CBSE EXAMINATION PAPER-2020

NEET-ZOOLOGY

(Solved)

Time allowed : 3 hours | Maximum Marks : 720

General Instructions :

Read the following instructions carefully and follow them :

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

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

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

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

v. Use of calculator is NOT allowed.

Section A

Question 1.

A series LCR circuit is connected to an ac voltage source. When L is removed from the circuit, the phase difference between current and voltage is π/3. If instead C is removed from the circuit, the phase difference is again π/3 between current and voltage. The power factor of the circuit is :

[4 Marks]

(A) 1.0

(B) 0.5

(C) -1.0

(D) zero

Explanation:

When L is removed,
Phase difference
$\tan \varphi = |X_c|/R = \tan \pi/3 = X^c/R$ ...(i)
When C is removed,
Phase difference
$\tan \varphi = |X_l|/R = \tan \pi/3 = X_l/R$ ...(ii)
From eqs. (i) and (ii), $X_l = X^c$
Since, $X_l = X_c$, the circuit is in resonance.
In this case, Z = R
∴ Power factor, $\cos \varphi = R/Z = 1$.

Question 2.

A wire of length L, area of cross section A is hanging from a fixed support. The length of the wire changes to L_1 when mass M is suspended from its free end. The expression for Young's modulus is :

[4 Marks]

(A) $MgL / A(L_1 - L)$

(B) MgL_1 / AL

(C) MgL / AL_1

(D) $Mg(L_1 - L) / AL$

Explanation:

Stress = Force / Cross-sectional area = Mg/A
Strain = Change in length / Original length
$= \Delta L/L = (L_1 - L)/L$
Young's modulus,
Y = Stress / Strain

$= (Mg/A) \div ((L_1 - L)/L)$
$= MgL / A(L_1 - L)$

Question 3.

A long solenoid of 50 cm length having 100 turns carries a current of 2.5 A. The magnetic field at the centre of the solenoid is :
($\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1})

[4 Marks]

(A) 3.14×10^{-5} T

(B) 6.28×10^{-4} T

(C) 3.14×10^{-4} T

(D) 6.28×10^{-5} T

Explanation:

Magnetic field at the centre of solenoid, $B_{(solenoid)} = \mu_0 nI$
Given : No. of turns / length, $n = N/L = 100/(50 \times 10^{-2})$

= 200 turns/m

Current, I = 2.5 A

$\therefore B_{(solenoid)} = \mu_0 nI$
$= 4\pi \times 10^{-7} \times 200 \times 2.5$
$= 6.28 \times 10^{-4}$ T

Question 4.

A ray is incident at an angle of incidence i on one surface of a small angle prism (with angle of prism A) and emerges normally from the opposite surface. If the refractive index of the material of the prism is μ, then the angle of incidence is nearly equal to :

[4 Marks]

(A) μA/2

(B) A/2μ

(C) μA

(D) 2A/μ

Explanation:

Light ray emerges normally from another surface,
hence, e (angle of emergence) = 0

$\therefore r_2 = 0$

$r_1 + r_2 = A \Rightarrow r_1 = A$

$\mu_1 \sin i = \mu_2 \sin r$

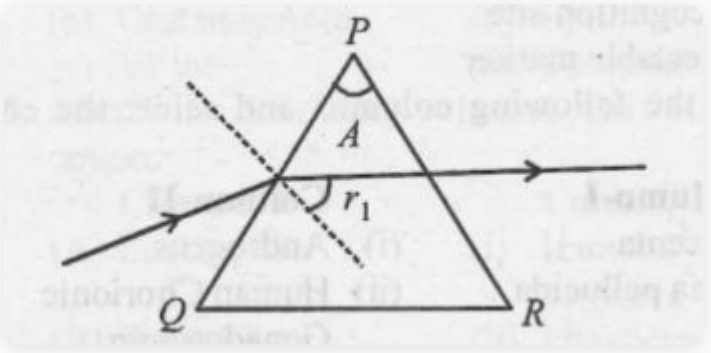
Applying Snell's law on first surface PQ

$\Rightarrow 1 \cdot \sin i = \mu \cdot \sin r_1$

$\Rightarrow \sin i = \mu \sin A$

For small angles ($\sin \theta \approx \theta$)

$\therefore i = \mu A$



Question 5.

In a certain region of space with volume 0.2 m^3, the electric potential is found to be 5 V throughout. The magnitude of electric field in this region is :

[4 Marks]

(A) zero

(B) 5 N/C

(C) 0.5 N/C

(D) 1 N/C

Explanation:

Since, electric potential is constant throughout the volume, hence electric field,
$E = - dV/dr = 0$.

Question 6.

For which one of the following, Bohr model is not valid?

[4 Marks]

(A) Deuteron atom

(B) Singly ionised neon atom (Ne^+)

(C) Singly ionised helium atom (He^+)

(D) Hydrogen atom

Explanation:

Bohr model is only valid for single electron species i.e., Hydrogen or hydrogen like atom – He^+, deuteron,etc.
Singly ionised neon atom has more than one electron in orbit. Hence, Bohr model is not valid.

Question 7.

Light with an average flux of 20 W/cm² falls at a non- reflecting surface at normal incidence having surface area 20 cm². The energy received by the surface during time span of 1 minute is :

[4 Marks]

(A) 10×10^3 J

(B) 48×10^3 J

(C) 24×10^3 J

(D) 12×10^3 J

Explanation:

Using intensity,

$I = E/At$

$\Rightarrow E = IAt$
$= 20/(10^{-4}) \times 20 \times 10^{-4} \times 60$
$= 24 \times 10^3$ J

Question 8.

An electron is accelerated from rest through a potential difference of V volt. If the de Broglie wavelength of the electron is 1.227×10^{-2} nm, the potential difference is :

[4 Marks]

(A) 10^4 V

(B) 10 V

(C) 10^3 V

(D) 10^2 V

Explanation:

Using,

$\lambda = 12.27/\sqrt{V}$ Å

$\Rightarrow \sqrt{V} = (12.27 \times 10^{-10})/(1.227 \times 10^{-11})$
$= 10^2$

[Given, $\lambda = 1.227 \times 10^{-11}$ m]

$\therefore V = 10^4$ volt

Question 9.

A body weighs 72 N on the surface of the earth. What is the gravitational force on it, at a height equal to half the radius of the earth?

[4 Marks]

(A) 32 N

(B) 48 N

(C) 30 N

(D) 24 N

Explanation:

Weight of a body on the surface of the earth,

$W_s = mg = 72$ N

Acceleration due to gravity, g varies with height,

$h = R/2$ (given)

$W_h = mgs/(1 + h/R)^2$

$= 72/(1 + (R/2)/R)^2$

$= 72/(3/2)^2$

$= 4/9 \times 72$

$= 32$ N

Question 10.

Light of frequency 1.5 times the threshold frequency is incident on a photosensitive material. What will be the photoelectric current if the frequency is halved and intensity is doubled?

[4 Marks]

(A) zero

(B) doubled

(C) one-fourth

(D) four times

Explanation:

For photoelectric emission, photoelectric current, incident light frequency should be greater than threshold frequency.
Light of frequency 1.5 times the threshold frequency ν_0 incident.
$\nu = 3/2\ \nu_0$

If frequency is halved,

$\therefore \nu' = \nu/2 = 3/4\ \nu_0$

$\therefore \nu' < \nu_0$

$\therefore$ No photoelectric emission will take place.

Question 11.

A 40 μF capacitor is connected to a 200 V, 50 Hz ac supply. The rms value of the current in the circuit is,nearly:

[4 Marks]

(A) 25.1 A

(B) 2.5 A

(C) 2.05 A

(D) 1.7 A

Explanation:

Given :

Capacitance, $C = 40\ \mu F = 40 \times 10^{-6}\ F$

Frequency, $f = 50\ Hz$

$\therefore \omega = 2\pi f = 100\pi$

$\varepsilon_{rms} = 200\ V$

$\therefore I_{rms} = \varepsilon_{rms}/X^c = \varepsilon_{rms}/(1/C\omega)$

$= 200 \times 40 \times 10^{-6} \times 2\pi \times 50$

$= 2.5\ A.$

Question 12.

A ball is thrown vertically downward with a velocity of 20 m/s from the top of a tower. It hits the ground after some time with a velocity of 80 m/s. The height of the tower is : ($g = 10\ m/s^2$)

[4 Marks]

(A) 340 m

(B) 300 m

(C) 360 m

(D) 320 m

Explanation:

Using

$v^2 = u^2 + 2gh$

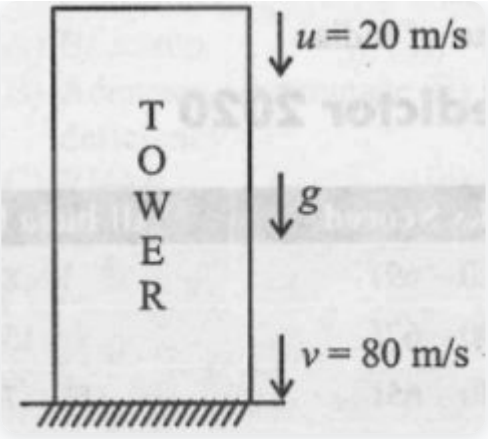
Height,

$h = v^2 - u^2 / 2g$

$= (80)^2 - (20)^2 / 2 \times 10$

$= 6400 - 400 / 20$

$= 300\ m$



Question 13.

A cylinder contains hydrogen gas at pressure of 249 kPa and temperature 27°C.
Its density is : ($R = 8.3\ J\ mol^{-1}\ K^{-1}$)

[4 Marks]

(A) 0.5 kg/m³

(B) 0.02 kg/m³

(C) 0.1 kg/m³

(D) 0.2 kg/m³

Explanation:

Given :

Pressure, $P = 249\ kPa = 249 \times 10^3\ N/m^2$

Mass of hydrogen, $M = 2\ g = 2 \times 10^{-3}\ kg$

Temperature, $T = 27 + 273 = 300\ K$

Using, ideal gas equation,

$PV = nRT$

$PM = \rho RT$ ($\because \rho = M/V$)

$\therefore \rho = PM/RT$

$= (249 \times 10^3)(2 \times 10^{-3}) / 8.3 \times 300$

= 0.2 kg/m³

Question 14.

When a uranium isotope $^{235}_{92}U$ is bombarded with a neutron, it generates $^{89}_{36}Kr$, three neutrons and :

[4 Marks]

(A) $^{103}_{36}Kr$

(B) $^{91}_{40}Zr$

(C) $^{144}_{56}Ba$

(D) $^{101}_{36}Kr$

Explanation:

It is a nuclear fission reaction.

$^{235}_{92}U + ^{1}_{0}n \longrightarrow ^{89}_{36}Kr + ^{144}_{56}Ba + 1/3n + Q$

Question 15.

The increase in the width of the depletion region in a p-n junction diode is due to :

[4 Marks]

(A) forward bias only

(B) increase in forward current

(C) both forward bias and reverse bias

(D) reverse bias only

Explanation:

Due to reverse biasing, the width of the depletion region increases in a p-n junction diode.

Question 16.

The phase difference between displacement an acceleration of a particle in a simple harmonic motion is :

[4 Marks]

(A) π rad

(B) zero

(C) 3π/2 rad

(D) π/2 rad

Explanation:

Displacement equation of a SHM

$y = A \sin(\omega t + \phi)$

∴ Velocity,

$v = dy/dt = A\omega \cos(\omega t + \phi)$

Acceleration,

$a = dv/dt$

or,

$a = -A\omega^2 \sin(\omega t + \phi)$

$\therefore a = A\omega^2 \sin(\omega t + \phi + \pi)$

Hence, phase difference between displacement and acceleration is π.

Question 17.

An iron rod of susceptibility 599 is subjected to a magnetising field of 1200 A m^{-1}. The permeability of the material of the rod is :

($\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1})

[4 Marks]

(A) 8.0×10^{-5} T m A^{-1}

(B) $2.4\pi \times 10^{-5}$ T m A^{-1}

(C) $2.4\pi \times 10^{-7}$ T m A^{-1}

(D) $2.4\pi \times 10^{-4}$ T m A^{-1}

Explanation:

Given :

Magnetic susceptibility of iron,

$\chi_m = 599$

Using,

$\mu_r = 1 + \chi_m = 600$

$\mu = \mu_r\mu_0$

$= 600 \times 4\pi \times 10^{-7}$

$= 2400\pi \times 10^{-7}$

Hence, permeability of the material of the rod,

$\mu = 2.4\pi \times 10^{-4}$ T m A^{-1}

Question 18.

The quantities of heat required to raise the temperature of two solid copper spheres of radii r_1 and r_2 ($r_1 = 1.5\ r_2$) through 1 K are in the ratio :

[4 Marks]

(A) 9/4

(B) 3/2

(C) 27/8

(D) 5/3

Explanation:

Heat supplied,

$\Delta Q = ms\Delta T$

$\Delta Q = (4/3)\pi r^3 \rho s \Delta T$

[$\because \rho = m/V$ & $V = (4/3)\pi r^3$]

or,

$\Delta Q \propto r^3$

$\therefore \Delta Q_1/\Delta Q_2 = (r_1/r_2)^3$

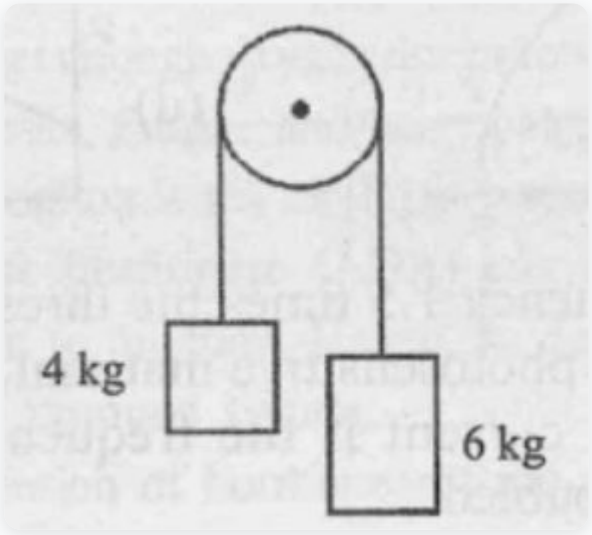
$= (1.5)^3$

$= 27/8$

Question 19.

Two bodies of mass 4 kg and 6 kg are tied to the ends of a massless string. The string passes over a pulley which is frictionless (see figure). The acceleration of the system in terms of acceleration due to gravity (g) is :

[4 Marks]



(A) g

(B) g/10

(C) g/5

(D) g/2

Explanation:

Given :

Mass $m_1 = 4$ kg and $m_2 = 6$ kg.

Acceleration of the system,

$a = (m_1 - m_2)g / (m_1 + m_2)$

where $m_1 > m_2$

$\therefore a = (6 - 4)g / (6 + 4)$

$= g/5$

Question 20.

The mean free path for a gas, with molecular diameter d and number density n can be expressed as :

[4 Marks]

(A) $1 / \sqrt{2}\, n^2\pi^2d^2$

(B) $1 / \sqrt{2}\, n\pi d$

(C) $1 / \sqrt{2}\, n^2\pi d^2$

(D) $1 / \sqrt{2}\, n\pi d^2$

Explanation:

Mean free path for a gas,
$\lambda_m = 1 / \sqrt{2}\, n\pi d^2$
Here, d = diameter of a gas molecule and, n = molecular density.

Question 21.

A short electric dipole has a dipole moment of 16×10^{-9} C m. The electric potential due to the dipole at a point at a distance of 0.6 m from the centre of the dipole, situated on a line making an angle of 60° with the dipole axis is :
$(1 / 4\pi\varepsilon_0 = 9 \times 10^9\ N\ m^2 / C^2)$

[4 Marks]

(A) 400 V

(B) 200 V

(C) zero

(D) 50 V

Explanation:

Given,

Dipole moment of short electric dipole,

$p = 16 \times 10^{-9}$ C m.

Distance from centre of dipole, r = 0.6 m

Electric potential, $V = kp \cos \theta / r^2$

$V= 9 \times 10^9 \times 16 \times 10^{-9} \times \cos 60° / 0.36$

$\therefore V = 200$ V

Question 22.

Dimensions of stress are :

[4 Marks]

(A) $[ML^{-1}T^{-2}]$

(B) $[MLT^{-2}]$

(C) $[ML^2T^{-2}]$

(D) $[ML^0T^{-2}]$

Explanation:

Stress = Force / Area

Dimension of force = $[MLT^{-2}]$

Dimension of area = $[L^2]$

$\therefore$ Stress = $[MLT^{-2}]/[L^2]$

= $[ML^{-1}T^{-2}]$

Question 23.

The energy required to break one bond in DNA is 10^{-20} J. This value in eV is nearly

[4 Marks]

(A) 0.6

(B) 0.06

(C) 0.006

(D) 6

Explanation:

One electron volt (1 eV) is the energy gained by
electron moving through a potential difference of 1 V.

