CBSE EXAMINATION PAPER-2011

NEET-ZOOLOGY

(Solved)

Time allowed : 3 hours | Maximum Marks : 800

General Instructions :

Read the following instructions carefully and follow them :

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

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

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

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

v. Use of calculator is NOT allowed.

Section A

Question 1.

A body is moving with velocity 30 m/s towards east. After 10 seconds its velocity becomes 40 m/s towards north. The average acceleration of the body is

[4 Marks]

(A) 1 m/s^2

(B) 7 m/s^2

(C) 5 m/s^2

(D) 7 m/s^2

Explanation:

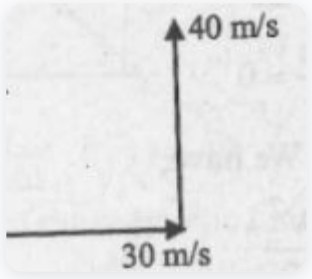
Average acceleration

<a>= Change in velocity / Total Time.

<a>= |40ĵ - 30î| / 10

<a>= √(4² + (-3)²)

<a>= 5 m/s².



Question 2.

A boy standing at the top of a tower of 20m height drops a stone. Assuming g=10 ms^{-2}, the velocity with which it hits the ground is

[4 Marks]

(A) 20.0 m/s

(B) 10.0 m/s

(C) 40.0 m/s

(D) 5.0 m/s

Explanation:

Here, u = 0. We have, $v^2 = u^2 + 2gh \Rightarrow v = \sqrt{(2gh)} = \sqrt{(2 \times 10 \times 20)} = 20$ m/s.

Question 3.

A missile is fired for maximum range with an initial velocity of 20 m/s. If g=10 m/s² the range of the missile is

[4 Marks]

(A) 40m

(B) 50m

(C) 60m

(D) 20m

Explanation:

For maximum range, the angle of projection, $\theta = 45°$.

$\therefore R = u^2\sin(2\theta)/g$

$= (20)^2\sin(2\times45°)/10 = 400\times1/10$

$= 40$ m.

Question 4.

A particle moves in a circle of radius 5 cm with constant speed and time period 0.2π s. The acceleration of the particle is

[4 Marks]

(A) 25 m/s²

(B) 15 m/s²

(C) 36 m/s²

(D) 5 m/s²

Explanation:

Centripetal acceleration $a_c = \omega^2 r = (2\pi/T)^2 r = (2\pi/0.2\pi)^2 \times 5 \times 10^{-2} = 5$ m/s².

Question 5.

A body of mass M hits normally a rigid wall with velocity V and bounces back with the same velocity. The impulse experienced by the body is

[4 Marks]

(A) MV

(B) 1.5MV

(C) 2MV

(D) zero

Explanation:

Impulse experienced by the body = change in momentum

= MV - (-MV)

= 2MV.

Question 6.

A person of mass 60 kg is inside a lift of mass 940 kg and presses the button on control panel. The lift starts moving upwards with an acceleration 1.0 m/s². If g=10 ms^{-2} the tension in the supporting cable is

[4 Marks]

(A) 8600N

(B) 9680N

(C) 11000N

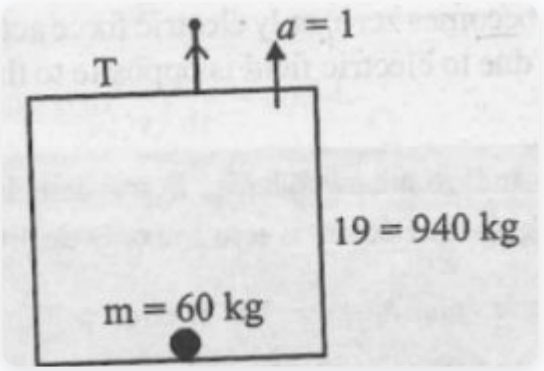
(D) 1200N

Explanation:

Total mass = (m+m) (60 + 940) kg = 1000 kg.

Let T be the tension in the supporting cable, then T - 1000g = 1000 × 1 [∵ a =1m/sec]

⇒ T = 11000N.



Question 7.

