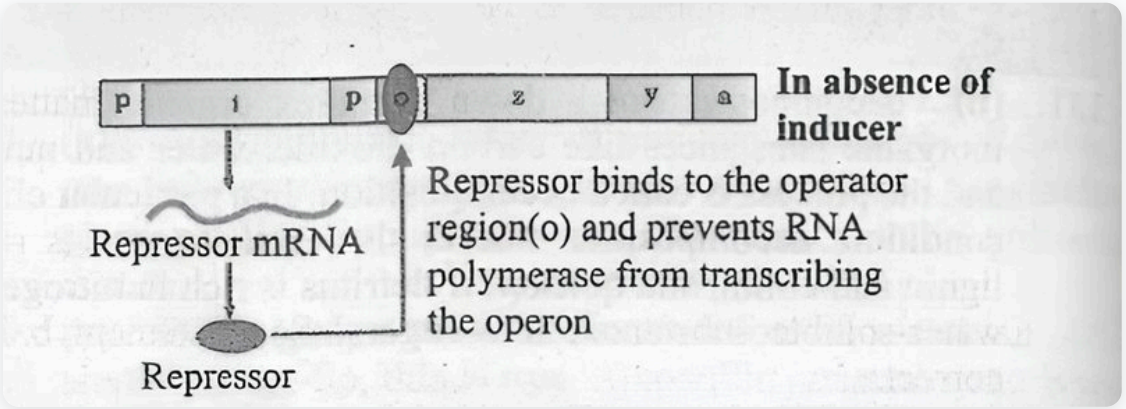
(B) z, y, a genes will be transcribed

(C) Only z gene will get transcribed

(D) RNA polymerase will bind the promoter region

Explanation:

If lactose is provided in the growth medium of the bacteria, the lactose is transported into the cells through the action of permease (Remember, a very low level of expression of lac operon has to be present in the cell all the time, otherwise lactose cannot enter the cells). The lactose then induces the operon in the following manner.



Question 162.

Identify the asexual reproductive structure associated with Penicillium:

[4 Marks]

(A) Buds

(B) Zoospores

(C) Gemmules

(D) Conidia

Explanation:

The asexual spores are conidia produced exogenously in ascomycetes, on the special mycelium called conidiophores. Hence, correct option is (Conidia) as Penicillium is the example of Ascomycetes.

Question 163.

If the length of a DNA molecule is 1.1 metres, what will be the approximate number of base pairs?

[4 Marks]

(A) 6.6×10^9 bp

(B) 6.6×10^6 bp

(C) 3.3×10^6 bp

(D) 3.3×10^9 bp

Explanation:

If the length of DNA double helix in a typical mammalian cell is calculated (simply by multiplying the total number of bp with distance between two consecutive bp, that is, 3.3 × 109 bp × 0.34 × 10^{-9} m/bp), it comes out to be approximately 1.1 metres. A length that is far greater than the dimensions of a typical nucleus (approximately 10^{-6} m).

Question 164.

Which of the following is not a connective tissue?

[4 Marks]

(A) Neuroglia

(B) Adipose tissue

(C) Cartilage

(D) Blood

Explanation:

Neuroglia, are non-neuronal cells in the central nervous system and the peripheral nervous system. They maintain homeostasis, form myelin, and provide support and protection for neurons. Hence, it is neural tissue not a connective tissue.

NOTES
Neuroglia are located throughout the CNS and PNS. In the CNS, the most important glial cells include astrocytes, microglia, oligodendrocytes, and ependymal cells.

Question 165.

Given below are two statements:
Statement I: Restriction endonucleases recognise specific sequence to cut DNA known as palindromic nucleotide sequence.
Statement II: Restriction endonucleases cut the DNA strand a little away from the centre of the palindromic site.

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) Statement I is correct but Statement II is incorrect

(C) Both Statement I and Statement II are incorrect

(D) Both Statement I and Statement II are correct

Explanation:

Both the statements are correct.

Question 166.

Detritivores breakdown detritus into smaller particles. This process is called:

[4 Marks]

(A) Catabolism

(B) Decomposition

(C) Fragmentation

(D) Humification

Explanation:

Detritivores (e.g., earthworm) break down detritus into smaller particles. This process is called fragmentation.

Question 167.

Which of the following statements are true spermatogenesis but do not hold true Oogenesis?