$\therefore$ 1 eV = 1.6×10^{-19} J

1 J = $1/(1.6 \times 10^{-19})$ eV

10^{-20} J = $(10^{-20})/(1.6 \times 10^{-19})$ eV

= 0.06 eV

Question 24.

In a guitar, two strings A and B made of same material are slightly out of tune and produce beats of frequency 6 Hz. When tension in B is slightly decreased, the beat frequency increases to 7 Hz. If the frequency of A is 530 Hz, the original frequency of B will be

[4 Marks]

(A) 524 Hz

(B) 536 Hz

(C) 537 Hz

(D) 523 Hz

Explanation:

Frequency of string,

$f = 1/(2l) \sqrt{(T/m)}$

Frequency $\propto \sqrt{\text{Tension}}$

Difference of $f_{(A)}$ and $f_{(B)}$ is 6 Hz.

If tension decreases, $f_{(B)}$ decreases and becomes $f'_{(B)}$.

Now, difference of $f_{(A)}$ and $f'_{(B)}$ = 7 Hz (increases)

So, $f_{(A)} > f_{(B)}$

$f_{(A)} - f_{(B)} = 6$ Hz

⇒ f Subscript (A) = 530 Hz

⇒ f Subscript (B) = 524 Hz (original)

Question 25.

The color code of a resistance is given below

The values of resistance and tolerance, respectively, are

[4 Marks]



(A) 47 kΩ, 10%

(B) 4.7 kΩ, 5%

(C) 470 Ω, 5%

(D) 470 kΩ, 5%

Explanation:

According to colour coding -

Yellow	Violet	Brown	Gold
4	7	1	5%

First colour gives first digit, second colour gives the second digit and third colour gives the multiplier and fourth colour gives tolerance.

∴ Resistance,

$R = 47 \times 10^1 \pm 5\%$

$= 470 \pm 5\%\ \Omega$

Question 26.

The Brewsters angle i Subscriprt (b) for an interface should be

[4 Marks]

(A) 30° < i Subscripr (b) < 45°

(B) i Subscripr (b) = 90°

(C) 45° < i Subscripr (b) < 90°

(D) 0° < i Subscripr (b) < 30°

Explanation:

According to Brewster's law, when a beam of unpolarised light is reflected from a transparent medium of refractive index (μ_2), the reflected light is completely polarised at a certain angle of incidence called the angle of polarisation (i Subscript (b)).

tan i Subscript (b) = μ_2/μ_1

For air, $\mu_1 = 1$

$\therefore$ tan i Subscript (b) = $\mu_2 > 1$

$\Rightarrow$ tan i Subscript (b) > 1

$\Rightarrow$ 90° > i Subscript (b) > 45°

Question 27.

The capacitance of a parallel plate capacitor with air as medium is 6 μF. With the introduction of a dielectric medium, the capacitance becomes 30 μF. The permittivity of the medium is :

($\varepsilon_0 = 8.85 \times 10^{-12}\ C^2\ N^{-1}\ m^{-2}$)

[4 Marks]

(A) $0.44 \times 10^{-10}\ C^2\ N^{-1}\ m^{-2}$

(B) $1.77 \times 10^{-12}\ C^2\ N^{-1}\ m^{-2}$

(C) $5.00\ C^2\ N^{-1}\ m^{-2}$

(D) $0.44 \times 10^{-13}\ C^2\ N^{-1}\ m^{-2}$

Explanation:

Capacitance of a parallel plate capacitor with air is

$C = \varepsilon_0 A/d$ ...(i)

Here,

A = area of plates of capacitor,

d = distance between the plates

Capacitance of a same parallel plate capacitor with introduction of dielectric medium of dielectric constant K is

$C' = K\varepsilon_0 A/d$ ...(ii)

Dividing (ii) by (i)

$\Rightarrow C'/C = K$

$\Rightarrow 30/6 = K$

$\Rightarrow K = 5$

$\Rightarrow K = \varepsilon/\varepsilon_0$

$\Rightarrow \varepsilon = K\varepsilon_0$

$= 5 \times 8.85 \times 10^{-12}$

$= 0.44 \times 10^{-10}\ C^2\ N^{-1}\ m^{-2}$

Question 28.

Find the torque about the origin when a force of $3\hat{j}$ N acts on a particle whose position vector is $2\hat{k}$ m.

[4 Marks]

(A) $6\hat{i}$ Nm

(B) $-6\hat{i}$ Nm

(C) $6\hat{k}$ Nm

(D) $6\hat{j}$ Nm

Explanation:

Given :

Force, F vector = $3\hat{j}$ N

Position vector, r vector = $2\hat{k}$ m

Torque, τ vector = r vector × F vector

$= 2\hat{k} \times 3\hat{j}$

= 6(k̂ × ĵ)

= 6(−î)

⇒ τ vector = −6î Nm

Question 29.

A resistance wire connected in the left gap of a metre bridge balances a 10 Ω resistance in the right gap at a point which divides the bridge wire in the ratio 3 : 2. If the length of the resistance wire is 1.5 m, then the length of 1 Ω of the resistance wire is :

[4 Marks]

(A) 1.5×10^{-2} m

(B) 1.0×10^{-2} m

(C) 1.0×10^{-1} m

(D) 1.5×10^{-1} m

Explanation:

Let R_1 be the resistance of resistance wire.

From the balancing condition of metre bridge,

$R_1/10 = l_1/l_2 = 3/2$

⇒ $R_1 = (30/2) = 15$ Ω

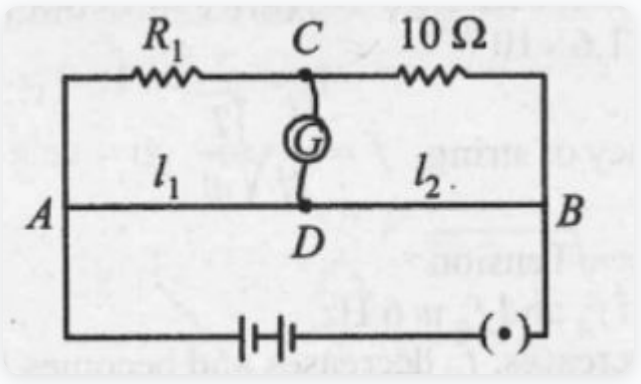
Length of 15 Ω resistance wire is 1.5 m.

∴ Length of 1 Ω resistance wire

= 1.5/15

= 0.1 m

= 1.0×10^{-1} m



Question 30.

For transistor action, which of the following statements is correct?

[4 Marks]

(A) Base, emitter and collector regions should have same size.

(B) Both emitter junction as well as the collector junction are forward biased.

(C) The base region must be very thin and lightly doped.

(D) Base, emitter and collector regions should have same doping concentrations.

Explanation:

In a transistor, emitter is heavily doped, the base region is lightly doped and thin. The size of collector region is larger than other two regions. Length profile in transistor is $L^C > L^E > L^B$ and doping profile in transistor is E > C > B.

For transistor action, Base-emitter junction is forward biased and Base-collector junction is reversed biased.

Question 31.

The ratio of contributions made by the electric field and magnetic field components to the intensity of an electromagnetic wave is :

(c = speed of electromagnetic waves)

[4 Marks]

(A) 1 : 1

(B) 1 : c

(C) 1 : c^2

(D) c : 1

Explanation:

The energy in electromagnetic wave is divided equally between the electric and magnetic field. So, in an electromagnetic wave, half of the intensity is provided by the electric field and half by the magnetic field.

Hence, required ratio should be 1 : 1.

Question 32.

A charged particle having drift velocity of 7.5×10^{-4} m s^{-1} in an electric field of 3×10^{-10} V m^{-1}, has a mobility in m^2 V^{-1} s^{-1} of :

[4 Marks]

(A) 2.5×10^6

(B) 2.25×10^{15}

(C) 2.5×10^{-6}

(D) 2.25×10^{-15}

Explanation:

Given,

Drift velocity of charged particle,

V-d = 7.5×10^{-4} m/s

Electric field,

E = 3×10^{-10} V m^{-1}

Mobility, $\mu = V^d/E$

$= (7.5 \times 10^{-4})/(3 \times 10^{-10})$

$= 2.5 \times 10^6$ m^2 V^{-1} s^{-1}

Question 33.

A spherical conductor of radius 10 cm has a charge of 3.2×10^{-7} C distributed uniformly. What is the magnitude of electric field at a point 15 cm from the centre of the sphere?

$(1/4\pi\varepsilon_0 = 9 \times 10^9$ $Nm^2/C^2)$

[4 Marks]

(A) 1.28×10^7 N/C

(B) 1.28×10^6 N/C

(C) 1.28×10^4 N/C

(D) 1.28×10^5 N/C

Explanation:

If the charge on a spherical conductor of radius R is Q, then electric field at distance r from centre is

$E = 0$ (if $r < R$)

$E = (1/4\pi\varepsilon_0) \times Q/r^2$ (if $r \geq R$)

Electric field at a distance 15 cm from the centre of sphere will be

$E = (9 \times 10^9 \times 3.2 \times 10^{-7})/(225 \times 10^{-4})$

$= 0.128 \times 10^6$

$= 1.28 \times 10^5$ N/C

Question 34.

Taking into account the significant figures, what is th value of 9.99 m − 0.0099 m?

[4 Marks]

(A) 9.9801 m

(B) 9.980 m

(C) 9.9 m

(D) 9.98 m

Explanation:

In subtraction the number of decimal places in the result should be equal to the number of decimal places of that term in the operation which contain lesser number of decimal places.

```
   9.99
− 0.0099
————————
  9.9801
```

As the least number of decimal places is 2. So, answer should be **9.98 m**.

Question 35.

In Young's double slit experiment, if the separation between coherent sources is halved and the distance of the screen from the coherent sources is doubled, then the fringe width becomes:

[4 Marks]

(A) one-fourth

(B) double

(C) four times

(D) half

Explanation:

Fringe width,

$\beta = \lambda D/d$

Here,

λ = wavelength of light from coherent sources,

D = distance of screen from the coherent sources,

d = separation between coherent sources

When,

$d' = d/2$

and

$D' = 2D$

New Fringe width,

$\beta' = \lambda(2D)/(d/2)$

$= 4\lambda D/d$

$\Rightarrow \beta' = 4\beta$

Fringe width becomes 4 times.

Question 36.

Two cylinders A and B of equal capacity are connected to each other via a stop cock. A contains an ideal gas at standard temperature and pressure. B is completely evacuated. The entire system is thermally insulated. The stop cock is suddenly opened. The process is:

[4 Marks]

(A) isobaric

(B) isothermal

(C) adiabatic

(D) isochoric

Explanation:

Entire system is thermally insulated. So, no heat exchange with surrounding will take place. Hence, process will be adiabatic.

Question 37.

The energy equivalent of 0.5 g of a substance is:

[4 Marks]

(A) 4.5×10^{16} J

(B) 0.5×10^{13} J

(C) 1.5×10^{13} J

(D) 4.5×10^{13} J

Explanation:

From the Einstein's mass-energy equivalence, the relation between the mass of a substance *m* and its energy *E* is

$E = mc^2$

Here, c = speed of light

$\therefore E = 0.5 \times 10^{-3} \times (3 \times 10^8)^2$

$= 0.5 \times 10^{-3} \times 9 \times 10^{16}$

$= 4.5 \times 10^{13}$ J.

Question 38.

A capillary tube of radius r is immersed in water andwater rises in it to a height h. The mass of the water in the capillary is 5 g. Another capillary tube of radius 2r is immersed in water. The mass of water that will rise in this tube is:

[4 Marks]

(A) 5.0 g

(B) 10.0 g

(C) 20.0 g

(D) 2.5 g

Explanation:

Force of surface tension balances the weight of water
in capillary tube.

$F_s = 2\pi rT \cos\theta = mg$

Here, T and θ are constants.

So, $m \propto r$

Let m_1 and m_2 be the mass of water in two capillary tube.

$\therefore m_2/m_1 = r_2/r_1$

$\Rightarrow m_2/5.0 = 2r/r \quad (\because r_2 = 2r)$

$\Rightarrow m_2 = 10.0$ g

Question 39.

A screw gauge has least count of 0.01 mm and there are 50 divisions in its circular scale. The pitch of the screw gauge is:

[4 Marks]

(A) 0.01 mm

(B) 1.0 mm

(C) 0.5 mm

(D) 0.25 mm

Explanation:

Least count of screw gauge = 0.01 mm

Least count

= Pitch / No. of divisions on circular scale

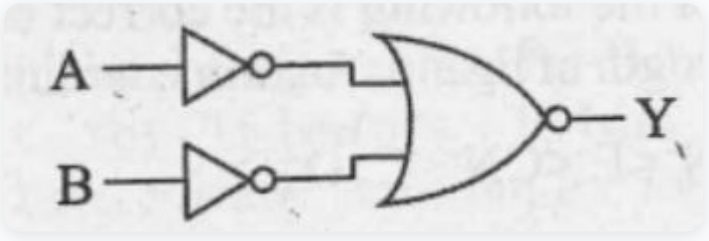
⇒ 0.01 mm = Pitch / 50

⇒ Pitch = 0.5 mm

Question 40.

For the logic circuit shown, the truth table is:

[4 Marks]



(A)

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

(B)

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

(C)

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

(D)

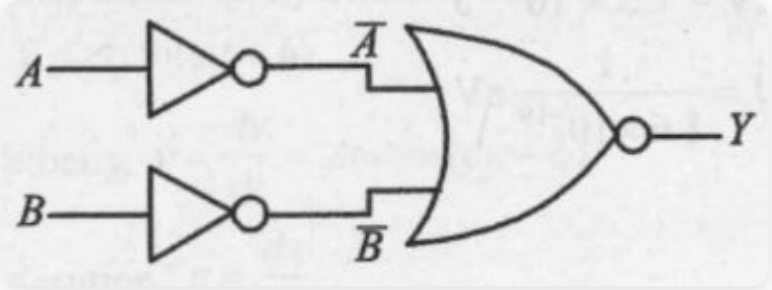
A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

Explanation:

Y = bar ($\overline{A}$ + $\overline{B}$) = A · B ⇒ AND Gate

Truth Table is :

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



Question 41.

The average thermal energy for a mono-atomic gas is :

(k subscript (B) is Boltzmann constant and T, absolute temperature)

[4 Marks]

(A) 1/2 k subscript (B) T

(B) 7/2 k subscript (B) T

(C) 3/2 k subscript (B) T

(D) 5/2 k subscript (B) T

Explanation:

From the law of equipartition of energy, energy associated with each degree of freedom is 1/2 (kT)

For monoatomic gases, degree of freedom is 3. Hence, average thermal energy for mono-atomic gas is $KE_{av}g$ = 3 × 1/2 k subscript (B)T

= 3/2 k subscript (B) T

Question 42.

The solids which have the negative temperature coefficient of resistance are:

[4 Marks]

(A) semiconductors only

(B) insulators and semiconductors

(C) metals

(D) insulators only

Explanation:

For metals temperature coefficient of resistance is positive while for insulators and semiconductors, temperature coefficient of resistance is negative.

Question 43.

Two particles of mass 5 kg and 10 kg respectively areattached to the two ends of a rigid rod of length 1 m withnegligible mass. The centre of mass of the system fromthe 5 kg particle is nearly at a distance of :

[4 Marks]

(A) 67 cm

(B) 80 cm

(C) 33 cm

(D) 50 cm

Explanation:

Centre of mass of a system of two particles of masses m_1 and m_2 having position vectors $\overline{x}_1$ and $\overline{x}_2$ vector is

$x_m = (m_1x_1 + m_2x_2)/(m_1 + m_2)$

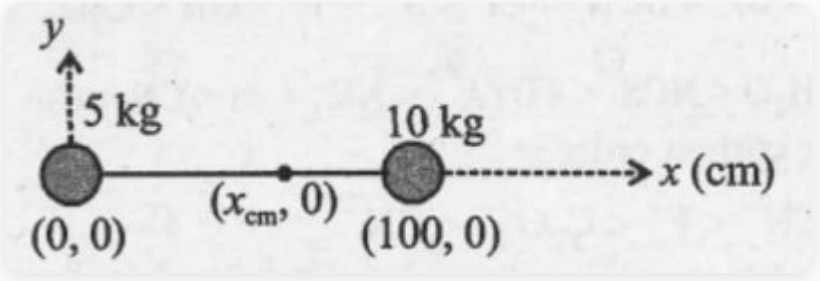
Taking particle of mass 5 kg at origin.

$\Rightarrow x_m = (5 \times 0 + 100 \times 10)/(5 + 10)$

$= 200/3$

$= 66.66$ cm

$\Rightarrow x_m = 67$ cm



Question 44.