Force F on a particle moving in a straight line varies with distance d as shown in the figure. The work done on the particle during its displacement of 12 m is

[4 Marks]

(A) 21J

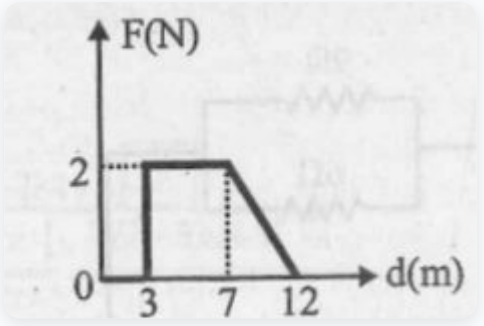
(B) 18J

(C) 13J

(D) 26J

Explanation:

Work done = area under F-d graph = [2 × (7 - 3)] + [1/2 × 2 × (12 - 7)] = 8 + 5 = 13J.



Question 8.

The potential energy of a system increases if work is done

[4 Marks]

(A) upon the system by a non conservative force

(B) by the system against a conservative force

(C) by the system against a non conservative force

(D) upon the system by a conservative force

Explanation:

When work is done by the system against a conservative force, its potential energy increases

Question 9.

A body projected vertically from the earth reaches a height equal to earth's radius before returning to the earth. The power exerted by the gravitational force is greatest

[4 Marks]

(A) at the instant just after the body is projected

(B) at the instant just before the body hits the earth

(C) it remains constant all through

(D) at the highest position of the body

Explanation:

Power exerted by a force is given by P = F.v. When the body is just above the earth's surface, its velocity is greatest. At this instant, gravitational force is also maximum. Hence, the power exerted by the gravitational force is greatest at the instant just before the body hits the earth.

Question 10.

The instantaneous angular position of a point on a rotating wheel is given by the equation $\theta(t) = 2t^3 - 6t^2$. The torque on the wheel becomes zero at

[4 Marks]

(A) t = 0.25s

(B) t = 2s

(C) t = 0.5s

(D) t = 1s

Explanation:

$\theta(t) = 2t^3 - 6t^2$

$\Rightarrow d\theta/dt = 6t^2 - 12t \Rightarrow \alpha = d^2\theta/dt^2$

$= 12t - 12 = 0$

$\therefore t = 1$ sec.

Question 11.

The moment of inertia of a thin uniform rod of mass M and length L about an axis passing through its midpoint and perpendicular to its length is I_0. Its moment of inertia about an axis passing through one of its ends and perpendicular to its length is

[4 Marks]

(A) $I_0 + ML^2$

(B) $I_0 + 2ML^2$

(C) $I_0 + ML^2/2$

(D) $I_0 + ML^2/4$

Explanation:

By theorem of parallel axes,

$I = I_cm + Md^2$

$I = I_0 + M(L/2)^2 = I_0 + ML^2/4$.

Question 12.

A planet moving along an elliptical orbit is closest to the sun at a distance r_1 and farthest away at a distance of r_2. If v_1 and v_2 are the linear velocities at these points respectively, then the ratio v_1/v_2 is

[4 Marks]

(A) $(r_1/r_2)^2$

(B) r_2/r_1

(C) $(r_2/r_1)^2$

(D) r_1/r_2

Explanation:

Angular momentum is conserved. $\therefore L_1 = L_2$

$\Rightarrow mr_1v_1 = mr_2v_2$

$\Rightarrow r_1v_1 = r_2v_2$

$\Rightarrow v_1/v_2 = r_2/r_1$.

Question 13.

During an isothermal expansion, a confined ideal gas does -150 J of work against its surroundings. This implies that

[4 Marks]

(A) 150 J of heat has been added to the gas

(B) no heat is transferred because the process is isothermal

(C) 300 J of heat has been added to the gas

(D) 150 J heat has been removed from the gas

Explanation:

According to question work done by gas is given -150J so that according to it answer will be (d)

Question 14.