(i) It results in the formation of haploid gametes

(ii) Differentiation of gamete occurs after the completion of meiosis

(iii) Meiosis occurs continuously in a mitotically dividing stem cell population

(iv) It is controlled by the Luteinising hormone (LH) and Follicle Stimulating Hormone (FSH) secreted by the anterior pituitary

(v) It is initiated at puberty

Choose the most appropriate answer from the options given below:

[4 Marks]

(A) (ii), (iv) and (v) only

(B) (ii)and (iii) only

(C) (ii), (iii) and (v) only

(D) (iii) and (v) only

Explanation:

Oocytes start division and enter into prophase-I of the meiotic division and get temporarily arrested at that stage, called primary oocytes.
Oogenesis is initiated during the embryonic development stage when a couple of million gamete mother cells (oogonia) are formed within each fetal ovary; no more oogonia are formed and added after birth.

Question 168.

Given below are two statements:
Statement I: Fatty acids and glycerols cannot be absorbed into the blood.
Statement II: Specialized lymphatic capillaries called lacteals carry chylomicrons into lymphatic vessels and ultimately into the blood.
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 incorrect

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

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

(D) Both Statement I and Statement II are correct

Explanation:

Fatty acids and glycerol being insoluble, cannot be absorbed into the blood. They are first incorporated into small droplets called micelles which move into the intestinal mucosa. They are re-formed into very small protein coated fat globules called chylomicrons which are transported into the lymph vessels (lacteals) in the villi. These lymph vessels ultimately release the absorbed substances into the blood stream.

Question 169.

If ‘8’ Drosophila in a laboratory population of ‘80’ died during a week, the death rate in the population is individuals per Drosophila per week.

[4 Marks]

(A) 0.1

(B) zero

(C) 10

(D) 1.0

Explanation:

If 8 individuals in a laboratory population of 80 (Drosophila melanogaster) fruit flies died during a specified time interval, say a week, the death rate in the population during that period is 8/80 = 0.1 individuals per fruitfly per week.

Question 170.

Given below are two statements:
Statement I: The coagulum is formed of network of threads called thrombins.
Statement II: Spleen is the graveyard of erythrocytes.
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) Statement I is incorrect but Statement II is correct

(C) Both Statement I and Statement II are incorrect

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

Explanation:

Coagulum is formed mainly of a network of threads called fibrins in which dead and damaged formed elements of blood are trapped.

Spleen mainly contains lymphocytes and phagocytes. It acts as a filter of the blood by trapping blood-borne microorganisms.

Spleen also has a large reservoir of erythrocytes. Henc, also refer to the graveyard of erythrocytes.

Question 171.

Tegmina in cockroach, arises from:

[4 Marks]

(A) Metathorax

(B) Mesothorax

(C) Prothorax and Mesothorax

(D) Prothorax

Explanation:

Forewings (mesothoracic) called tegmina are opaque dark and leathery and cover the hind wings when at rest.

Question 172.

In the taxonomic categories which hierarchial arrangement in ascending order is correct in case of animals?

[4 Marks]

(A) Kingdom, Phylum, Class, Order, Family, Genus, Species

(B) Kingdom, Order, Phylum, Class, Family, Genus, Species

(C) Kingdom, Class, Phylum, Family, Order, Genus, Species

(D) Kingdom, Order, Class, Phylum, Family, Genus, Species

Explanation:

Taxonomical studies of all known organisms have led to the development of common categories such as kingdom, phylum or division (for plants), class, order, family, genus and species. (provide option are in descending order).

Question 173.

Identify the microorganism which is responsible. for the production of an immunosuppressive molecule cyclosporin A:

[4 Marks]

(A) Streptococcus cerevisiae

(B) Aspergillus niger

(C) Clostridium butylicum

(D) Trichoderma polysporum

Explanation:

Cyclosporin A is used as an immunosuppressive agent in organ-transplant patients, is produced by the fungus Trichoderma polysporum.

Question 174.

Which of the following is not the function of conducting part of respiratory system?

[4 Marks]

(A) Inhaled air is humidified

(B) Temperature of inhaled air is brought to body temperature

(C) Provides surface for diffusion of O_2 and CO_2

(D) It clears inhaled air from foreign particles

Explanation:

The part starting with the external nostrils up to the terminal bronchioles constitute the conducting part whereas the alveoli and their ducts form the respiratory or exchange part of the respiratory system. The conducting part transports the atmospheric air to the alveoli, clears it from foreign particles, humidifies and also brings the air to body temperature. Exchange

part is the site of actual diffusion of O_2 and CO_2 between blood and atmospheric air.