Sucrose on hydrolysis gives:

[4 Marks]

(A) α-D-Glucose + β-D-Fructose

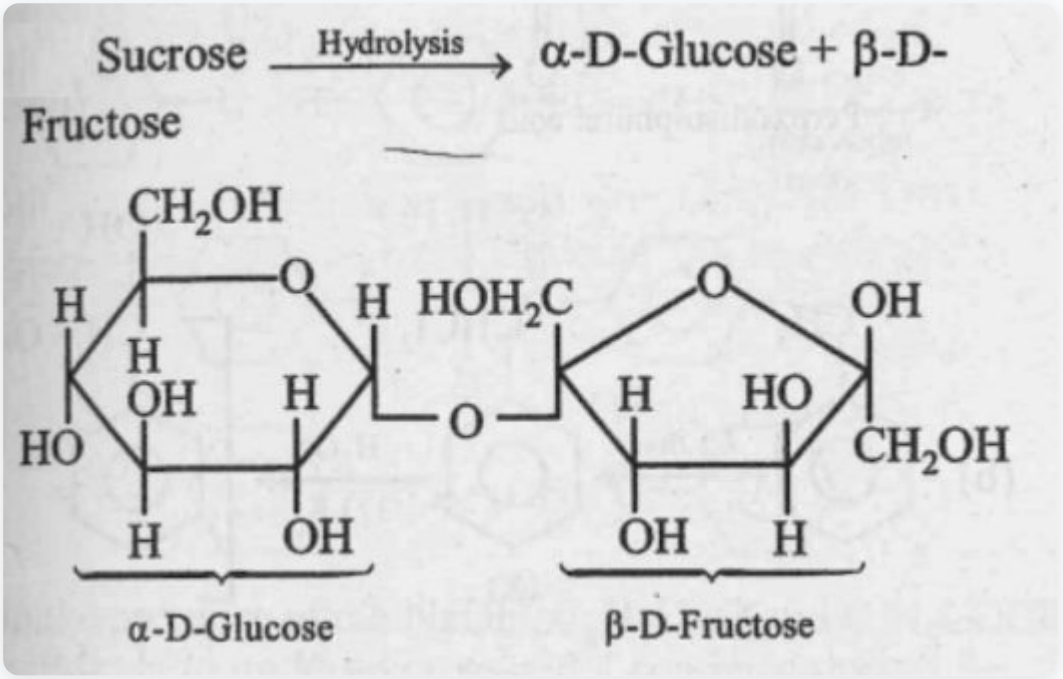
(B) α-D-Glucose + β-D-Glucose

(C) α-D-Glucose + β-D-Fructose

(D) α-D-Fructose + β-D-Fructose

Explanation:

.



Question 45.

Elimination reaction of 2-Bromo-pentane to form pent-2-ene is:

(A) β-Elimination reaction

(B) Follows Zaitsev rule

(C) Dehydrohalogenation reaction

(D) Dehydration reaction

[4 Marks]

(A) (B), (C), (D)

(B) (A), (B), (C)

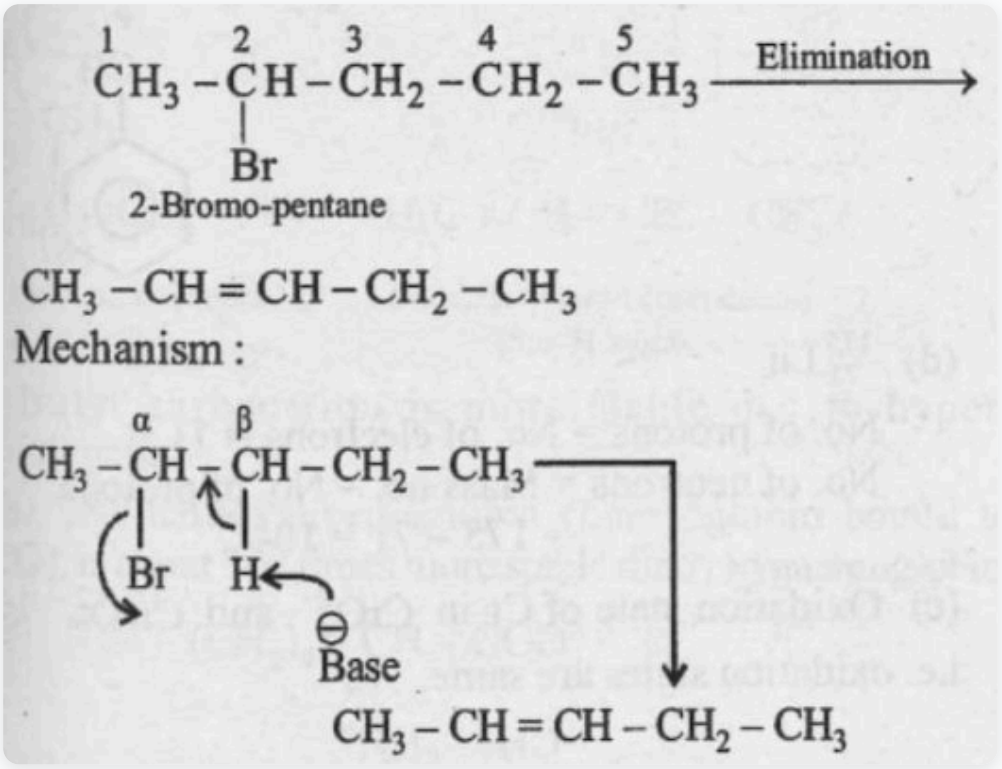
(C) (A), (C), (D)

(D) (A), (B), (D)

Explanation:

It is a β-elimination reaction as β-hydrogen is abstracted and results more substituted alkene, which follows Zaitsev's rule.

Since 'H' and 'Br' are removed, it is dehydro- halogenation.



Question 46.

The number of Faradays (F) required to produce 20 g of calcium from molten $CaCl_2$(Atomic mass of Ca = 40 g mol^{-1}) is:

[4 Marks]

(A) 1

(B) 4

(C) 3

(D) 2

Explanation:

1 equivalent of any substance is deposited by 1 F of charge. 20 g calcium contains,

Number of equivalents = Given mass / Equivalent mass

Equivalent mass of Ca = Atomic mass / Valency

= 40/2 = 20

∴ 20/20 = 1

So, 1 Faraday of charge is required to deposit 1 equivalent of Ca.

Question 47.

An element has a body centered cubic (bcc) structure with a cell edge of 288 pm. The atomic radius is:

[4 Marks]

(A) (√2/4) × 288 pm

(B) (4/√2) × 288 pm

(C) (4/√3) × 288 pm

(D) (√3/4) × 288 pm

Explanation:

For bcc,

√3a = 4r

⇒ r = √3a/4

Given,

a = 288 pm

∴ r = (√3/4) × 288 pm

Question 48.

Find out the solubility of $Ni(OH)_2$ in 0.1 M NaOH. Given that the ionic product of $Ni(OH)_2$ is 2×10^{-15}

[4 Marks]

(A) 2×10^{-8} M

(B) 1×10^{-13} M

(C) 1×10^{8} M

(D) 2×10^{-13} M

Explanation:

.

$$Ni(OH)_2(s) \rightleftharpoons Ni^{2+}(aq) + 2OH^-(aq)$$

$$s \qquad\qquad s \qquad\qquad 2s$$

$$NaOH(aq) \longrightarrow Na^+(aq) + OH^-(aq)$$

$$0.1 \qquad\qquad 0.1 \qquad\qquad 0.1$$

$$\text{Total } (OH^-) = 2s + 0.1 \approx 0.1$$

$$\text{Ionic product} = (Ni^{2+})(OH^-)^2$$

$$\Rightarrow 2 \times 10^{-15} = s(0.1)^2$$

$$\Rightarrow s = 2 \times 10^{-13} \text{ M}$$

Question 49.

For the reaction, $2Cl(g) \longrightarrow Cl_2(g)$, the correct option is:

[4 Marks]

(A) $\Delta_r H > 0$ and $\Delta_r S < 0$

(B) $\Delta_r H > 0$ and $\Delta_r S > 0$

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

(D) $\Delta_r H < 0$ and $\Delta_r S < 0$

Explanation:

We know that, $Cl_2(g) \longrightarrow 2Cl(g)$ is an endothermic reaction because it required energy to break bond.

So reverse reaction, $2Cl(g) \longrightarrow Cl_2(g)$ will be exothermic, $\Delta_r H < 0$.

Also, two gaseous atoms combine together to form one gaseous molecule.

So, randomness decreases i.e., $\Delta_r S < 0$.

Question 50.

Which of the following is the correct order of increasing field strength of ligands to form coordination compounds?

[4 Marks]

(A) $SCN^- < F^- < C_2O_4^{2-} < CN^-$

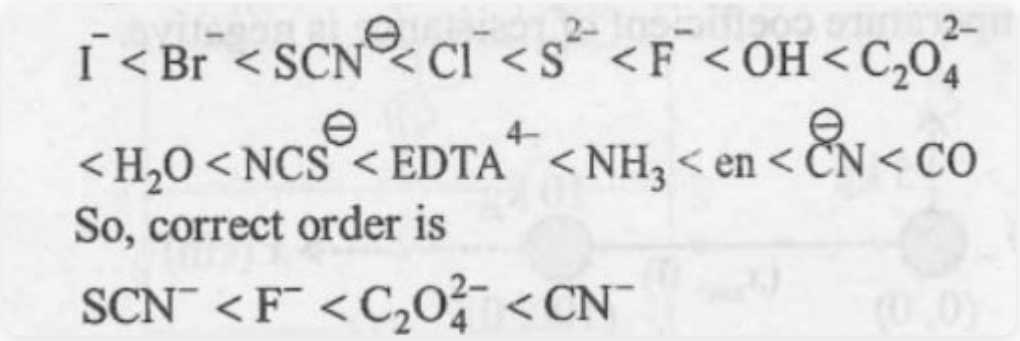
(B) $CN^- < C_2O_4^{2-} < SCN^- < F^-$

(C) $SCN^- < F^- < CN^- < C_2O_4^{2-}$

(D) $F^- < SCN^- < C_2O_4^{2-} < CN^-$

Explanation:

According to spectiochemical series, the order of ligand field strength is



Question 51.

The calculated spin only magnetic moment of Cr^{2+} ion is

[4 Marks]

(A) 2.84 BM

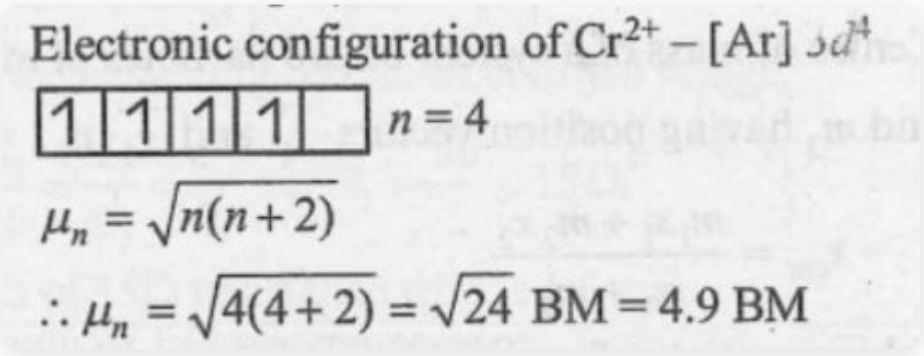
(B) 4.90 BM

(C) 3.87 BM

(D) 5.92 BM

Explanation:

.



Question 52.

Which of the following set of molecules will have zero dipole moment?

[4 Marks]

(A) Boron trifluoride, beryllium difluoride, carbon dioxide, 1,4-dichlorobenzene

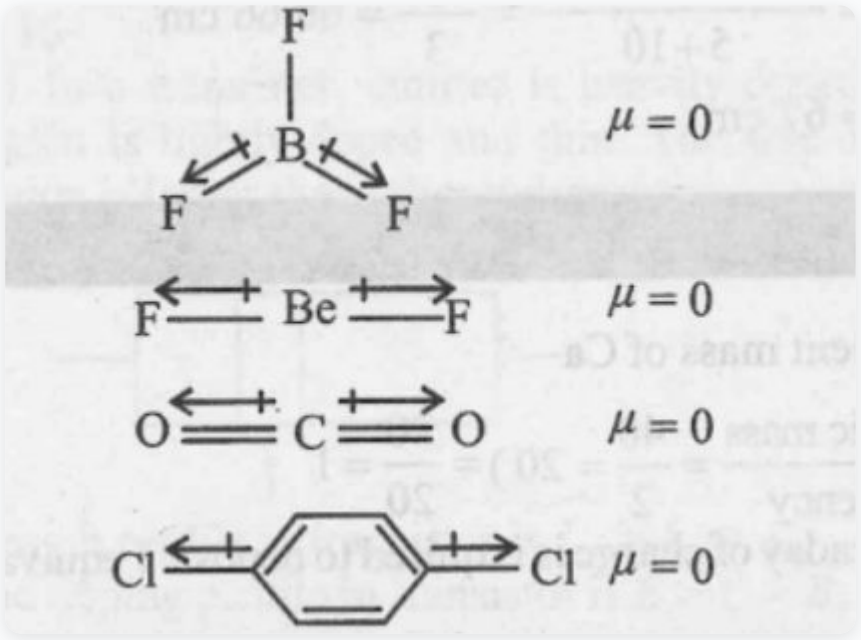
(B) Nitrogen trifluoride, beryllium difluoride, water, 1,3-dichlorobenzene

(C) Ammonia, beryllium difluoride, water, 1,4-dichlorobenzene

(D) Boron trifluoride, hydrogen fluoride, carbon dioxide, 1,3-dichlorobenzene

Explanation:

BF_3, BeF_2, CO_2 and 1,4-dichlorobenzene all are symmetrical molecules.



Question 53.

The following metal ion activates many enzymes, participates in the oxidation of glucose to produce ATP and with Na, is responsible for the transmission of nerve signals.

[4 Marks]

(A) Iron

(B) Copper

(C) Potassium

(D) Calcium

Explanation:

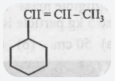
Potassium (K) activates many enzymes to participate in oxidation of glucose to produce ATP and helps in the transmission of nerve signal along with Na.

Question 54.

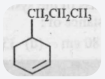
An alkene on ozonolysis gives methanal as one of the product. Its structure is:

[4 Marks]

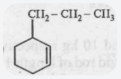
(A)



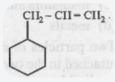
(B)



(C)

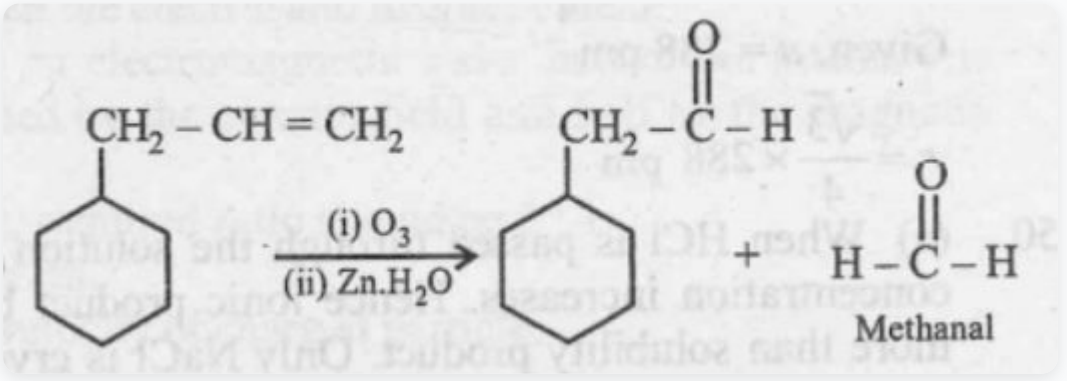


(D)



Explanation:

.



Question 55.