When 1 kg of ice at 0°C melts to water at 0°C, the resulting change in its entropy, taking latent heat of ice to be 80 cal/°C, is

[4 Marks]

(A) 80 cal/K

(B) 293 cal/K

(C) 8×10^4 cal/K

(D) 273 cal/K

Explanation:

Change in entropy is given by

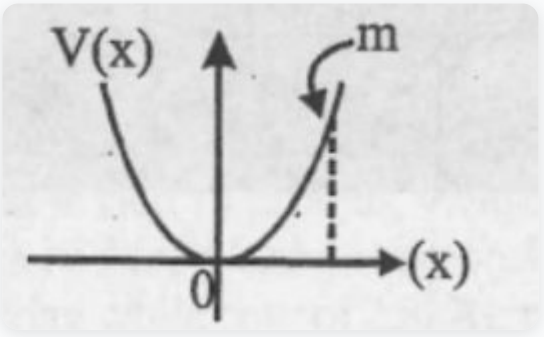
$\Delta S = dQ/T$ or $\Delta S = \Delta Q/T = mL_f / 273$

$\Delta S = (1000 \times 80) / 273 = 293$ cal/K.

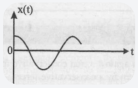
Question 15.

A particle of mass m is released from rest and follows a parabolic path as shown. Assuming that the displacement of the mass from the origin is small, which graph correctly depicts the position of the particle as a function of time

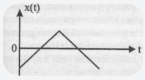
[4 Marks]



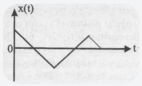
(A)



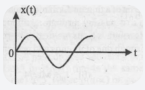
(B)



(C)



(D)



Explanation:

The given velocity-position graph depicts that the motion of the particle is SHM.

In SHM, at t=0, v=0 and x = x_max.

Question 16.

Out of the following functions, representing motion of a particle, which represents SHM?

(A) $y = \sin(\omega t) - \cos(\omega t)$

(B) $y = \sin^3(\omega t)$

(C) $y = 5\cos(3\pi/4 - 3\omega t)$

(D) $y = 1 + \omega t + \omega^2 t^2$

[4 Marks]

(A) Only (D) does not represent SHM

(B) Only (A)

(C) Only (A) and (C)

(D) Only (A) and (B)

Explanation:

Only functions given in (A) & (C) represent SHM.

Question 17.

Two waves are represented by the equations $y_1 = a\sin(\omega t + kx + 0.57)$ m and $y_2 = a\cos(\omega t + kx)$ m, where x is in meter and t in sec. The phase difference between them is

[4 Marks]

(A) 1.57 radian

(B) 0.57 radian

(C) 1.25 radian

(D) 1.0 radian

Explanation:

Here, $y_1 = a\sin(\omega t + kx + 0.57)$

so, $\phi_1 = 0.57$

and $y_2 = a \cos(\omega t + kx)$

$= a \sin[\pi/2 + (\omega t + kx)]$

So, $\phi_2 = \pi/2$

Phase difference, $\Delta\phi = \phi_2 - \phi_1$

$= \pi/2 - 0.57 = 3.14/2 - 0.57$

$= 1.57 - 0.57 = 1$ radian.

Question 18.

Sound waves travel at 350 m/s through a warm air and at 3500 m/s through brass. The wavelength of a 700 Hz acoustic wave as it enters brass from warm air

[4 Marks]

(A) decreases by a factor 10

(B) increases by a factor 20

(C) increases by a factor 10

(D) decreases by a factor 20

Explanation:

We have, $v = n\lambda$.

$\Rightarrow v \propto \lambda$ (as n remains constant). Thus, as v increases 10 times , λ also increases 10 times.

Question 19.

A charge Q is enclosed by a Gaussian spherical surface of radius R. If the radius is doubled, then the outward electric flux will

[4 Marks]

(A) remain the same

(B) be doubled

(C) increase four times

(D) be reduced to half

Explanation:

By Gauss's theorem,

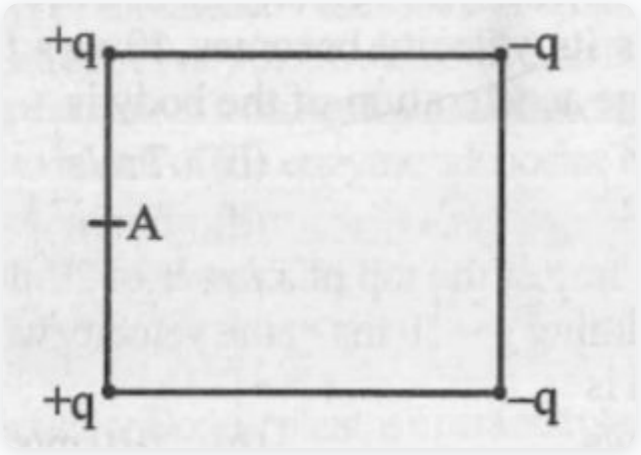
$\phi = Q_{in} / \varepsilon_0$.