Question 175.

Lippe's loop is a type of contraceptive used as:

[4 Marks]

(A) Cervical barrier

(B) Copper releasing IUD

(C) Non—Medicated IUD

(D) Vault barrier

Explanation:

Intra Uterine Devices are presently available as the non-medicated IUDs (e.g., Lippes loop), copper releasing IUDs (CuT, Cu7, Multiload 375) and the hormone releasing IUDs (Progestasert, LNG-20)

Question 176.

Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).
Assertion (A): All vertebrates are chordates but all chordates are not vertebrates.Reason (R): Notochord is replaced by vertebral column
in the adult vertebrates.
In the light of the above statements, choose the most appropriate answer from the options given below :

[4 Marks]

(A) (A) is correct but (R) is not correct

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

Explanation:

The members of subphylum Vertebrata possess notochord during the embryonic period. The notochord is replaced by a cartilaginous or bony vertebral column in the adult. Thus all vertebrates are chordates but all chordates are not vertebrates.

Question 177.

Given below are two statements :
Statement I: Mycoplasma can pass through less than 1 micron filter size.
Statement II: Mycoplasma are bacteria with cell wall.
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) Both Statement I and Statement II are incorrect

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

Explanation:

Mycoplasma or PPLO can pass through less than 1 micron filter size. the prokaryotes have a cell wall surrounding the cell membrane except in mycoplasma.

Question 178.

Regarding Meiosis, which of the statements is incorrect?

[4 Marks]

(A) DNA replication occurs in S phase of Meiosis-II

(B) Pairing of homologous chromosomes and recombination occurs in Meiosis-I

(C) Four haploid cells are formed at the end of Meiosis-II

(D) There are two stages in Meiosis, Meiosis-I and II

Explanation:

M phase represent the phase when the actual cell division (Mitosis/ meiosis) occurs. During G1 phase the cell is metabolically active and continuously grows but does not replicate its DNA. Hence, S or synthesis phase marks the period during which DNA synthesis or replication takes place. During this time the amount of DNA per cell doubles.

Question 179.

In-situ conservation refers to:

[4 Marks]

(A) Conserve only extinct species

(B) Conserve only endangered species

(C) Conserve only high risk species

(D) Protect and conserve the whole ecosystem

Explanation:

When we conserve and protect the whole ecosystem, its biodiversity at all levels is protected - we save the entire forest to save the tiger. This approach is called in situ (on site) conservation.

Question 180.

At which stage of life the oogenesis process is initiated?

[4 Marks]

(A) Adult

(B) Puberty

(C) Birth

(D) Embryonic development stage

Explanation:

Oogenesis is initiated during the embryonic development stage when a couple of million gamete mother cells (oogonia) are formed within each fetal ovary; no more oogonia are formed and added after birth.

Question 181.

Which of the following is a correct match for disease and its symptoms?

[4 Marks]

(A) Myasthenia gravis - Genetic disorder resulting in weakening and paralysis of skeletal muscle

(B) Arthritis - Inflamed joints

(C) Muscular dystrophy - An autoimmune disorder causing progressive degeneration of skeletal muscle

(D) Tetany - high Ca^{2+} level causing rapid spasms.

Explanation:

Arthritis: Inflammation of joints.

Myastheniz gravis: Auto immune disorder affecting neuromuscular junction leading to fatigue, weakening and paralysis of skeletal muscle.
Muscular dystrophy: Progressive degeneration of skeletal muscle mostly due to genetic disorder.

Tetany: Rapid spasms (wild contractions) in muscle due to low Ca^{++} in body fluid.

Question 182.

Given below are two statements:
Statement I: Autoimmune disorder is a condition where body defense mechanism recognizes its own cells as foreign bodies.
Statement II: Rheumatoid arthritis is a condition where body does not attack self cells.
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 incorrect

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

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

(D) Both Statement I and Statement II are correct

Explanation:

two reason for causing auto immune disorder:

First, higher vertebrates can distinguish foreign molecules as well as foreign organisms. Most of the experimental immunology deals with this aspect. Second, sometimes due to genetic and other unknown reasons, the body attack self-cells. This results in damage to the body and is called auto-immune disease.

Rheumatoid arthritis which affects many people in our society is an auto-immune disease.

Question 183.