Reaction between acetone and methylmagnesium chloride followed by hydrolysis will give:

[4 Marks]

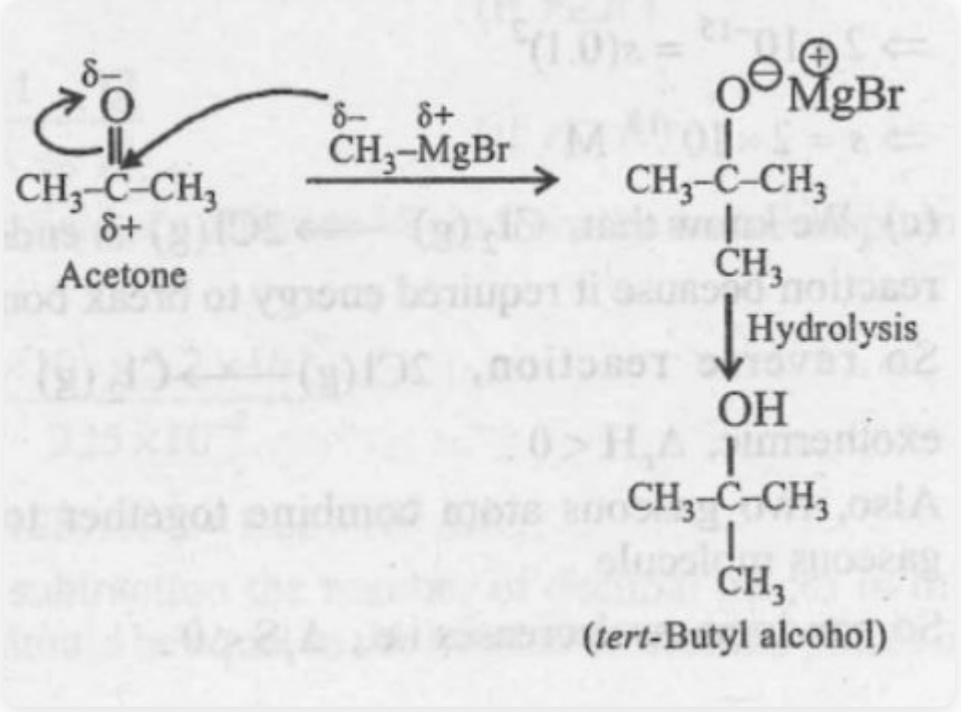
(A) Isopropyl alcohol

(B) Sec. butyl alcohol

(C) Tert. butyl alcohol

(D) Isobutyl alcohol

Explanation:



Question 56.

Which of the following is a natural polymer?

[4 Marks]

(A) poly (Butadiene-styrene)

(B) polybutadiene

(C) poly (Butadiene-acrylonitrile)

(D) cis-1, 4-polyisoprene

Explanation:

cis-1,4-Polyisoprene is a natural polymer.

Question 57.

Identify the correct statements from the following:

(A) $CO_2(g)$ is used as refrigerant for ice-cream and frozen food.

(B) The structure of C_{60} contains twelve six carbon rings and twenty five carbon rings.

(C) ZSM-5, a type of zeolite, is used to convert alcohols into gasoline.

(D) CO is colorless and odourless gas.

[4 Marks]

(A) (A), (B) and (C) only

(B) (C) and (D) only

(C) (A) and (C) only

(D) (B) and (C) only

Explanation:

(i) Dry ice, $CO_2(s)$, is used as refrigerant.

(ii) C_{60} contains 20 six-membered rings, 12 five-membered rings.

(iii) Ethanol, methanol and larger alcohols can be converted at 300–400°C in the presence of a zeolite catalyst (ZSM-5).

Question 58.

The correct option for free expansion of an ideal gas under adiabatic condition is

[4 Marks]

(A) q = 0, ΔT = 0 and w = 0

(B) q > 0, ΔT > 0 and w > 0

(C) q = 0, ΔT < 0 and w > 0

(D) q < 0, ΔT = 0 and w = 0

Explanation:

Free expansion of ideal gas

$P_{ex} = 0$

$\therefore w = -P_{ex}\Delta V = 0$

Adiabatic process $\Rightarrow q = 0$

$\Delta E = q + w$ (first law of thermodynamics)

$\therefore \Delta E = 0$

$\Delta E = nC_v dT \Rightarrow \Delta E = 0$

So, q = 0, ΔT = 0, w = 0.

Question 59.

Which of the following oxoacid of sulphur has –O–O– linkage?

[4 Marks]

(A) $H_2S_2O_8$, peroxodisulphuric acid

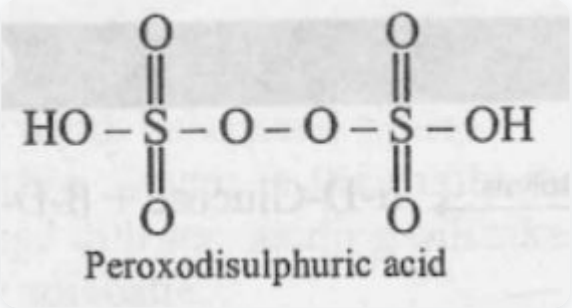
(B) H_2SO_4, sulphuric acid

(C) $H_2S_2O_7$, pyrosulphuric acid

(D) H_2SO_3, sulphurous acid

Explanation:

.

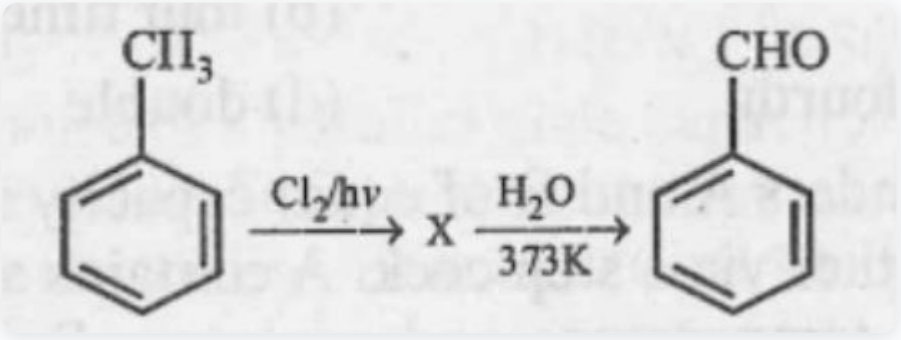


Peroxodisulphuric acid

Question 60.

Identify compound X in the following sequence of reactions

[4 Marks]



(A)



(B)



(C)

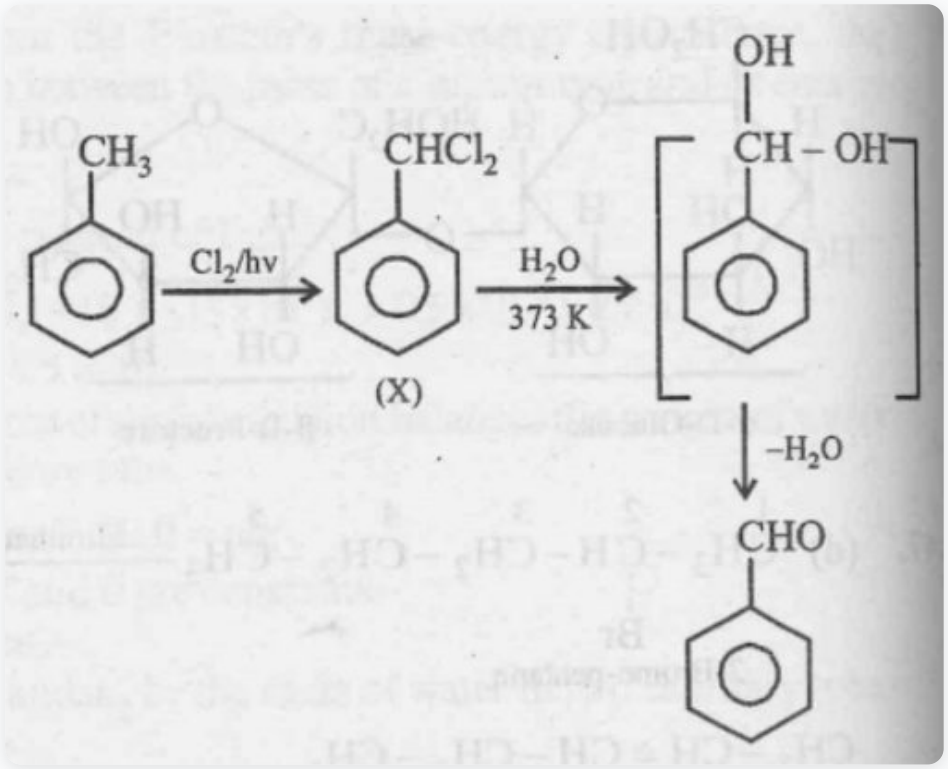


(D)



Explanation:

.



Question 61.

The number of protons, neutrons and electrons in $^{175}_{71}Lu$, respectively, are

[4 Marks]

(A) 71, 71 and 104

(B) 175, 104 and 71

(C) 71, 104 and 71

(D) 104, 71 and 71

Explanation:

$^{175}_{71}Lu$

No. of protons = No. of electrons = 71

No. of neutrons = Mass no. − No. of protons

= 175 − 71 = 104

Question 62.

Identify the incorrect statement.

[4 Marks]

(A) Cr^{2+} is a stronger reducing agent than Fe^{2+} in water.

(B) The oxidation states of chromium in CrO_4^{2-} and $Cr_2O_7^{2-}$ are not the same.

(C) The transition metals and their compounds are known for their catalytic activity due to their ability to adopt multiple oxidation states and to form complexes.

(D) Interstitial compounds are those that are formed when small atoms like H, C or N are trapped inside the crystal lattices of metals.

Explanation:

Oxidation state of Cr in CrO_4^{2-} and $Cr_2O_7^{2-}$ is +6, i.e. oxidation states are same.

Question 63.

Which of the following is a cationic detergent?

[4 Marks]

(A) Sodium lauryl sulphate

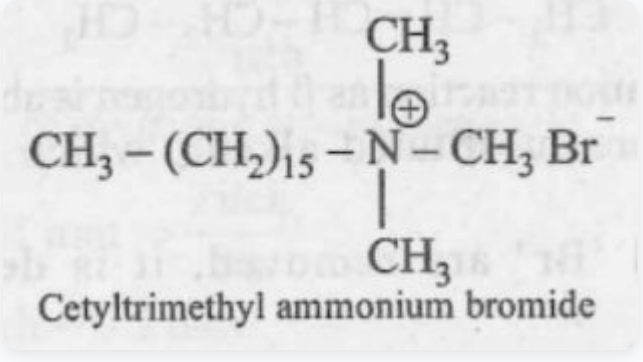
(B) Sodium dodecylbenzene sulphonate

(C) Cetyltrimethyl ammonium bromide

(D) Sodium stearate

Explanation:

.



Cetyltrimethyl ammonium bromide

Question 64.

The freezing point depression constant (Kf) of benzene is 5.12 K kg mol^{-1}. The freezing point depression for the solution of molality 0.078 m containing a non-electrolyte solute in benzene is (rounded off upto two decimal places)

[4 Marks]

(A) 0.20 K

(B) 0.80 K

(C) 0.40 K

(D) 0.60 K

Explanation:

$\Delta T\text{-}f = K_f m$

$= 5.12 \times 0.078$

$= 0.399$ K

$= 0.40$ K

Question 65.

Identify the incorrect match.

[4 Marks]

Name	IUPAC Official Name
(A) Unnilunium	Mendelevium
(B) Unniltrium	Lawrencium
(C) Unnilhexium	Seaborgium
(D) Unununnium	Darmstadtium

(A) (A), (i)

(B) (D), (iv)

(C) (B), (ii)

(D) (C), (iii)

Explanation:

Unununium (Z = 111), it is Roentgenium (Rg) not Darmstadtium.

Question 66.

The mixture which shows positive deviation from Raoult's law is

[4 Marks]

(A) Acetone + Chloroform

(B) Benzene + Toluene

(C) Ethanol + Acetone

(D) Chloroethane + Bromoethane

Explanation:

Hydrogen bond of ethanol gets weakened by addition of acetone. Thus the mixture of ethanol and acetone show positive deviation from Raoult's law.

Question 67.

Match the following:

Which of the following is the correct option?

[4 Marks]

Match the following :

Oxide	Nature
(A) CO	(i) Basic
(B) BaO	(ii) Neutral
(C) Al_2O_3	(iii) Acidic
(D) Cl_2O_7	(iv) Amphoteric

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

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

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

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

Explanation:

CO : Neutral oxide

BaO : Basic oxide

Al_2O_3 : Amphoteric oxide

Cl_2O_7 : Acidic oxide

Question 68.

Which one of the following has maximum number of atoms?

[4 Marks]

(A) 1 g of Mg(s) [Atomic mass of Mg = 24]

(B) 1 g of O_2(g) [Atomic mass of O = 16]

(C) 1 g of Li(s) [Atomic mass of Li = 7]

(D) 1 g of Ag(s) [Atomic mass of Ag = 108]

Explanation:

Number of atoms

= (W/Molar mass) × N Subscript (A) × atomicity

(a) Number of Mg atoms

= (1/24) × N Subscript (A) × 1

(b) Number of O atoms

= (1/32) × N Subscript (A) × 2

(c) Number of Li atoms

= (1/7) × N Subscript (A) × 1

(d) Number of Ag atoms

= (1/108) × N Subscript (A) × 1

Question 69.

Reaction between benzaldehyde and acetophenone in presence of dilute NaOH is known as

[4 Marks]

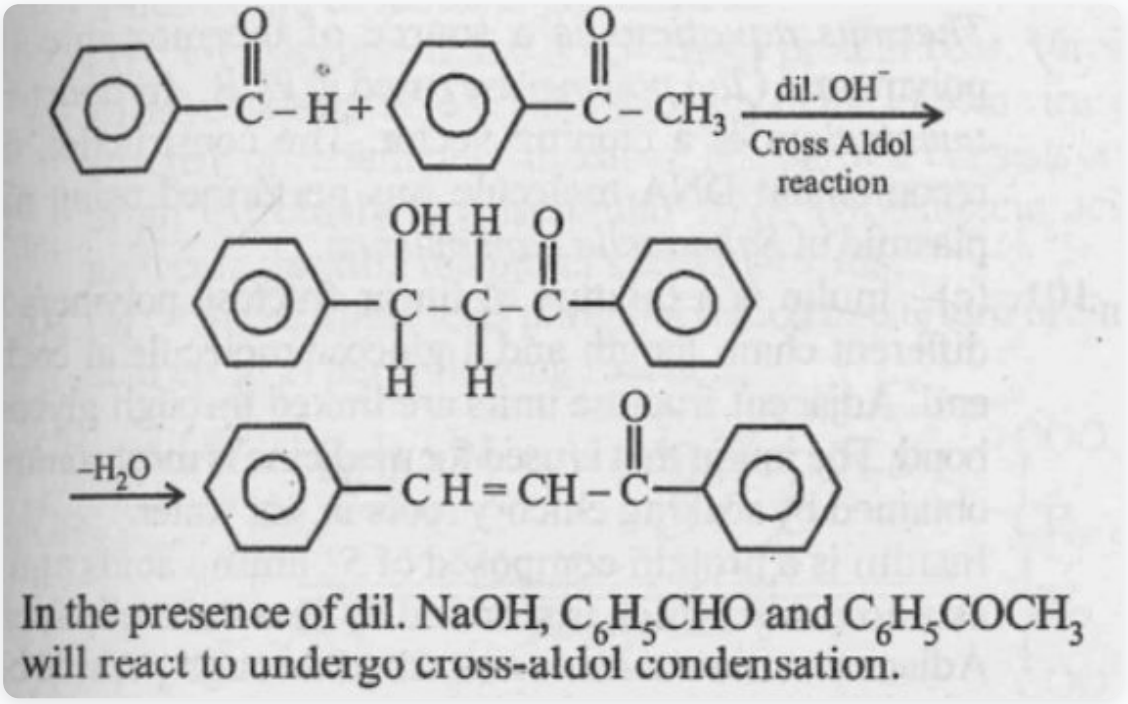
(A) Cannizzaro's reaction

(B) Cross Cannizzaro's reaction

(C) Cross Aldol condensation

(D) Aldol condensation

Explanation:



Question 70.

A tertiary butyl carbocation is more stable than a secondary butyl carbocation because of which of the following?

[4 Marks]

(A) +R effect of $–CH_3$ groups

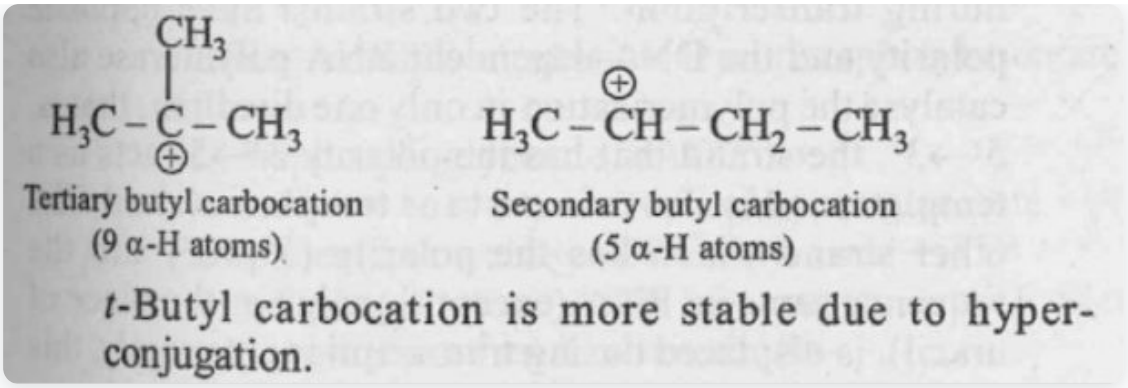
(B) –R effect of $–CH_3$ groups

(C) Hyperconjugation

(D) –I effect of $–CH_3$ groups

Explanation:

.