Thus, the net flux depends only on the charge enclosed by the surface. Hence, there will be no effect on the net flux if the radius of the surface is doubled.

Question 20.

Four electric charges +q, +q, -q and -q are placed at the corners of a square of side 2L. The electric potential at point A, midway between the two charges +q and +q, is

[4 Marks]



(A) $(1/4\pi\varepsilon_0)\ (2q/L)\ (1 + \sqrt{5})$

(B) $(1/4\pi\varepsilon_0)\ (2q/L)\ (1 + 1/\sqrt{5})$

(C) $(1/4\pi\varepsilon_0)\ (2q/L)\ (1 - 1/\sqrt{5})$

(D) zero

Explanation:

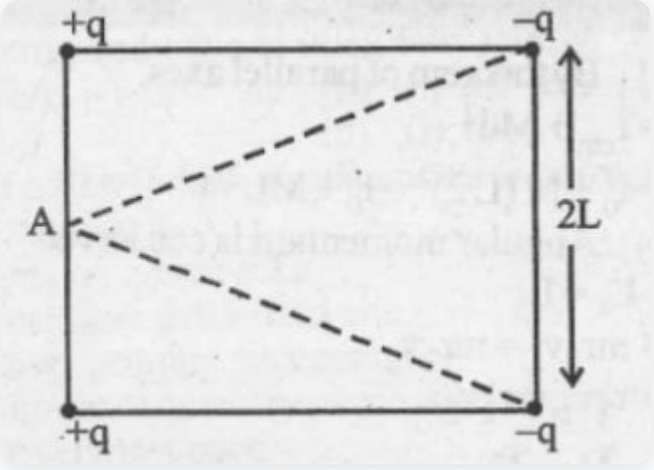
Distance of point A from the two +q charges = L.

Distance of point A from the two -q charges = $\sqrt{(L^2 + (2L)^2)} = \sqrt{5}$ L.

$\therefore V_A = (Kq/L \times 2) - (Kq/\sqrt{5}L \times 2)$

$= (2Kq/L)[1 - 1/\sqrt{5}]$

$= (1/4\pi\varepsilon_0)\ (2q/L)\ (1 - 1/\sqrt{5})$.



Question 21.

A current of 2A flows through a 2Ω resistor when connected across a battery. The same battery supplies a current of 0.5 A when connected across a 9Ω resistor. The internal resistance of the battery is

[4 Marks]

(A) 0.5 Ω

(B) 1/3 Ω

(C) 1/4 Ω

(D) 1 Ω

Explanation:

Let the internal resistance of the battery be r. Then the current flowing through the circuit is given by

$i = E / (R + r)$.

In first case,

$2 = E / (2 + r)$. .....(i)

In second case,

$0.5 = E / (9 + r)$. .....(ii)

From (i) & (ii),

$4 + 2r = 4.5 + 0.5r$

$\Rightarrow 1.5r = 0.5 \Rightarrow r = 1/3\ \Omega$.

Question 22.

The rate of increase of thermo-e.m.f. with temperature at the neutral temperature of a thermocouple

[4 Marks]

(A) is positive

(B) is zero

(C) depends upon the choice of the two materials of the thermocouple

(D) is negative

Explanation:

We have, $e = at + bt^2$.

$\Rightarrow de/dt = a + 2bt$.