In gene therapy of Adenosine Deaminase (ADA) deficiency, the patient requires periodic infusion of genetically engineered lymphocytes because:

[4 Marks]

(A) Lymphocytes from patient's blood are grown in culture, outside the body.

(B) Gene isolated from marrow cells producing ADA is introduced into cells at embryonic stage.

(C) Retroviral vector is introduced into these lymphocytes.

(D) Genetically engineered lymphocytes are not immortal cells.

Explanation:

A functional ADA cDNA (using a retroviral vector) is introduced into the treated lymphocytes, which are subsequently returned to the patient. However, as these cells are not immortal, the patient requires periodic infusion of such genetically engineered lymphocytes.

Question 184.

Breeding crops with higher levels of vitamins and minerals or higher proteins and healthier fats is called:

[4 Marks]

(A) Bio-magnification

(B) Bio-remediation

(C) Bio-accumulation

(D) Bio-fortification

Explanation:

Biofortification is the process of breeding crops with higher levels of vitamins and minerals, or higher protein and healthier fats — is the most practical means to improve public health.

Question 185.

Which one of the following statements is correct?

[4 Marks]

(A) The tricuspid and the bicuspid valves open due to the pressure exerted by the simultaneous contraction of the atria

(B) Blood moves freely from atrium to the ventricle during joint diastole.

(C) Increased ventricular pressure. causes closing of the semilunar valves.

(D) The atrio-ventricular node (AVN) generates an action potential to stimulate atrial contraction

Explanation:

During cardiac cycle, As 'the ventricular pressure declines further, the tricuspid and bicuspid valves are pushed open by the pressure in the atria exerted by the blood which was being emptied into them by the veins. The blood moves freely to the ventricles. The ventricles and atria are again in a relaxed during joint diastole) state, as earlier.

Question 186.

Select the incorrect statement regarding synapses:

[4 Marks]

(A) The membranes of presynaptic and postsynaptic neurons are in close proximity in an electrical synapse.

(B) Impulse transmission across a chemical synapse is always faster than that across an electrical synapse.

(C) Chemical synapses use neurotransmitters

(D) Electrical current can flow directly from one neuron into the other across the electrical synapse.

Explanation:

Impulse transmission across an electrical synapse is always faster than that across a chemical synapse.

Question 187.

Select the incorrect statement with respect to acquired immunity.

[4 Marks]

(A) Acquired immunity is non-specific type of defense present at the time of birth.

(B) Primary response is produced when our body encounters a pathogen for the first time.

(C) Anamnestic response is due to memory of first encounter.

(D) Anamnestic response is elicited on subsequent encounters with the same pathogen.

Explanation:

Acquired immunity s pathogen specific. It is characterised by memory. This means when our body encounters a pathogen for the first time it produces a response in a low intensity (primary response). Subsequent encounter with the same pathogen elicits a highly intensified secondary or anamnestic response. This is ascribed to the fact that our body appears to have memory of the first encounter.

Question 188.

Match List-I with List-II.

Choose the correct answer from the options given below:

[4 Marks]

List-I (Biological Molecules)	List-II (Biological functions)
(A) Glycogen	(i) Hormone
(B) Globulin	(ii) Biocatalyst
(C) Steroids	(iii) Antibody
(D) Thrombin	(iv) Storage product

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

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

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

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

Explanation:

Glycogen — storage product

Globulin — antibody

Steroids - hormone

Thrombin — thrombin

Question 189.

Match List-I with List-II with respect to methods of Contraception and their respective actions.

Choose the correct answer from the options given
below:

[4 Marks]

	List-I		List-II
(A)	Diaphragms	(i)	Inhibit ovulation and Implantation
(B)	Contraceptive	(ii)	Increase phagocytosis of Pills sperm within Uterus
(C)	Intra uterine	(iii)	Absence of Menstrual Devices cycle and ovulation following parturition
(D)	Lactational	(iv)	They cover the cervix Amenorrhea blocking the entry of sperms

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

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

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

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

Explanation:

Diaphragms- they cover the cervix blocking the entry of sperms

Contraceptive pills — inhibit ovulation and implantation

Intra uterine devices — increases phagocytosis of sperm within uterus

Lactational amenorrhea — absences of menstrual cycle and ovulation following parturition.

Question 190.

Ten E.coli cells with '5N - dsDNA are incubated in medium containing "N nucleotide. After 60 minutes, how many E.coli cells will have DNA totally free from '5N?