Question 71.

Which of the following is not correct about carbon monoxide?

[4 Marks]

(A) It is produced due to incomplete combustion.

(B) It forms carboxyhaemoglobin.

(C) The carboxyhaemoglobin (haemoglobin bound to CO) is less stable than oxyhaemoglobin.

(D) It reduces oxygen carrying ability of blood.

Explanation:

The carboxyhaemoglobin (haemoglobin bound to CO), is about 300 times more stable than oxyhaemoglobin.

Question 72.

Which of the following is a basic amino acid?

[4 Marks]

(A) Serine

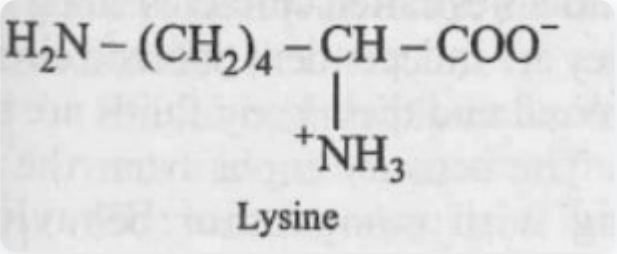
(B) Alanine

(C) Tyrosine

(D) Lysine

Explanation:

Since it contains more number of $–NH_2$ groups as compared to –COOH groups, hence it is basic amino acid.



Lysine

Question 73.

Urea reacts with water to form A which will decompose to form B. B when passed through $Cu^{2+}(aq)$, deep blue colour solution C is formed. What is the formula of C from the following?

[4 Marks]

(A) $CuSO_4$

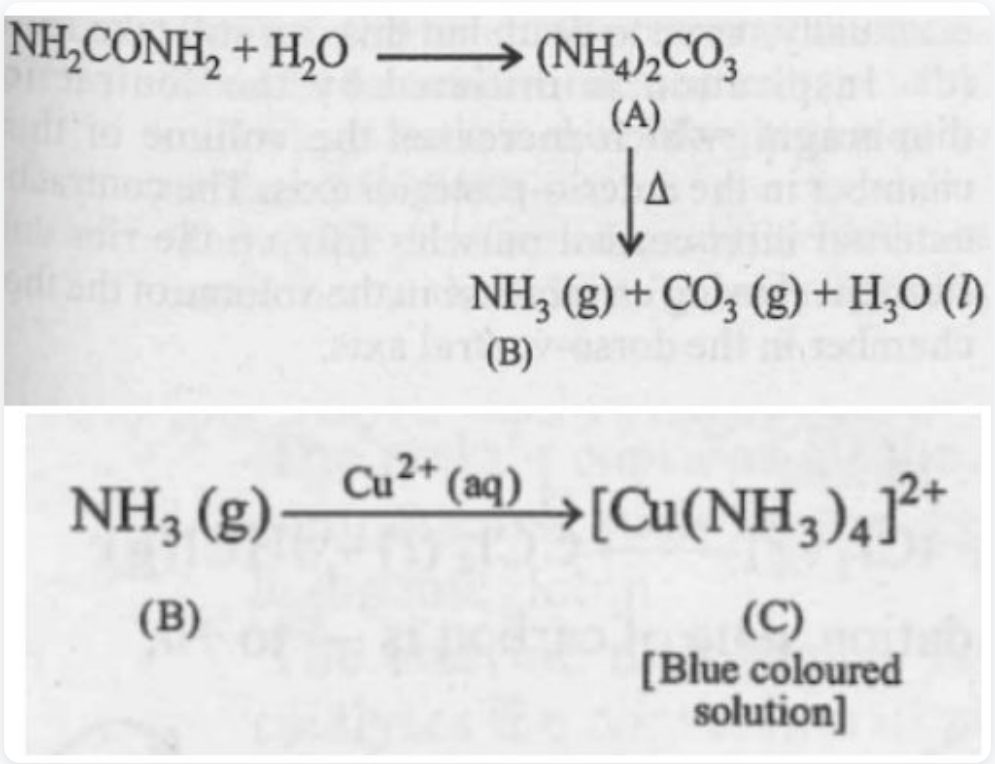
(B) $CuCO_3 \cdot Cu(OH)_2$

(C) $Cu(OH)_2$

(D) $[Cu(NH_3)_4]^{2+}$

Explanation:

.



Question 74.

A mixture of N_2 and Ar gases in a cylinder contains 7 g of N_2 and 8 g of Ar. If the total pressure of the mixture of the gases in the cylinder is 27 bar, the partial pressure of N_2 is:

[Use atomic masses (in g mol^{-1}): N = 14, Ar = 40]

[4 Marks]

(A) 15 bar

(B) 12 bar

(C) 9 bar

(D) 18 bar

Explanation:

$$n_{N_2} = \frac{7}{28} = \frac{1}{4} = 0.25$$

$$n_{Ar} = \frac{8}{40} = \frac{1}{5} = 0.20$$

Now, applying Dalton's law of partial pressure,

$$p_{N_2} = (\text{mole fraction})N_2 \cdot P_{Total}$$

$$\frac{0.25}{0.45} \times 27 = \frac{5}{9} \times 27 = 15 \text{ bar}$$

Question 75.

Identify the correct statement from the following:

[4 Marks]

(A) Blister copper has blistered appearance due to evolution of CO_2.

(B) Pig iron can be moulded into a variety of shapes.

(C) Wrought iron is impure iron with 4% carbon.

(D) Vapour phase refining is carried out for Nickel by Van Arkel method.

Explanation:

The iron obtained from blast furnace contains about 4% carbon and smaller amount of impurities like S, P, Si, Mn. This form of iron is known as pig iron. It can be moulded into variety of shapes.

Question 76.

Hydrolysis of sucrose is given by the following reaction.

Sucrose + H_2O ⇌ Glucose + Fructose

If the equilibrium constant (Kc) is 2×10^{13} at 300 K, the value of $\Delta_r G°$ at the same temperature will be:

[4 Marks]

(A) $-8.314\ J\ mol^{-1}\ K^{-1} \times 300\ K \times \ln(2 \times 10^{13})$

(B) $-8.314\ J\ mol^{-1}\ K^{-1} \times 300\ K \times \ln(4 \times 10^{13})$

(C) $8.314\ J\ mol^{-1}\ K^{-1} \times 300\ K \times \ln(3 \times 10^{13})$

(D) $8.314\ J\ mol^{-1}\ K^{-1} \times 300\ K \times \ln(2 \times 10^{13})$

Explanation:

$\Delta G = \Delta G° + RT \ln Q$

At equilibrium $\Delta G = 0$, $Q = K_eq$

So,

$\Delta_r G° = -RT \ln K_eq$

$\Delta_r G° = -8.314\ J\ mol^{-1}\ K^{-1} \times 300\ K \times \ln (2 \times 10^{13})$

Question 77.

Identify a molecule which does not exist.

[4 Marks]

(A) Li_2

(B) O_2

(C) C_2

(D) He_2

Explanation:

For He_2 molecule, Electronic configuration is

$\sigma 1s^2, \sigma^* 1s^2$

Bond order

= 1/2 (N_b − N_a)

= 1/2 (2 − 2)

= 0

Since, bond order of He_2 is zero, so it does not exist.

Question 78.

An increase in the concentration of the reactants of a reaction leads to change in

[4 Marks]

(A) collision frequency

(B) activation energy

(C) threshold energy

(D) heat of reaction

Explanation:

The number of collisions per second per unit volume of the reaction mixture is known as collision frequency (Z).

Collision frequency ∝ number of reacting molecules or atoms. Higher the concentration of reactant molecules, higher is the probability of collision and so the collision frequency.

Question 79.

Which of the following alkane cannot be made in good yield by Wurtz reaction?

[4 Marks]

(A) n-Hexane

(B) 2,3-Dimethylbutane

(C) n-Heptane

(D) n-Butane

Explanation:

.

Wurtz reaction is used to prepare symmetrical alkanes like $R_1 - R_1$, as

$$R_1 - X + 2Na + X - R_1 \xrightarrow{\text{Dry ether}} R_1 - R_1 + 2NaX$$

If R_1 and R_2 are different, then mixture of alkanes may be obtained as

$$R_1 - X + 2Na + R_2 - X \xrightarrow{\text{Dry ether}}$$

$$R_1 - R_1 + R_1 - R_2 + R_2 - R_2 + 2NaX$$

Hence, *n*-heptane cannot be made in good yield using Wurtz reaction, since it is unsymmetrical alkene.

Question 80.

Which of the following amine will give the carbylamine test?

[4 Marks]

(A)



(B)



(C)



(D)



Explanation:

Aliphatic and aromatic primary amines give carbylamine reaction. Since aniline is primary aromatic amine it gives carbylamine test.

Question 81.

On electrolysis of dil. sulphuric acid using Platinum (Pt) electrode, the product obtained at anode will be

[4 Marks]

(A) Hydrogen gas

(B) SO_2 gas

(C) H_2S gas

(D) Oxygen gas

Explanation:

During the electrolysis of dil. sulphuric acid using Pt electrodes following reaction occurs.

At cathode :

$4H^+(aq) + 4e^- \longrightarrow 2H_2(g)$

At anode :

$2H_2O(l) \longrightarrow O_2(g) + 4H^+(aq) + 4e^-$

Question 82.

What is the change in oxidation number of carbon in the following reaction?

$CH_4(g) + 4Cl_2(g) \longrightarrow CCl_4(l) + 4HCl(g)$

[4 Marks]

(A) −4 to +4

(B) 0 to +4

(C) +4 to +4

(D) 0 to −4

Explanation:

.

$$\overset{-4}{CH_4}\,(g) + 4Cl_2\,(g) \longrightarrow \overset{+4}{CCl_4}\,(l) + 4HCl(g)$$

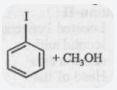
Change in oxidation state of carbon is –4 to +4.

Question 83.

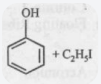
Anisole on cleavage with HI gives

[4 Marks]

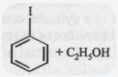
(A)



(B)



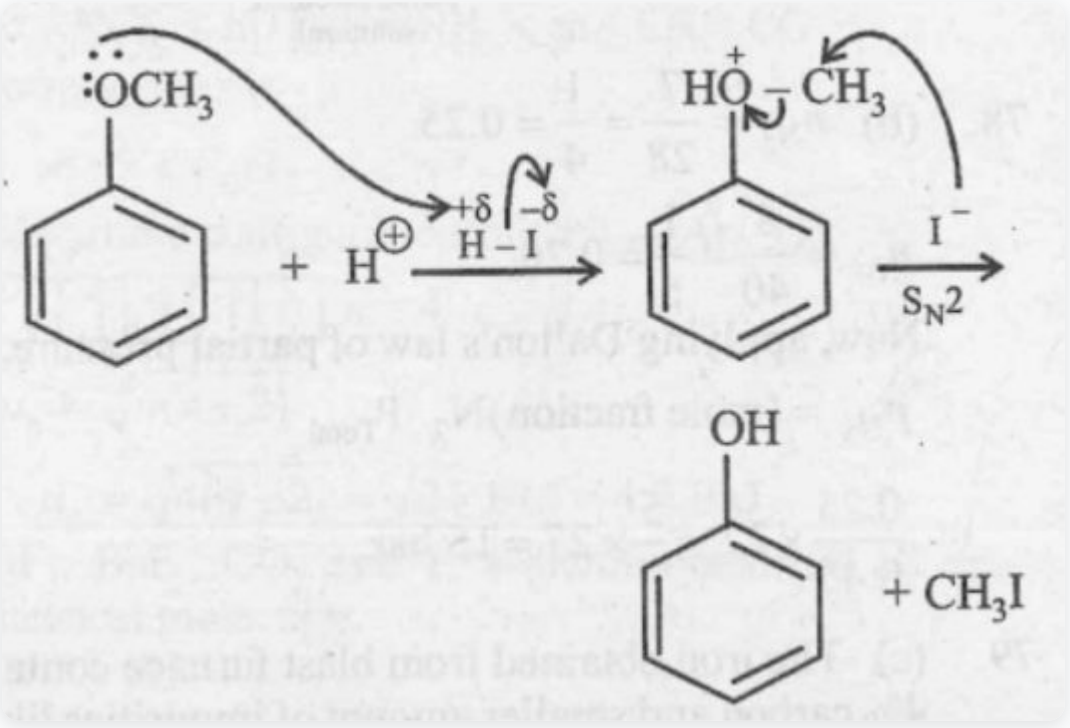
(C)



(D)



Explanation:



Question 84.

Measuring Zeta potential is useful in determining which property of colloidal solution?

[4 Marks]

(A) Stability of the colloidal particles

(B) Solubility

(C) Size of the colloidal particles

(D) Viscosity

Explanation:

In colloidal solution, the potential difference between the fixed layer and the diffused layer of opposite charge is known as Zeta potential. Greater the Zeta potential, more will be the stability of colloidal particle.

Question 85.

Paper chromatography is an example of

[4 Marks]

(A) Adsorption chromatography

(B) Column chromatography

(C) Thin layer chromatography

(D) Partition chromatography

Explanation:

Paper chromatography is a type of partition chromatography.

Question 86.

Match the following and identify the correct option.

[4 Marks]

(A) $CO(g) + H_2(g)$	(i) $Mg(HCO_3)_2 + Ca(HCO_3)_2$
(B) Temporary hardness of water	(ii) An electron deficient hydride
(C) B_2H_6	(iii) Synthesis gas
(D) H_2O_2	(iv) Non-planar structure

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

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

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

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

Explanation:

(A) Water gas is a mixture of combustible gases (CO and H_2).

(B) Temporary hardness of water is due to bicarbonates of calcium and magnesium. It can be removed by boiling of water.

(C) Diborane (B_2H_6) is an electron deficient hydride.

(D) Hydrogen peroxide (H_2O_2) is a non-planar molecule with twisted symmetry. It is non-planar, non-linear molecule with an open book structure.

Question 87.

If the distance between two consecutive base pairs is 0.34 nm and the total number of base pairs of a DNA double helix in a typical mammalian cell is 6.6×10^9 bp, then the length of the DNA is approximately

[4 Marks]

(A) 2.7 meters

(B) 2.0 meters

(C) 2.5 meters

(D) 2.2 meters

Explanation:

Length of DNA

= $[0.34 \times 10^{-9}]$ m $\times 6.6 \times 10^9$ bp

= 2.2 m

Distance between 2 base pair in DNA helix

= 0.34 nm

= 0.34×10^{-9} m

Total number of base pair

= 6.6×10^9 bp

Question 88.

Bilaterally symmetrical and acoelomate animals are exemplified by

[4 Marks]

(A) Platyhelminthes

(B) Aschelminthes

(C) Annelida

(D) Ctenophora

Explanation:

Platyhelminthes are bilaterally symmetrical, triploblastic and acoelomate animals with organ level of organisation.

Question 89.

Match the following columns and select the correct option.

[4 Marks]

Column-I	Column-II
(A) Gregarious, polyphagous pest	(i) *Asterias*
(B) Adult with radial symmetry and larva with bilateral symmetry	(ii) *Scorpion*
(C) Book lungs	(iii) *Ctenoplana*
(D) Bioluminescence	(iv) *Locusta*

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

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

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

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

Explanation:

Locusta is a gregarious pest. In Echinoderms, adults are radially symmetrical but larvae are bilaterally symmetrical. Scorpions respire through book lungs. Bioluminescence is well marked in ctenophores.

Question 90.

Which is the important site of formation of glycoproteins and glycolipids in eukaryotic cells?

[4 Marks]

(A) Polysomes

(B) Endoplasmic reticulum

(C) Golgi bodies

(D) Peroxisomes

Explanation:

Golgi bodies is site of formation of glycoproteins and glycolipids in eukaryotic cells.

Question 91.

The QRS complex in a standard ECG represents

[4 Marks]

(A) Repolarisation of auricles

(B) Repolarisation of ventricles

(C) Depolarisation of auricles

(D) Depolarisation of ventricles

Explanation:

The QRS complex represents the depolarisation of the ventricles, which initiates the ventricular contraction. The contraction starts shortly after Q and marks the beginning of the systole.

Question 92.

Match the following columns and select the correct option.

[4 Marks]

Column-I	Column-II
(a) Floating Ribs	(i) Located between second and seventh ribs
(b) Acromion	(ii) Head of the Humerus
(c) Scapula	(iii) Clavicle
(d) Glenoid cavity	(iv) Do not connect with the sternum

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

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

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

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

Explanation:

11^{th} and 12^{th} pairs of ribs are not connected ventrally and are therefore, called floating ribs. Acromion is a flat expanded process of spine of scapula. The lateral end of clavicle articulates with acromion process. Scapula is a flat triangular bone in the dorsal part of the thorax between 2^{nd} and the 7^{th} rib. Glenoid cavity of scapula articulates with head of the humerus to form the shoulder joint.