At neutral temperature,

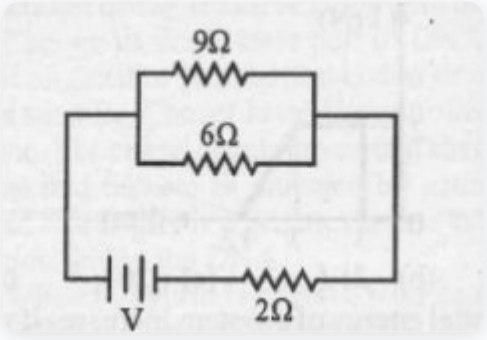
$t = -a/2b$

$\therefore de/dt = 0$.

Question 23.

If power dissipated in the 9-Ω resistor in the circuit shown is 36 watt, the potential difference across the 2-Ω resistor is

[4 Marks]



(A) 4 volt

(B) 8 volt

(C) 10 volt

(D) 2 volt

Explanation:

We have, $P = V^2/R \Rightarrow 36 = V^2/9$

$\Rightarrow V = 18V.$

Current passing through the 9Ω resistor is

$i_1 = V/R = 18/9 = 2A.$

The 9Ω and 6Ω resistors are in parallel, therefore

$i_1 = 6/9+6 \times i$

where i is the current delivered by the battery.

$\therefore i = 2\times15/6 = 5A$

Thus, Potential difference across 2Ω resistor is $V = iR = 5 \times 2 = 10V.$

Question 24.

A uniform electric field and uniform magnetic field are acting along the same direction in a certain region. If an electron is projected in the region such that its velocity is pointed along the direction of fields, then the electron

[4 Marks]

(A) will turn towards right of direction of motion

(B) speed will decrease

(C) will turn towards left direction of motion

(D) speed will increase

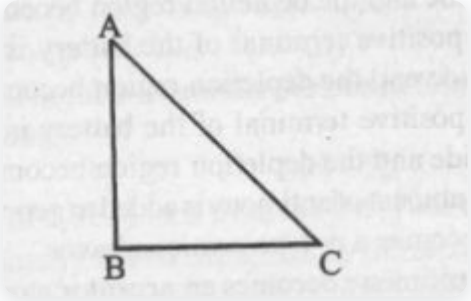
Explanation:

□□ and □□ are in the same direction, so the magnetic force on the electron becomes zero. But force on the electron due to the electric field is opposite to the direction of velocity

Question 25.

A current carrying loop in the form of a right angle isosceles triangle ABC is placed in a uniform magnetic field acting along AB. If the magnetic force on the arm BC is F, what is the force on the arm AC?

[4 Marks]



(A) -√2 □□

(B) -□□

(C) √2 □□

(D) □□

Explanation:

Leta current i be flowing in the loop ABC in the direction shown in the figure. If the length of each of the

sides AB and BC be x then

|□□| =i x B

where B is the magnitude of the magnetic force.

The direction of □□ will be n the direction perpendicular to the plane of the paper and going into it.

By Pythagorus theorem,

AC = √ x^2 + x^2 = √2x

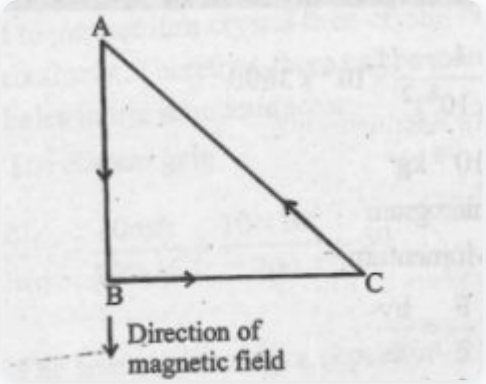
∴ Magnitude of force on AC

= i√2× B sin 45°

= i√2xB × 1/√2

= ixB = |□□|

The direction of the force on AC is perpendicular to the plane of the paper and going out of it. Hence, force on AC = -□□



Question 26.

There are four light-weight-rod samples A, B, C, D separately suspended by threads. A bar magnet is slowly brought near each sample and the following observations are noted:

(i) A is feebly repelled

(ii) B is feebly attracted

(iii) C is strongly attracted

(iv) D remains unaffected. Which one of the following is true?