[4 Marks]

(A) 40 cells

(B) 80 cells

(C) 20 cells

(D) 60 cells

Explanation:

E.coli cells with ^{16}N-dsDNA are incubated in medium contain ^{15}N Nucleotide.

If the culture ran for a generation (i.e. after 20 min.) had 100% hybrid DNA. DNA extracted from the culture after IInd generation (i.e. after 40 min.), then hybrid DNA was composed of equal amounts i.e. 50% light DNA and 50 hybrid. And for III generation (i.e. after 60 min.) amount of DNA is 75% hybrid and 25% light DNA. Therefore, if 10 cells of E.coli is incubated in medium, after 60 min, 80 cells will formed in IIIrd generation, there, 60 cells (75%) will have DNA totally free from ^{15}N.

Question 191.

The recombination frequency between the genes a & c is 5%, b & c is 15%, b & d is 9%, a & b is 20%, c & d is 24% and a & d is 29%. What will be the sequence of these genes on a linear chromosome?

[4 Marks]

(A) a, c, b, d

(B) a, b, c, d

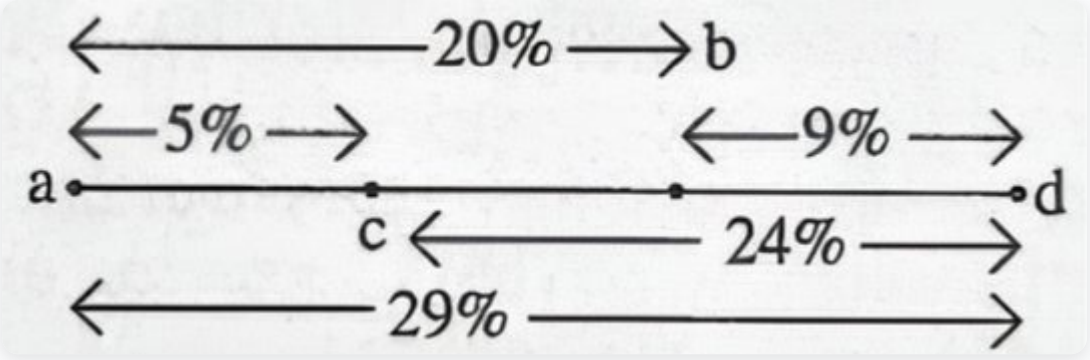
(C) a, d, b, c

(D) d, b, a, c

Explanation:

According to given percentage

So the sequence of genes, a, b, c & d will be a, c, b, d.



Question 192.

Given below are two statements:
Statement I: In a scrubber the exhaust from the thermal plant is passed through the electric wires to charge the dust particles.
Statement II: Particulate matter (PM 2.5) can not be removed by scrubber but can be removed by an electrostatic precipitator.

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) Statement I is incorrect but Statement II is correct

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

(D) Both Statement I and Statement II are incorrect

Explanation:

The collecting plates are grounded and attract the charged dust particles.

The dangers of particulate matter that are very very small and are not removed by electrostatic precipitators. According to Central Pollution Control Board (CPCB), particulate size 2.5 micrometers or less in diameter (PM 2.5) are responsible for causing the greatest harm to human health.

Question 193.

Statements related to human Insulin are given below.

Which statement(s) is/are correct about genetically engineered Insulin?

(i) Pro-hormone insulin contain extra stretch of C-peptide

(ii) A-peptide and B-peptide chains of insulin were produced separately in E.coli, extracted and combined by creating disulphide bond between them.

(iii) Insulin used for treating Diabetes was extracted from Cattles and Pigs.

(iv) Pro-hormone Insulin needs to be processed for converting into a mature and functional hormone.

(v) Some patients develop allergic reactions to the foreign insulin.

Choose the most appropriate answer from the options given below:

[4 Marks]

(A) (iii), (iv) and (v) only

(B) (i), (ii) and (iv) only

(C) (ii) only

(D) (iii) and (iv) only

Explanation:

Chains A and B were produced separately, extracted and combined by creating disulfide bonds to form human insulin.

Insulin used for diabetes was earlier extracted from pancreas of slaughtered cattle and pigs.

Insulin is synthesised as a pro-hormone (like a pro-enzyme, the pro-hormone also needs to be processed before it becomes a fully mature and functional hormone) which contains an extra stretch called the C peptide. Insulin from an animal source, though caused some patients to develop allergy or other types of reactions to the foreign protein,

Question 194.