Question 93.

Experimental verification of the chromosomal theory of inheritance was done by

[4 Marks]

(A) Sutton

(B) Boveri

(C) Mendel

(D) Morgan

Explanation:

Experimental verification of the chromosomal theory of inheritance was done by Morgan. Sutton and Boveri proposed chromosomal theory of inheritance but it was experimentally verified by T.H. Morgan.

Question 94.

Identify the incorrect statement.

[4 Marks]

(A) Sapwood is involved in conduction of water and minerals from root to leaf.

(B) Sapwood is the innermost secondary xylem and is lighter in colour.

(C) Due to deposition of tannins, resins, oils etc., heart wood is dark in colour. (d) Heart wood does not con

(D) Heart wood does not conduct water but gives mechanical support.

Explanation:

Sapwood is outermost secondary xylem. Outer secondary xylem or sapwood serves in water conduction, while the inner part called heartwood is composed of dead but structurally strong primary xylem.

Question 95.

Match the following columns and select the correct option.

[4 Marks]

Column-I	Column-II
(A) Pituitary gland	(i) Grave's disease
(B) Thyroid gland	(ii) Diabetes mellitus
(C) Adrenal gland	(iii) Diabetes insipidus
(D) Pancreas	(iv) Addison's disease

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

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

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

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

Explanation:

Grave's disease is due to excess secretion of thyroid hormones (T_3 & T_4). Diabetes mellitus is due to hyposecretion of insulin from beta-cells of pancreas. Diabetes insipidus is due to hyposecretion of

ADH from posterior pituitary. Addison's disease is due to hyposecretion of hormone from adrenal cortex.

Question 96.

Match the organism with its use in biotechnology.

[4 Marks]

(A) *Bacillus thuringiensis*	(i) Cloning vector
(B) *Thermus aquaticus*	(ii) Construction of first rDNA molecule
(C) *Agrobacterium tumefaciens*	(iii) DNA polymerase
(D) *Salmonella typhimurium*	(iv) Cry proteins

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

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

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

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

Explanation:

Bacillus thuringiensis is a source of Cry-proteins. *Thermus aquaticus* is a source of thermostable DNA polymerase (*Taq* polymerase) used in PCR. *Agrobacterium tumefaciens* is a cloning vector. The construction of 1st recombinant DNA molecule was performed using native plasmid of *Salmonella typhimurium*.

Question 97.

Identify the substances having glycosidic bond and peptide bond, respectively in their structure

[4 Marks]

(A) Cellulose, lecithin

(B) Glycerol, trypsin

(C) Inulin, insulin

(D) Chitin, cholesterol

Explanation:

Inulin is a mixture of linear fructose polymers with different chain length and a glucose molecule at each C2 end. Adjacent fructose units are linked through glycosidic bond. The inulin that is used for medicine is most commonly obtained by soaking chicory roots in hot water. Insulin is a protein composed of 51 amino acids and acts as a hormone which is secreted by beta-cells of pancreas. Adjacent amino acids are attached through peptide bond.

Question 98.

Name the enzyme that facilitates opening of DNA helix during transcription.

[4 Marks]

(A) DNA ligase

(B) RNA polymerase

(C) DNA polymerase

(D) DNA helicase

Explanation:

RNA polymerase facilitates opening of DNA helix during transcription. The two strands have opposite polarity and the DNA-dependent RNA polymerase also catalyse the polymerisation in only one direction, that is, 5′→3′, the strand that has the polarity 3′→5′ acts as a template, and is also referred to as template strand. The other strand which has the polarity (5′→3′) and the sequence same as RNA (except thymine at the place of uracil), is displaced during transcription. Strangely, this strand is referred to as coding strand.

Question 99.

If the head of cockroach is removed, it may live for few days because

[4 Marks]

(A) the cockroach does not have nervous system.

(B) the head holds a small proportion of a nervous system while the rest is situated along the ventral part of its body.

(C) the head holds a 1/3rd of a nervous system while the rest is situated along the dorsal part of its body.

(D) the supra-oesophageal ganglia of the cockroach are situated in ventral part of abdomen.

Explanation:

Cockroaches breathe passively through a network of pipes connected to holes called spiracles along the length of their body. They are independent of blood circulation to move oxygen around and their body fluids are at a muchlower pressure. The sensory input from the eyes and antennae, along with many other behaviours, are transmitted and handled by their brain such as running and reacting to touch, handled by 'mini brains' called ganglia in each body segment. (A decapitated cockroach will eventually starve to death but this can still take few days.

Question 100.

Select the correct events that occur during inspiration.

(i) Contraction of diaphragm

(ii) Contraction of external inter-costal muscles

(iii) Pulmonary volume decreases

(iv) Intra pulmonary pressure increases

[4 Marks]

(A) Only (iv)

(B) (i) and (ii)

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

(D) (iii) and (iv)

Explanation:

Inspiration is initiated by the contraction of diaphragm, which increases the volume of thoracic chamber in the anterio-posterior axis. The contraction of external inter-costal muscles lifts up the ribs and the sternum causing an increase in the volume of the thoracic chamber in the dorso-ventral axis.

Question 101.

By which method was a new breed 'Hisardale' of sheep formed by using Bikaneri ewes and Marino rams?

[4 Marks]

(A) Mutational breeding

(B) Cross breeding

(C) Inbreeding

(D) Out crossing

Explanation:

Hisardale is a new breed of sheep developed in Punjab by crossing Bikaneri-ewe and Marino rams. In cross-breeding, superior males of one breed are
mated with superior females of another breed.

Question 102.

Which one of the following is the most abundant protein in the animals?

[4 Marks]

(A) Collagen

(B) Insulin

(C) Lectin

(D) Haemoglobin

Explanation:

Collagen is the most abundant protein in animal world. Collagen is the major insoluble fibrous protein found in the extracellular matrix and in connective tissue. RuBisCO is the most abundant protein in the whole of the Biosphere.

Question 103.

How many true breeding pea plant varieties did Mendel select as pairs, which were similar except in one character with contrasting traits?

[4 Marks]

(A) 2

(B) 8

(C) 4

(D) 14

Explanation:

Mendel selected 14 true breeding plant varieties. True breeding line refers to the plant that has undergone continuous self-pollination and showed stable trait inheritance and expression for several generations. Mendel (father of genetics) selected 14 true-breeding pea plant varieties, as pairs, which were similar except for one character with contrasting traits.

Question 104.

The body of the ovule is fused within the funicle at

[4 Marks]

(A) Chalaza

(B) Hilum

(C) Nucellus

(D) Micropyle

Explanation:

The attachment point of funicle and body of ovule is known as hilum. A hilum is a scar or mark left on a seed coat by the former attachment to the ovary wall or to the funiculus (which in turn attaches to the ovary wall). A hilum can also be a nucleus of a starch grain; the point around which layers of starch are deposited.

Question 105.

Which of the following is correct about viroids?

[4 Marks]

(A) They have free RNA without protein coat

(B) They have DNA with protein coat

(C) They have free DNA without protein coat

(D) They have RNA with protein coat

Explanation:

Viroids have free RNA without protein coat. Viroid, an infectious particle smaller than any of the known viruses, an agent of certain plant diseases. The particle consists only of an extremely small circular RNA (ribonucleic acid) molecule, lacking the protein coat of a virus.

Question 106.

The number of substrate level phosphorylations in one turn of citric acid cycle is

[4 Marks]

(A) Three

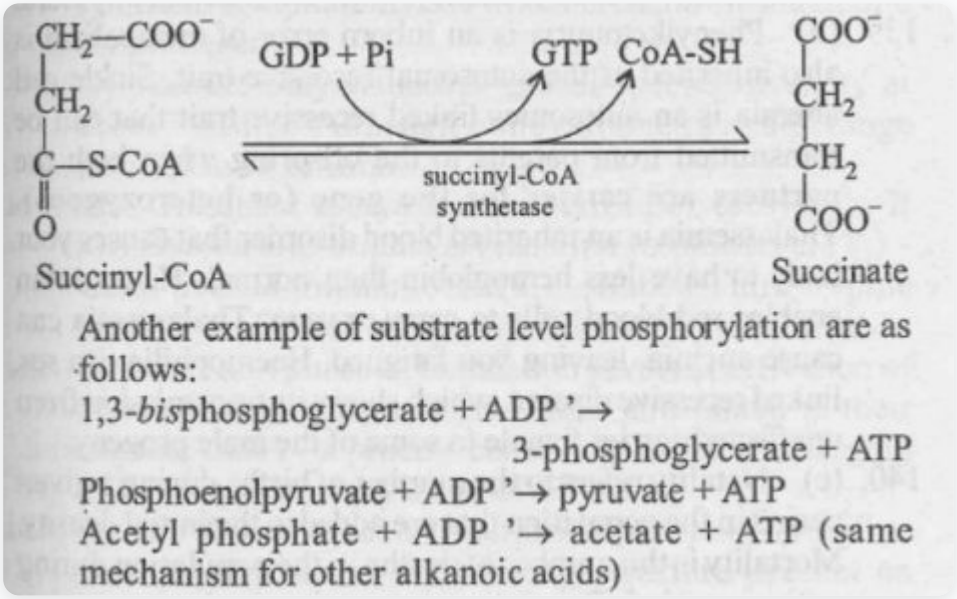
(B) Zero

(C) Two

(D) One

Explanation:

One substrate level phosphorylation in one turn of citric acid cycle as per following reaction:



Another example of substrate level phosphorylation are as follows:

1,3-*bis*phosphoglycerate + ADP '→ 3-phosphoglycerate + ATP

Phosphoenolpyruvate + ADP '→ pyruvate + ATP

Acetyl phosphate + ADP '→ acetate + ATP (same mechanism for other alkanoic acids)

Question 107.

The product(s) of reaction catalyzed by nitrogenase in root nodules of leguminous plants is/are

[4 Marks]

(A) Ammonia and oxygen

(B) Nitrate alone

(C) Ammonia and hydrogen

(D) Ammonia alone

Explanation:

Ammonia and Hydrogen.

$N_2 + 8e^- + 8H^+ + 16ATP \longrightarrow 2NH_3 + H_2 + 16ADP + 16Pi$

The steps involved in the process of nitrogen fixation are as follows:

• Rhizobia multiply and colonise the surroundings of the roots and get attached to epidermal and root hair cells.

• The root-hairs curl and the bacteria invade the root-hair.

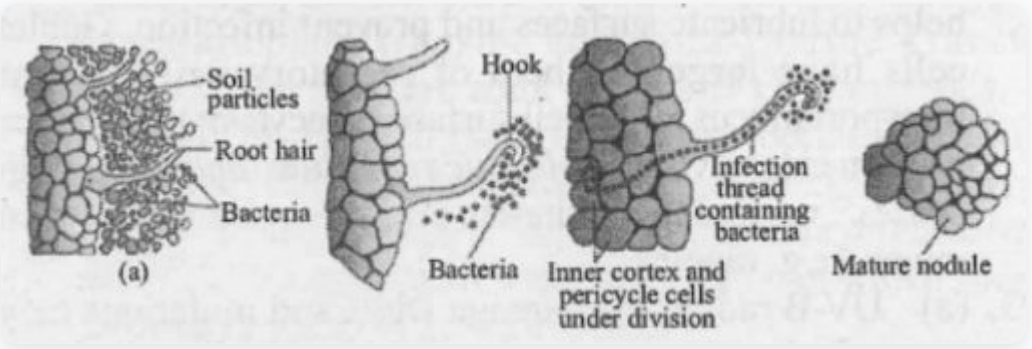
• An infection thread is produced carrying the bacteria into the cortex of the root, where they initiate the nodule formation in the cortex of the root.

• Then the bacteria are released from the thread into the cells which leads to the differentiation of specialised nitrogen fixing cells.

• The nodule thus formed, establishes a direct vascular connection with the host for exchange of nutrients.

• The nodule contains all the necessary biochemical components, such as the enzyme nitrogenase and leghaemoglobin.

• The enzyme nitrogenase is a Mo-Fe protein and catalyses the conversion of atmospheric nitrogen toammonia, the first stable product of nitrogen fixation.



Question 108.

The rate constant for a first order reaction is $4.606 \times 10^3\ s^{-1}$ The time required to reduce 2.0 g of the reactant to 0.2 g is:

[4 Marks]

(A) 100s

(B) 500s

(C) 200s

(D) 1000s

Explanation:

First order rate equation is

$k=2.303/t \log[A_o]/ [A]$

$\Rightarrow 4.606\times10^{-3} = 2.303 /t \log 2/0.2$

$\Rightarrow t= 2.303/4.606\times10^{-3} \times \log10$

$=10^3/2=500$ sec

Question 109.

Match the following diseases with the causative organism and select the correct option.

[4 Marks]

Column-I	Column-II
(A) Typhoid	(i) Wuchereria
(B) Pneumonia	(ii) Plasmodium
(C) Filariasis	(iii) Salmonella
(D) Malaria	(iv) Haemophilus

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

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

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

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

Explanation:

Typhoid fever in humans is caused by pathogenic bacterium *Salmonella typhi*. Pneumonia is caused by *Streptococcus pneumoniae* and *Haemophilus influenzae*. Filariasis or elephantiasis is caused by the filarial worm, *Wuchereria bancrofti* and *Wuchereria malayi*. Malaria is caused by different species of *Plasmodium*.

Question 110.

From his experiments, S.L. Miller produced amino acids by mixing the following in a closed flask

[4 Marks]

(A) CH_3, H_2, NH_4 and water vapor at 800°C

(B) CH_4, H_2, NH_3 and water vapor at 600°C

(C) CH_4, H_2, NH_3 and water vapor at 800°C

(D) CH_3, H_2, NH_3 and water vapor at 600°C

Explanation:

In 1953, S.L. Miller, an American scientist created electric discharge in a closed flask containing CH_4, H_2, NH_3 and water vapor at 800°C.

Question 111.

Which of the following statements is correct?

[4 Marks]

(A) Adenine pairs with thymine through three H-bonds

(B) Adenine pairs with thymine through one H-bond

(C) Adenine does not pair with thymine

(D) Adenine pairs with thymine through two H-bonds

Explanation:

Based on the observation of Erwin Chargaff that for a double stranded DNA, the ratios between Adenine and Thymine and Guanine and Cytosine are constant and equals one. Adenine pairs with thymine through two H-bonds i.e., A = T and guanine pairs with cytosine with three H-bonds.

Question 112.

Match the following with respect to meiosis

Select the correct option from the following

[4 Marks]

(A) Zygotene	(i) Terminalization
(B) Pachytene	(ii) Chiasmata
(C) Diplotene	(iii) Crossing over
(D) Diakinesis	(iv) Synapsis

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

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

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

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

Explanation:

Zygotene ⟶ Synapsis

Pachytene ⟶ Crossing over

Diplotene ⟶ Chiasmata formation

Diakinesis ⟶ Terminalisation

Question 113.

Choose the correct pair from the following

[4 Marks]

(A) Exonucleases — Make cuts at specific positions within DNA

(B) Nucleases — Separate the two strands of DNA

(C) Ligases — Join the two DNA molecules

(D) Polymerases — Break the DNA into fragments

Explanation:

Ligases join the two DNA molecules. DNA ligase is an enzyme which can connect two strands of DNA together by forming a bond between the phosphate group of one strand and the deoxyribose group on another. It is used in cells to join together the Okazaki fragments which are formed on the lagging strand during DNA replication.

Question 114.

Select the option including all sexually transmitted diseases.

[4 Marks]

(A) Gonorrhoea, Malaria, Genital herpes

(B) AIDS, Malaria, Filaria

(C) Cancer, AIDS, Syphilis

(D) Gonorrhoea, Syphilis, Genital herpes

Explanation:

Gonorrhoea, Syphilis, Genital herpes are sexually transmitted diseases. Gonorrhoea is caused by a bacterium *Neisseria gonorrhoeae*. Syphilis is caused by a bacterium *Treponema pallidum*. Genital

herpes is caused by a virus Type-II-Herpes simplex virus.

Question 115.

Embryological support for evolution was disapproved by

[4 Marks]

(A) Alfred Wallace

(B) Charles Darwin

(C) Karl Ernst von Baer

(D) Oparin

Explanation:

Embryological support for evolution was disapproved by Karl Ernst von Baer, he noted that embryos never pass through the adult stages of other animals during embryonic development.

Question 116.

The roots that originate from the base of the stem are

[4 Marks]

(A) Lateral roots

(B) Fibrous roots

(C) Prop roots

(D) Primary roots

Explanation:

The roots that originate from the base of the stem are fibrous roots. A fibrous root system is the opposite of a taproot system. It is usually formed by thin, moderately branching roots growing from the stem. A fibrous root system is universal in monocotyledonous plants and ferns. The fibrous root systems look like a mat made out of rootswhen the tree has reached full maturity.