[4 Marks]

(A) A is of a non-magnetic material

(B) C is of a diamagnetic material

(C) B is of a paramagnetic material

(D) D is of a ferromagnetic material

Explanation:

A → diamagnetic,

B → paramagnetic,

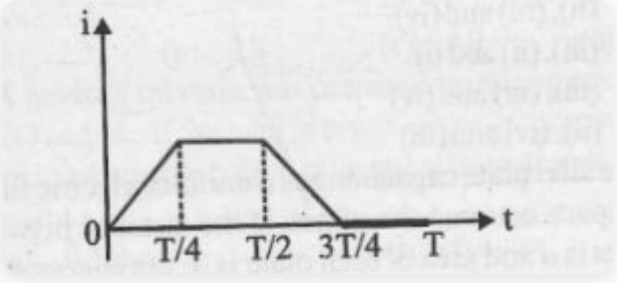
C → ferromagnetic,

D → non-magnetic.

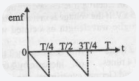
Question 27.

The current i in a coil varies with time as shown in the figure. The variation of induced emf with time would be

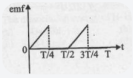
[4 Marks]



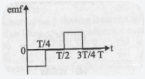
(A)



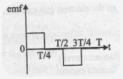
(B)



(C)



(D)



Explanation:

e = -L(di/dt).

During 0 to T/4, di/dt = const.

∴ e = -ve

During T/4 to T/2, di/dt = 0,

∴ e = 0

During T/2 to 3T/4, di/dt = const.

∴ e = +ve

Thus graph given in option (a) represents the variation of induced emf with time.

Question 28.

In an ac circuit an alternating voltage e = 200√2 sin 100t volts is connected to a capacitor of capacity 1 μF. The r.m.s. value of the current in the circuit is

[4 Marks]

(A) 20mA

(B) 200mA

(C) 100mA

(D) 10mA

Explanation:

$V_{rms} = 200\sqrt{2} / \sqrt{2} = 200V$.

$I_{rms} = V_{rms} / X_C = (200 / 1) / (100 \times 10^{-6})$

$= 2 \times 10^{-2} = 20mA$.

Question 29.

An ac voltage is applied to a resistance R and an inductor L in series. If R and the inductive reactance are both equal to 3Ω, the phase difference between the applied voltage and the current in the circuit is

[4 Marks]

(A) zero

(B) π/4

(C) π/2

(D) π/6

Explanation:

The phase difference φ is given by $\tan \phi = X_L / R = 3 / 3 = 1$.

$\rightarrow \phi = \pi/4$.

Question 30.

The electric and the magnetic field associated with an E.M. wave, propagating along the +z-axis, can be represented by

[4 Marks]

(A) [□□ = E_0 î, □□ = B_0 ĵ]

(B) [□□ = E_0 □□, □□ = B_0 î]

(C) [□□ = E_0 ĵ, □□ = B_0 î]

(D) [□□ = E_0 ĵ, □□ = B_0 k̂]

Explanation:

E.M. wave always propagates in a direction perpendicular to both electric and magnetic fields. So, electric and magnetic fields should be along + X and + Y—

directions respectively. Therefore, option (a) is the correct option.

Question 31.

The decreasing order of wavelength of infrared, microwave, ultraviolet and gamma rays is

[4 Marks]

(A) gamma rays, ultraviolet, infrared, microwaves

(B) infrared, microwave, ultraviolet, gamma rays

(C) microwaves, gamma rays, infrared, ultraviolet

(D) microwave, infrared, ultraviolet, gamma rays

Explanation:

The decreasing order of the wavelengths is as given below: microwave, infrared, ultraviolet, gamma rays.

Question 32.

Which of the following is not due to total internal reflection?

[4 Marks]

(A) Working of optical fibre

(B) Difference between apparent and real depth of pond

(C) Mirage on hot summer days

(D) Brilliance of diamond

Explanation:

Difference between apparent and real depth of a pond is due to the refraction of light, not due to the total internal reflection. Other three phenomena are due to the total internal reflection.

Question 33.

In the Davisson and Germer experiment, the velocity of electrons emitted from the electron gun can be increased by

[4 Marks]

(A) increasing the filament current

(B) increasing the potential difference between the anode and filament

(C) decreasing the filament current

(D) decreasing the potential difference between the anode and filament

Explanation:

In the Davisson and Germer experiment, the velocity of electrons emitted from the electron gun can be increased by increasing the potential difference between the anode and filament.