Which of the following statements is not true?

[4 Marks]

(A) Sweet potato and potato is an example of analogy

(B) Flippers of penguins and dolphins are a pair of homologous organs

(C) Homology indicates common ancestry

(D) Analogous structures are a result of convergent evolution

Explanation:

The eye of the octopus and of mammals or the flippers of Penguins and Dolphins are the example of analogy (analogous organ).

Question 195.

Which of the following is not a desirable feature of a cloning vector?

[4 Marks]

(A) Presence of single restriction enzyme site

(B) Presence of a marker gene

(C) Presence of two or more recognition sites

(D) Presence of origin of replication

Explanation:

In the alien DNA, if Presence of more than one recognition sites within the vector will generate several fragments, which will complicate the gene cloning. Hence, the vector needs to have very few, preferably single, recognition sites for the commonly used restriction enzymes.

Question 196.

Which of the following is a correct statement?

[4 Marks]

(A) Mycoplasma have DNA, Ribosome and cell wall.

(B) Cyanobacteria are a group of autotrophic organisms classified under Kingdom Monera.

(C) Slime moulds are saprophytic organisms classified under Kingdom Monera.

(D) Bacteria are exclusively heterotrophic organisms.

Explanation:

The cyanobacteria have chlorophyll a similar to green plants and are photosynthetic autotrophs. The cyanobacteria are unicellular, colonial or filamentous, freshwater/marine or terrestrial algae including in kingdom monera.

Question 197.

Match List-I with List-II

Choose the correct answer from the options given below:

[4 Marks]

List-I		List-II	
(A)	Bronchioles	(i)	Dense Regular Connective Tissue
(B)	Goblet cell	(ii)	Loose Connective Tissue
(C)	Tendons	(iii)	Glandular Tissue
(D)	Adipose Tissue	(iv)	Ciliated Epithelium

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

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

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

(D) (A)-(iii), (B)-(iv), (c)-(ii), (D)-(i)

Explanation:

Bronchioles —ciliated epithelium

Goblet cell - glandular tissue

Tendons — dense regular connective tissue

Adipose tissue — loose connective tissue

Question 198.

Which of the following are not the effects of Parathyroid

hormone?

(i) Stimulates the process of bone resorption

(ii) Decreases Ca^{2+} level in blood

(iii) Reabsorption of Ca^{2+} by renal tubules

(iv) Decreases the absorption of Ca^{2+} from digested food

(v) Increases metabolism of carbohydrates

Choose the most appropriate answer from the options

given below:

[4 Marks]

(A) (ii), (iv) and (v) only

(B) (i) and (v) only

(C) (ii) and (iii) only

(D) (i) and (iii) only

Explanation:

Parathyroid hormone (PTH) increases the Ca^{2+} levels in the blood. PTH acts on bones and stimulates the process of bone resorption. PTH also stimulates reabsorption of Ca^{2+} by the renal tubules and increases Ca^{2+} absorption from the digested food. PTH plays a significant role in calcium balance not in metabolism of carbohydrates.

Question 199.

If a colour blind female marries a man whose mother was

also colour blind, what are the chances of her progeny

having colour blindness?

[4 Marks]

(A) 25%

(B) 50%

(C) 100%

(D) 75%

Explanation:

There is 100% chance of her progeny having colour blindness.

Question 200.

A nucleus of mass number 189 splits into two nuclei having mass number 125 and 64. The ratio of radius of two daughter nuclei respectively is:

[4 Marks]

(A) 5 : 4

(B) 25 : 16

(C) 1 : 1

(D) 4 : 5

Explanation:

We know that $R = R_0A^{1/3}$ $R_1/R_2 = (A_1/A_2)^{1/3} = (125/64)^{1/3} = 5/4$

NOTES The volume of a nucleus varies directly with mass number. $V = (4/3)\pi R^3 = (4/3)\pi R_0^3 A$ ($\because R = R_0A^{1/3}$) $\therefore V \propto A$ Also, density of nucleus is constant, independent of A. Nuclear density (ρ) = Mass of nucleus / Volume of nucleus = $mA / [(4/3)\pi(R_0A^{1/3})^3] = 3m / (4\pi R_0^3)$= Constant Here, m = Average mass of a nucleon = 1.66×10^{-27} kg

$R_0 = 1.2 \times 10^{-15}$ m = 1.2 fm