Question 117.

In gel electrophoresis, separated DNA fragments can be visualized with the help of

[4 Marks]

(A) Acetocarmine in bright blue light

(B) Ethidium bromide in infrared radiation

(C) Acetocarmine in UV radiation

(D) Ethidium bromide in UV radiation

Explanation:

The separated DNA fragments can be visualised onlymafter staining the DNA with Ethidium bromide followed by exposure to UV radiation.

Question 118.

Which of the following hormone levels will cause release of ovum (ovulation) from the graafian follicle?

[4 Marks]

(A) Low concentration of LH

(B) High concentration of Progesterone

(C) Low concentration of FSH (d) High concentration of Estrogen

(D) High concentration of Estrogen

Explanation:

The gonadotropin (LH and FSH) increases gradually during the follicular phase, and stimulates follicular development as well as secretion of estrogens by the growing follicles. Both LH and FSH attain a peak level in the middle of cycle (about 14th day). Rapid secretion of LH leading to its maximum level during the mid-cycle called LH surge induces rupture of Graafian follicle and thereby the release of ovum (ovulation).

Question 119.

Goblet cells of alimentary canal are modified from

[4 Marks]

(A) Squamous epithelial cells

(B) Compound epithelial cells

(C) Columnar epithelial cells

(D) Chondrocytes

Explanation:

Goblet cells are found within the lining of the airways and intestines. Goblet cells secrete mucus, which helps to lubricate surfaces and prevent infection. Goblet cells have large numbers of secretory vesicles that transport mucus to the cell surface (exocytosis). Theyalso have an extensive endoplasmic reticulum' and large golgi bodies" needed to synthesise and the proteins found in mucus (e.g. mucin).

Question 120.

Snow-blindness in Antarctic region is due to

[4 Marks]

(A) High reflection of light from snow

(B) Inflammation of cornea due to high dose of UV-B radiation

(C) Damage to retina caused by infra-red rays

(D) Freezing of fluids in the eye by low temperature

Explanation:

UV-B radiations damage DNA and mutations may occur. In human eye, cornea absorbs UV-B radiations, and a high dose of UV-B causes inflammation of cornea called snow blindness, cataract, etc.

Question 121.

Match the following concerning essential elements and their functions in plants

Select the correct option

[4 Marks]

(A) Iron	(i) Photolysis of water
(B) Zinc	(ii) Pollen germination
(C) Boron	(iii) Required for chlorophyll biosynthesis
(D) Manganese biosynthesis	(iv) IAA

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

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

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

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

Explanation:

Iron is essential for the formation of chlorophyll. Zinc is needed for synthesis of auxin. Boron plays a role in pollen grain germination. Manganese is involved in the splitting of water to liberate O_2, during photosynthesis.

Question 122.

Bt cotton variety that was developed by the introduction of toxin gene of *Bacillus thuringiensis* (Bt) is resistant to

[4 Marks]

(A) Fungal diseases

(B) Insect pests

(C) Insect predators

(D) Plant nematodes

Explanation:

Btcotton isresistant to cotton ‘bollworn (Insect pest). cry I Ac and cry II Ab genes have been introduced in cotton to protect it from cotton bollworm. This makes Bt cotton as biopesticide.

Question 123.

Ray florets have

[4 Marks]

(A) Inferior ovary

(B) Half inferior ovary

(C) Hypogynous ovary

(D) Superior ovary

Explanation:

Rayfloret have inferior ovary. Ray floret is condition in flower where any of a number of strap-shapedand typically sterile florets that form the ray e.g., Sunflower Epigynous flower are formed in family Asteraceae.

Question 124.

Montreal protocol was signed in 1987 for control of

[4 Marks]

(A) Emission of ozone depleting substances

(B) Release of Green House gases

(C) Transport of Genetically modified organisms from one country to another

(D) Disposal of e-wastes

Explanation:

Montreal protocol – Signed in 16 Sep, 1987 (Ozone day) came into force – 1 Jan, 1989. It was aimed at stopping the production and import of ODS and reduce their concentration in the atmosphere. The main uses of ozone depleting substances include:

• CFCs and HCFCs in refrigerators and air conditioners,

• HCFCs and halons in fire extinguishers,

• CFCs and HCFCs in foam,

• CFCs and HCFCs as aerosol propellants, and

• Methyl bromide for fumigation of soil, structures and goods to be imported or exported.

Question 125.

Identify the wrong statement with regard to Restriction Enzymes.

[4 Marks]

(A) Each restriction enzyme functions by inspecting the length of a DNA sequence.

(B) Sticky ends can be joined by using DNA ligases.

(C) They are useful in genetic engineering.

(D) They cut the strand of DNA at palindromic sites.

Explanation:

Restriction endonucleases make cuts at specific positions within the DNA. They function by inspecting the length of a DNA sequence. Restriction endonuclease

binds to the DNA and cut the two strands of double helix at specific points in their sugar-phosphate backbones. They are used in genetic engineering to form recombinant molecules of DNA. DNA ligases join the DNA fragments.

Question 126.

The infectious stage of *Plasmodium* that enters the human body is

[4 Marks]

(A) Sporozoites

(B) Female gametocytes

(C) Trophozoites

(D) Male gametocytes

Explanation:

Plasmodium enters the human body as sporozoites (Infectious stage) through the bite of Infected Female Anopheles mosquito.

Question 127.

Meiotic division of the secondary oocyte is completed

[4 Marks]

(A) Prior to ovulation

(B) At the time of fusion of a sperm with an ovum

(C) After zygote formation

(D) At the time of copulation

Explanation:

Meiotic division of secondary oocyte is completed after the entry of sperm in secondary oocyte which lead to the formation of a large ovum and a tiny 2nd polar body.

Question 128.

The oxygenation activity of RuBisCO enzyme in photorespiration leads to the formation of

[4 Marks]

(A) 1 molecule of 6-C compound

(B) 1 molecule of 3-C compound

(C) 1 molecule of 4-C compound and 1 molecule of 2-C compound

(D) 2 molecules of 3-C compound

Explanation:

In photorespiration, O_2 binds to RuBisCo. As a result RuBP instead to being converted to 2 molecules of PGA bind with O_2 to form one molecule each of phosphoglycerate (3 carbon compound) and phosphoglycolate (2 carbon compound).

Question 129.

Which of the following statements are true for the phylum-Chordata?

(i) In Urochordata notochord extends from head to tail and it is present throughout their life.

(ii) In Vertebrata notochord is present during the embryonic period only.

(iii) Central nervous system is dorsal and hollow.

(iv) Chordata is divided into 3 subphyla : Hemichordata, Tunicata and Cephalochordata.

[4 Marks]

(A) (iii) and (i)

(B) (iii) and (iv)

(C) (ii) and (iii)

(D) (i) and (ii)

Explanation:

Invertebrata, notochord is present during embryonic period only as it is replaced by vertebral column. In chordates, central nervous system is dorsal and hollow.

Question 130.

Match the following columns and select the correct option.

[4 Marks]

Column-I	Column-II
(A) *Clostridium butylicum*	(i) Cyclosporin-A
(B) *Trichoderma polysporum*	(ii) Butyric Acid
(C) *Monascus purpureus*	(iii) Citric Acid
(D) *Aspergillus niger*	(iv) Blood cholesterol lowering agent

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

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

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

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

Explanation:

Clostridium butylicum (a bacterium) is used for the production of butyric acid. An bioactive molecule, cyclosporin A, that is used as an immunosuppressive agent in organ-transplant patients, is produced by the fungus *Trichoderma polysporum*. Statins produced by the yeast *Monascus purpureus* have been commercialized as blood- cholesterol lowering agents. It acts by competitively inhibiting the enzyme responsible for synthesis of cholesterol. *Aspergillus niger* (a fungus) is used for the commercial production of citric acid.

Question 131.

Which of the following pairs is of unicellular algae?

[4 Marks]

(A) Laminaria and Sargassum

(B) Chlorella and Spirulina

(C) Anabaena and Volvox

(D) Gelidium and Gracilaria

Explanation:

Chlorella and Spirulina are unicellular algae, Gelidium, Gracilaria, Laminaria and Sargassum are multicellular. Volvox is colonial.

Question 132.

In light reaction, plastoquinone facilitates the transfer of electrons from

[4 Marks]

(A) PS-II to Cyt b_6f complex

(B) PS-I to ATP synthase

(C) PS-I to $NADP^+$

(D) Cyt b_6f complex to PS-I

Explanation:

After excitement, e^- is passed from PS-II (P_{680}) to primary electron acceptor (Pheophytin). From primary e^- acceptor, e^- is passed to plastoquinone. Plastoquinone (PQ) in turn transfer its e^- to Cyt b_6f complex. Therefore plastoquinone facilitates the transfer of electrons from PS-II to Cyt b_6f complex.

Question 133.

Presence of which of the following conditions in urine are indicative of Diabetes Mellitus?

[4 Marks]

(A) Uremia and Ketonuria

(B) Renal calculi and Hyperglycaemia

(C) Uremia and Renal Calculi

(D) Ketonuria and Glycosuria

Explanation:

Presence of Ketone bodies in urine (Ketonuria) and presence of glucose in urine (Glycosuria) are indicative of Diabetes mellitus.

Question 134.

Secondary metabolites such as nicotine, strychnine and caffeine are produced by plants for their

[4 Marks]

(A) Nutritive value

(B) Effect on reproduction

(C) Growth response

(D) Defence action

Explanation:

A wide variety of chemical substances that we extract from plants on a commercial scale (nicotine, caffeine, quinine, strychnine, opium, etc) are produced by them (plants) as defences against grazers and browsers.

Question 135.

Which of the following would help in prevention of diuresis?

[4 Marks]

(A) Reabsorption of Na^+ and water from renal tubules due to aldosterone

(B) Atrial natriuretic factor causes vasoconstriction

(C) Decrease in secretion of renin by JG cells

(D) More water reabsorption due to undersecretion of ADH

Explanation:

Adrenal cortex secretes mineralocorticoids like aldosterone which increase the reabsorption of Na^+ and water from renal tubule that prevent diuresis. Diuresis is a condition in which the kidneys filter too much bodily fluid.

Question 136.

Select the correct match

[4 Marks]

(A) Haemophilia — Y linked

(B) Thalassemia — X linked

(C) Sickle cell anaemia — Autosomal recessive trait, chromosome-11

(D) Phenylketonuria — Autosomal dominant trait

Explanation:

Phenylketonuria is an inborn error of metabolism is also inherited as the autosomal recessive trait. Sickle cellanemia is an autosomes linked recessive trait that can be transmitted from parents to the offspring when both the partners are carrier for the gene (or heterozygous). Thalassemia is an

inherited blood disorder that causes your body to have less hemoglobin than normal. Hemoglobin enables red blood cells to carry oxygen. Thalassemia can cause anemia, leaving you fatigued. Haemophilia is a sex linked recessive disease, which shows its transmission from unaffected carrier female to some of the male progeny.

Question 137.

Which of the following is not an attribute of a population?

[4 Marks]

(A) Sex ratio

(B) Mortality

(C) Species interaction

(D) Natality

Explanation:

Natality refers to the number of births during a given period in the population that are added to the initial density. Mortality is the number of deaths in the population during a given period. Population interaction is the interaction between different populations. It refers to the effects that the organisms in a community have on one another. Thesex ratio is the ratio of males to females in a population.

Question 138.

Which of the following statements about inclusion bodies is incorrect?

[4 Marks]

(A) They are not bound by any membrane

(B) These represent reserve material in cytoplasm

(C) They lie free in the cytoplasm

(D) These are involved in ingestion of food particles

Explanation:

Inclusion bodies are nuclear or cytoplasmic aggregates which are stainable substances, usually proteins, and formed due to viral multiplication or genetic disorders in human beings these bodies are either intracellular or extracellular abnormalities and they are specific to certain diseases. These are not involved in ingestion of food particles.

Question 139.

The transverse section of a plant shows followinganatomical features:

(i) Large number of scattered vascular bundles surrounded by bundle sheath

(ii) Large conspicuous parenchymatous ground tissue

(iii) Vascular bundles conjoint and closed

(iv) Phloem parenchyma absent

Identify the category of plant and its part :

[4 Marks]

(A) Monocotyledonous stem

(B) Dicotyledonous root

(C) Dicotyledonous stem

(D) Monocotyledonous root

Explanation:

The monocot stem is characterised by conjoint, collateral, and closed vascular bundles, scattered in the ground tissue containing the parenchyma. Each vascular bundle is surrounded by sclerenchymatous bundle-sheath cells. Phloem parenchyma and medullary rays are absent in monocot stems.

Question 140.

In relation to Gross primary productivity and Net primary productivity of an ecosystem, which one of the following statements is correct?

[4 Marks]

(A) Gross primary productivity is always more than net primary productivity

(B) Gross primary productivity and Net primary productivity are one and same

(C) There is no relationship between Gross primary productivity and Net primary productivity

(D) Gross primary productivity is always less than net primary productivity

Explanation:

Gross primary productivity of an ecosystem is the rate of production of organic matter during photosynthesis. Net primary productivity is GPP-respiration. Hence, gross primary productivity is

always ‘more than NPP.

Question 141.

In water hyacinth and water lily, pollination takes place by:

[4 Marks]

(A) Insects or wind

(B) Wind and water

(C) Insects and water

(D) Water currents only

Explanation:

In majority of aquatic plants, the flowers emerge above the level of water. These may be pollinated by insects or wind eg.: Water hyacinth and water lily.

Question 142.

Which of the following is put into Anaerobic sludge digester for further sewage treatment?

[4 Marks]

(A) Activated sludge

(B) Primary sludge

(C) Effluents of primary treatment

(D) Floating debris

Explanation:

The sediment in settlement tank is called activated sludge. A small part of the activated sludge is pumped back into aeration tank. Remaining major part of the sludge is pumped into large tank called anaerobic sludge digesters.

Question 143.

The process responsible for facilitating loss of water in liquid form from the tip of grass blades at night and in early morning is

[4 Marks]

(A) Root pressure

(B) Imbibition

(C) Plasmolysis

(D) Transpiration

Explanation:

Root pressure is positive hydrostatic pressure. It develops in tracheary element at night and in early morning. Root pressure is caused by active distribution of mineral nutrient ions into the root xylem. Without transpiration to carry the ions up the stem, they accumulate in the root xylem and lower the water potential. Water then diffuses from the soil into the root xylem due to osmosis.

Question 144.

Cuboidal epithelium with brush border of microvilli is found in

[4 Marks]

(A) Eustachian tube

(B) Lining of intestine

(C) Ducts of salivary gland

(D) Proximal convoluted tubule of nephron

Explanation:

Cuboidal epithelium with brush border of microvilli is found in proximal convoluted tubule of nephron (PCT).

Question 145.

Select the correct statement.

[4 Marks]

(A) Insulin is associated with hyperglycaemia.

(B) Glucocorticoids stimulate gluconeogenesis.

(C) Glucagon is associated with hypoglycaemia.

(D) Insulin acts on pancreatic cells and adipocytes.

Explanation:

Glucagon is associated with hyperglycemia. Insulin acts on hepatocytes and adipocytes and is associated with hypoglycemia. Glucocorticoid stimulates gluconeogenesis, so increase blood sugar level.

Question 146.

Which of the following is not an inhibitory substance governing seed dormancy?

[4 Marks]

(A) Gibberellic acid

(B) Para-ascorbic acid

(C) Phenolic acid

(D) Abscisic acid

Explanation:

Gibberellic acid breaks seed dormancy. It activate synthesis of alpha-amylase which breakdown starch into simple sugar.

Question 147.

According to Robert May, the global species diversity is about

[4 Marks]

(A) 1.5 million

(B) 20 million

(C) 50 million

(D) 7 million

Explanation:

Robert May estimated global species diversity at about 7 million. Although some extreme estimates range from 20 to 50 million.

Question 148.

Match the trophic levels with their correct species examples in grassland ecosystem.

Select the correct option

[4 Marks]

(A) Fourth trophic level	(i) Crow
(B) Second trophic level	(ii) Vulture
(C) First trophic level	(iii) Rabbit
(D) Third trophic level	(iv) Grass

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

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

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

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

Explanation:

Grassland ecosystem is a terrestrial ecosystem. It includes various trophic levels.

First trophic level (T_1) – Grass

Second trophic level (T_2) – Rabbit

Third trophic level (T_3) – Crow

Fourth trophic level (T_4) – Vulture

Question 149.

The first phase of translation is

[4 Marks]

(A) Recognition of an anti-codon

(B) Aminoacylation of tRNA

(C) Recognition of DNA molecule

(D) Binding of mRNA to ribosome

Explanation:

The first phase of translation involves activation of amino acid in the presence of ATP and linked to their cognate tRNA – a process commonly called as charging of tRNA or aminoacylation of tRNA.

Question 150.