Question 34.

A biconvex lens has a radius of curvature of magnitude 20 cm. Which one of the following options best describe the image formed of an object of height 2 cm placed 30 cm from the lens?

[4 Marks]

(A) Virtual, upright, height = 1 cm

(B) Virtual, upright, height = 0.5 cm

(C) Real, inverted, height = 1 cm

(D) Real, inverted, height = 4 cm

Explanation:

R = 20 cm

$h_0 = 2$

u = - 30 cm

We have, $1/f = (\mu-1)(1/R_1 - 1/R_2)$

$= (3/2-1)(1/20 - (-1/20))$

$\Rightarrow f = (3/2-1) \times 2/20$

$\therefore f = 20$ cm

$1/f = 1/v - 1/u \Rightarrow 1/20 = 1/v + 1/30$

$1/v = 1/20 - 1/30 = 10/600$

v = 60 cm

$m = h_i / h_o = v/u$

$\Rightarrow h_i = v/u \times h_o = 60 / 30 \times 2$

= -4 cm.

So, image is inverted.

Question 35.

Electrons used in an electron microscope are accelerated by a voltage of 25 kV. If the voltage is increased to 100kV then the de-Broglie wavelength associated with the electrons would

[4 Marks]

(A) increase by 4 times

(B) decrease by 4 times

(C) increase by 2 times

(D) decrease by 2 times

Explanation:

$\lambda \propto 1/\sqrt{V}$

$\Rightarrow \lambda_1/\lambda_2 = \sqrt{(V_2/V_1)} = \sqrt{(100keV/25keV)} = 2$

$\Rightarrow \lambda_2 = \lambda_1/2$

Question 36.

Photoelectric emmision occurs only when the incident light has more than a certain minimum

[4 Marks]

(A) frequency

(B) wavelength

(C) intensity

(D) power

Explanation:

For occurrence of photoelectric effect, the incident light should have frequency more than a certain minimum which is called the threshold frequency (ν_0).

Question 37.

The momentum of a photon of energy hv will be

[4 Marks]

(A) hv/c

(B) c/hv

(C) hv/c^2

(D) hv

Explanation:

Correct Answer: hv/c

Photon momentum is directly linked to its energy through the relation for a massless particle: E = p c, hence p = E/c. Substituting the photon energy E = h v gives p = h v / c, which matches the option hv/c. Units check: J / (m·s^{-1}) = kg·m·s^{-}1, confirming momentum units.

Question 38.

Light of two different frequencies whose photons have energies 1 eV and 2.5 eV respectively illuminate a metallic surface whose work function is 0.5 eV successively. Ratio of maximum speeds of emitted electrons will be

[4 Marks]

(A) 1:2

(B) 1:4

(C) 1:1

(D) 1:5

Explanation:

The maximum kinetic energy of emitted electrons is given by

K.E. = ϕ - ϕ_0

$K.E._1$ = 1 eV - 0.5 eV = 0.5 eV. $K.E._2$ = 2.5 eV - 0.5 eV = 2 eV.

$\therefore$ K.E.$_1$/K.E.$_2$ = 0.5eV/ 2eV =1/4

$\Rightarrow v_1/v_2 = \sqrt{(1/4)} = 1/2$

Question 39.

In photoelectric emission process from a metal of work function 1.8 eV, the kinetic energy of most energetic electrons is 0.5 eV. The corresponding stopping potential is

[4 Marks]

(A) 1.2V

(B) 1.8V

(C) 2.3V

(D) 0.5V

Explanation:

The stopping potential is numerically equal to the maximum kinetic energy.

Question 40.

The wavelength of the first line of Lyman series for hydrogen atom is equal to that of the second line of Balmer series for a hydrogen like ion. The atomic number Z of hydrogen like ion is

[4 Marks]

(A) 2

(B) 1

(C) 3

(D) 4

Explanation:

For first line of Lyman series of hydrogen,

$hc/\lambda_1 = Rhc(1/1^2 - 1/2^2)$.