Strobili or cones are found in

[4 Marks]

(A) Pteris

(B) Marchantia

(C) Salvinia

(D) Equisetum

Explanation:

Strobili or cones are found in *Equisetum*. Strobili or cones are the dense and compact structure present on non flowering plants. They contain sporangia and perform function of protecting spores from wild animals and harsh conditions of environment.

Question 151.

Match the following columns and select the correct option.

[4 Marks]

Column-I	Column-II
(A) 6-15 pairs of *gill slits*	(i) *Trygon*
(B) Heterocercal caudal fin	(ii) Cyclostomes
(C) Air Bladder	(iii) Chondrichthyes
(D) Poison sting	(iv) Osteichthyes

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

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

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

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

Explanation:

Cyclostomes have an elongated body bearing 6-15 pairs of gill slits for respiration. The caudal fin is the tail fin located at the end of the caudal peduncle and is used for propulsion. See body-caudal fin locomotion. Heterocercal means the vertebrae extend into the upper lobe of the tail, making it longer (as in sharks). It is the opposite of hypocercal. Air bladder and poison sting (for e.g., *Trygon*) are found in Chondrichthyes as they have to swim constantly to avoid sinking.

Question 152.

Some dividing cells exit the cell cycle and enter vegetative inactive stage. This is called quiescent stage (G_0). This process occurs at the end of

[4 Marks]

(A) G_1 phase

(B) S phase

(C) G_2 phase

(D) M phase

Explanation:

Some dividing cells exit the cell cycle and enter vegetative inactive stage, called quiescent stage (G_0). This process occurs at the end of M-phase and beginning of G_1 phase.

Question 153.

Identify the correct statement with reference to human digestive system.

[4 Marks]

(A) Ileum opens into small intestine

(B) Vermiform appendix arises from duodenum

(C) Ileum is a highly coiled part

(D) Serosa is the innermost layer of the alimentary canal

Explanation:

As ileum is a highly coiled tube. Serosa is the outermost layer of the alimentary canal, thus, option (a) is an incorrect statement.

Question 154.

In which of the following techniques, the embryos aretransferred to assist those females who cannot conceive?

[4 Marks]

(A) ZIFT and IUT

(B) GIFT and ICSI

(C) ICSI and ZIFT

(D) GIFT and ZIFT

Explanation:

Option (d) is the answer because ART in which embryos are transferred, include ZIFT and IUT i.e. Zygote Intrafallopian Transfer and Intra Uterine Transfer respectively, both are embryo transfer (ET) methods. Option (a), (b) and (c) are incorrect because in GIFT (Gamete Intrafallopian Transfer), gamete is transferred into the fallopian tube of female who cannot produce ova. ICSI is Intra cytoplasmic sperm injection in which sperm is directly injected into the ovum.

Question 155.

The plant parts which consist of two generations - one within the other

(i) Pollen grains inside the anther

(ii) Germinated pollen grain with two male gametes

(iii) Seed inside the fruit

(iv) Embryo sac inside the ovule

[4 Marks]

(A) (i), (ii) and (iii)

(B) (iii) and (iv)

(C) (i) and (iv)

(D) (i) only

Explanation:

Theplant parts which consist of two generations one within the other are pollen grains inside the anther and embryo sac inside the ovule. Pollen grain is haploid inside the diploid anther. Embryo sac is haploid inside the diploid ovule.

Question 156.

Dissolution of the synaptonemal complex occurs during

[4 Marks]

(A) Zygotene

(B) Diplotene

(C) Leptotene

(D) Pachytene

Explanation:

Dissolution of the synaptonemal complex occurs during diplotene stage of Prophase-I of Meiosis-I. The beginning of diplotene is recognised by the dissolution of the synaptonemal complex and the tendency of the recombined homologous chromosomes of the bivalents to separate from each other except at the sites of crossovers. These X-shaped structures are called chiasmata.

Question 157.

Match the following columns and select the correct option.

[4 Marks]

Column-I	Column-II
(A) Organ of Corti	(i) Connects middle ear and pharynx
(B) Cochlea	(ii) Coiled part of the labyrinth
(C) Eustachian tube	(iii) Attached to the oval window
(D) Stapes	(iv) Located on the basilar membrane

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

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

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

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

Explanation:

organ of Corti is located on the basilar membrane, thus (a) in column-I matches with (iv) in column-II. Cochlea, so (b) matches with (ii) in. The coiled portion of the labyrinth is called column II.

Question 158.

The ovary is half inferior in :

[4 Marks]

(A) Plum

(B) Brinjal

(C) Sunflower

(D) Mustard

Explanation:

The ovary is half inferior in Plum. A half-inferior ovary is embedded or surrounded by the receptacle. Such flowers are termed perigynous or half-epigynous. In some classifications, half-inferior ovaries are not recognized and are instead grouped with either the superior or inferior ovaries.

Question 159.

Identify the basic amino acid from the following.

[4 Marks]

(A) Tyrosine

(B) Valine

(C) Lysine

(D) GlutamicAcid

Explanation:

Lysine is the correct answer because lysine is a basic amino acid. Valine is a neutral amino acid: Glutamic acid is an acidic amino acid while Tyrosine is an aromatic amino acid.

Question 160.

Match the following columns and select the correct option.

[4 Marks]

Column-I	Column-II
(A) Eosinophils	(i) Immune response
(B) Basophils	(ii) Phagocytosis
(C) Neutrophils	(iii) Release histaminase, destructive enzymes
(D) Lymphocytes	(iv) Release granules containing histamine

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

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

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

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

Explanation:

because Eosinophils are associated with allergic reactions and release histaminase, Basophils secrete histamine, serotonin, heparin etc. and are involved in inflammatory reactions, Neutrophils are phagocytic cells; Both B and T lymphocytes are responsible for immune responses of the body.

Question 161.

Match the following

Choose the correct option from the following

[4 Marks]

(A) Inhibitor of catalytic activity	(i) Ricin
(B) Possess peptide bonds	(ii) Malonate
(C) Cell wall material in fungi	(iii) Chitin
(D) Secondary metabolite	(iv) Collagen

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

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

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

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

Explanation:

Because malonate is the competitive inhibitor of catalytic activity of succinic dehydrogenase, Collagen is proteinaceous in nature and possesses peptide bonds, Chitin is a homopolymer present in the cell wall of fungi and exoskeleton of arthropods, Abrin and Ricin are toxins, secondary metabolites.

Question 162.

Identify the correct statement with regard to G_1 phase (Gap 1) of interphase.

[4 Marks]

(A) Reorganisation of all cell components takes place.

(B) Cell is metabolically active, grows but does not replicate its DNA.

(C) DNA synthesis or replication takes place.

(D) Nuclear Division takes place.

Explanation:

During G_1, phase the cell is metabolically active and continuously grows but does not replicate its DNA. DNA synthesis takes place in S phase. Nuclear division occurs during Karyokinesis. Reorganization of all cell components takes place in M-Phase.

Question 163.

Name the plant growth regulator which upon spraying on sugarcane crop, increases the length of stem, thus increasing the yield of sugarcane crop.

[4 Marks]

(A) Abscisic acid

(B) Cytokinin

(C) Ethylene

(D) Gibberellin

Explanation:

Spraying sugarcane crop with gibberellins increases the length of the stem, thus increasing the yield by as much as 20 tonnes per acre.

Question 164.

Identify the wrong statement with reference to the gene 'I' that controls ABO blood groups.

[4 Marks]

(A) The gene (I) has three alleles.

(B) Allele 'i' does not produce any sugar.

(C) When I^A and I^B are present together, they express same type of sugar.

(D) A person will have only two of the three alleles.

Explanation:

ABO blood groups are controlled by the gene I. The gene I has three alleles I^A, I^B and i. The alleles I^A and I^B produce a slightly different form of the sugar while allele i does not produce any sugar because humans are diploid organisms, each person can possess at the most any two of the three I gene alleles.

Question 165.

Identify the wrong statement with reference to immunity.

[4 Marks]

(A) When exposed to antigen (living or dead) antibodies are produced in the host's body. It is called "Active immunity".

(B) Foetus receives some antibodies from mother, it is an example for passive immunity.

(C) Active immunity is quick and gives full response.

(D) When ready-made antibodies are directly given, it is called "Passive immunity".

Explanation:

because active immunity is slow and takes time to give its full effective response in comparison to passive immunity where pre-formed antibodies are administered.

Question 166.

The enzyme enterokinase helps in conversion of

[4 Marks]

(A) pepsinogen into pepsin

(B) protein into polypeptides

(C) trypsinogen into trypsin

(D) caseinogen into casein

Explanation:

The correct option 3 because trypsinogen is activated by an enzyme, enterokinase, secreted by the intestinal mucosa into active trypsin. Trypsinogen is a zymogen from pancreas.

Question 167.

The specific palindromic sequence which is recognized by *EcoRI* is

[4 Marks]

(A) 5′- GGAACC -3′ 3′- CCTTGG -5′

(B) 5′- CTTAAG -3′ 3′- GAATTC -5′

(C) 5′- GAATTC -3′ 3′- CTTAAG -5′

(D) 5′- GGATCC -3′ 3′- CCTAGG -5′

Explanation:

Because the specific palindromic sequence which is recognised by *EcoRI* is 5′ - GAATTC - 3′ 3′ - CTTAAG - 5′

Question 168.

Which of the following graph represents the variation of resistivity (ρ) with temperature (T) for copper?

[4 Marks]

(A)



(B)



(C)



(D)



Explanation:

Light ray emerges normally from another surface, hence, e (angle of emergence) = 0

$\therefore r_2 = 0$

$r_1 + r_2 = A \Rightarrow r_1 = A$

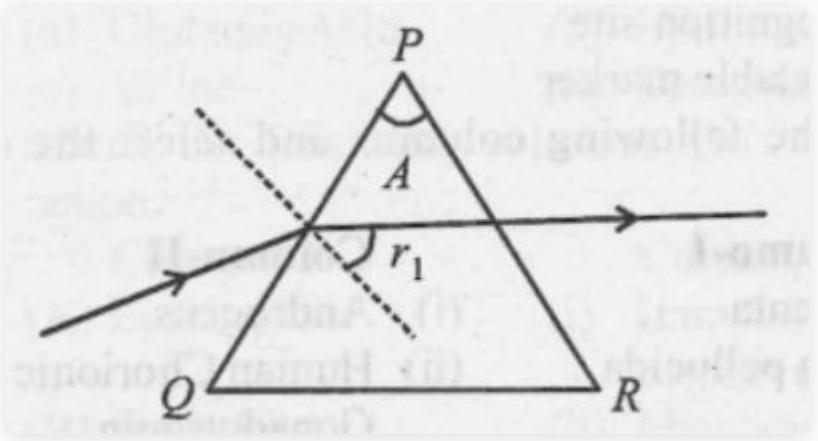
$\mu_1 \cdot \sin i = \mu_2 \cdot \sin r$

Applying Snell's law on first surface PQ

$\Rightarrow 1 \cdot \sin i = \mu \cdot \sin r_1 \Rightarrow \sin i = \mu \sin A$

For small angles ($\sin \theta \approx \theta$)

$\therefore i = \mu A$



Question 169.

HCl was passed through a solution of $CaCl_2$, $MgCl_2$ and NaCl. Which of the following compound(s) crystallise(s)?

[4 Marks]

(A) Both $MgCl_2$ and $CaCl_2$

(B) Only $MgCl_2$

(C) NaCl, $MgCl_2$ and $CaCl_2$

(D) Only NaCl

Explanation:

When HCl is passed through the solution Cl^- ion concentration increases. Hence ionic product becomes more than solubility product. Only NaCl is crystallised due to less solubility than $MgCl_2$ and $CaCl_2$.

Question 170.

Which of the following statements is correct?

[4 Marks]

(A) Adenine pairs with thymine through two H-bonds

(B) Adenine does not pair with thymine

(C) Adenine pairs with thymine through three H-bonds

(D) Adenine pairs with thymine through one H-bond

Explanation:

Based on the observation of Erwin Chargaff that for a double stranded DNA, the ratios between Adenine and Thymine and Guanine and Cytosine are constant and equals one. Adenine pairs with thymine through two H - bonds i.e., A =T and guanine pairs with cytosine with three H-bonds.

Question 171.

Match the following columns and select the correct option.

[4 Marks]

Column-I	Column-II
(A) Bt cotton	(i) Gene therapy
(B) Adenosine deaminase deficiency	(ii) Cellular defence
(C) RNAi	(iii) Detection of HIV infection
(D) PCR	(iv) *Bacillus thuringiensis*

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

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

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

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

Explanation:

The correct option is (d) because in Bt cotton the specific Bt toxin gene was isolated from Bacillus thuringiensis. The first clinical gene therapy was given in 1990 to a 4-year old girl with adenosine deaminase (ADA) deficiency. RNAi (RNA interference) takes place in all eukaryotic organisms as a method of cellular defense. PCR is now routinely used to detect HIV in suspected AIDS patients.

Question 172.

Floridean starch has structure similar to

[4 Marks]

(A) Starch and cellulose

(B) Laminarin and cellulose

(C) Amylopectin and glycogen

(D) Mannitol and algin

Explanation:

Floridean starch is stored food material in red algae. Its structure is similar to Amylopectin and Glycogen.

Question 173.

Which of the following statements is not correct?

[4 Marks]

(A) In man insulin is synthesised as a proinsulin.

(B) Genetically engineered insulin is produced in E. coli.

(C) The functional insulin has A and B chains linked together by hydrogen bonds.

(D) The proinsulin has an extra peptide called C-peptide.

Explanation:

The correct option is (b) because functional insulin has A and B chains linked together by disulphide bridges.

Question 174.

Flippers of Penguins and Dolphins are examples of

[4 Marks]

(A) Adaptive radiation

(B) Natural selection

(C) Industrial melanism

(D) Convergent evolution

Explanation:

The correct option is (d) because flippers of Penguing and Dolphins are an example of analogous organs, Analogous structures are a result of convergent evolution,

Question 175.

Which of the following refer to correct example(s) of organisms which have evolved due to changes in environment brought about by anthropogenic action?
(a) Darwin's Finches of Galapagos islands.
(b) Herbicide resistant weeds.
(c) Drug resistant eukaryotes.
(d) Man-created breeds of domesticated animals like dogs.

[4 Marks]

(A) b, c and d

(B) a and c

(C) only d

(D) only a

Explanation:

The correct option is (b) because herbicide resistant weeds, drug resistant eukaryotes and man created breeds of domesticated animals like dogs are examples of evolution by anthropogenic action. Darwin’s Finches of Galapagos islands are example of natural selection, adaptive radiation and founder’s effect.

Question 176.

Identify the wrong statement with reference to transport of oxygen.

[4 Marks]

(A) Low pCO_2 in alveoli favours the formation of oxyhaemoglobin.

(B) Binding of oxygen with haemoglobin is mainly related to partial pressure of O_2.

(C) Higher H^+ conc. in alveoli favours the formation of oxyhaemoglobin.

(D) Partial pressure of CO_2 can interfere with O_2 binding with haemoglobin.

Explanation:

The correct option is (b) because higher H+ concentration favours the dissociation of oxygen from. oxyhaemoglobin in tissues. In the alveoli, high pO2, low pCO2, lesser H+ concentration and lower temperature favour formation of oxyhaemoglobin.

Question 177.

The process of growth is maximum during

[4 Marks]

(A) Log phase

(B) Dormancy

(C) Senescence

(D) Lag phase

Explanation:

Inexponential growth, the initial growth is slow (lag phase) and it increases rapidly thereafter at an exponential rate in log or exponential phase.

Question 178.

Which of the following regions of the globe exhibits highest species diversity?

[4 Marks]

(A) Himalayas

(B) Amazon forests

(C) Western Ghats of India

(D) Madagascar

Explanation:

The largely tropical Amazon rain forest in South America has the greatest biodiversity on earth.

Question 179.

The sequence that controls the copy number of the linked DNA in the vector, is termed

[4 Marks]

(A) Palindromic sequence

(B) Ori site

(C) Selectable marker

(D) Recognition site

Explanation:

because ori sequence is responsible for controlling the copy number of the linked DNA in the vector. Ori i.e. origin of replication is responsible for initiation of replication.

Question 180.

Match the following columns and select the correct option.

[4 Marks]

Column-I	Column-II
(A) Placenta	(i) Androgens
(B) Zona pellucida	(ii) Human Chorionic Gonadotropin (hCG)
(C) Bulbo-urethral glands	(iii) Layer of the ovum
(D) Leydig cells	(iv) Lubrication of the Penis

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

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

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

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

Explanation:

The correct option is (c) because placenta secretes human chorionic gonadotropin (hCG). Zona pellucida is a primary egg membrane secreted by the secondary oocyte. The secretions of bulbourethral glands help in lubrication of the penis Leydig cells synthesise and secrete testicular hormones called androgens.