For second line of Balmer series of hydrogen like ion,

$hc/\lambda_2 = Z^2Rhc(1/2^2 - 1/4^2)$

By question, $\lambda_1 = \lambda_2$,

⇒ $(1/1 - 1/4) = Z^2(1/4 - 1/16)$

or $Z = 2$

Question 41.

The power obtained in a reactor using U^{235} disintegration is 1000 kW. The mass decay of U^{235} per hour is

[4 Marks]

(A) 40 microgram

(B) 1 microgram

(C) 20 microgram

(D) 10 microgram

Explanation:

$E = mc^2$

$m = E/c^2$

So, Mass decay per second

$dm/dt = 1/c^2\ dE/dt = 1 / c^2$(Power in watt)

$= 1/(3\times10^8)^2 \times 1000 \times 10^3$

and mass decay per hour = $dm/dt \times 60 \times 60$

$= 1/(3\times10^8)^2 \times 10^6 \times 3600$

$= 4 \times 10^{-8}$ kg

= 40 microgram.

Question 42.

A nucleus of mass M emits a photon of frequency v and the nucleus recoils. The recoil energy will be

[4 Marks]

(A) $h^2v^2 / 2Mc^2$

(B) Mc^2 - hv

(C) zero

(D) hv

Explanation:

Momentum Mu = E/c = hv/c. Recoil energy = 1/2 Mu^2

= 1/2 M^2u^2/M = 1 / 2M $(hv/c)^2$

= h^2v^2 / $2Mc^2$.

Question 43.

Fusion reaction takes place at high temperature because

[4 Marks]

(A) nuclei break up at high temperature

(B) atoms get ionised at high temperature

(C) kinetic energy is high enough to overcome the coulomb repulsion between nuclei

(D) molecules break up at high temperature

Explanation:

When the coulomb repulsion between the nuclei is overcome then nuclear fusion reaction takes place. This is possible when the temperature is too high.

Question 44.

The halflife of a radioactive isotope 'X' is 50 years. It decays to another element 'Y' which is stable. The two elements 'X' and 'Y' were found to be in the ratio of 1: 15 in a sample of a given rock. The age of the rock was estimated to be

[4 Marks]

(A) 150 years

(B) 200 years

(C) 250 years

(D) 100 years

Explanation:

Let number of atoms in X = N_x

Number of atoms in Y = N_y

By question

$N_x / N_y = 1 / 15$

∴ Part of $N_x = 1/16 (N_x + N_y)$

$=1/2^4(N_x + N_y)$

So, total 4 half-lives are passed, so age of rock is 4 × 50 = 200 years.

Question 45.

A nucleus ${}^{m}_{n}X$ emits one α-particle and two β-particles. The resulting nucleus is

[4 Marks]

(A)

${}^{m-4}_{n}X$

(B)

${}^{m-4}_{n-2}Y$

(C)

${}^{m-6}_{n}Z$

(D)

${}^{m-6}_{n-4}Z$

Explanation:

When ${}_{n}^{m}X$ emits one α-particle, its atomic mass decreases by 4 units and atomic number by 2. Therefore, the new nucleus becomes ${}^{m-4}_{n-2}Y$. But as it emits two β particles, its atomic number increases by 2. Thus the resulting nucleus is ${}_{n}^{m-4}X$.

Question 46.

In forward biasing of the p-n junction

[4 Marks]

(A) the positive terminal of the battery is connected to p-side and the depletion region becomes thick

(B) the positive terminal of the battery is connected to n-side and the depletion region becomes thin

(C) the positive terminal of the battery is connected to n-side and the depletion region becomes thick

(D) the positive terminal of the battery is connected to p-side and the depletion region becomes thin

Explanation:

In forward biasing of the p-n junction, the positive terminal of the battery is connected to p-side and the negative terminal of the battery is connected to n-side. The depletion region becomes thin.

Question 47.

If a small amount of antimony is added to germanium crystal

[4 Marks]

(A) the antimony becomes an acceptor atom

(B) it becomes a p-type semiconductor

(C) its resistance is increased

(D) there will be more free electrons than holes in the semiconductor

Explanation:

When small amount of antimony (pentavalent) is added to germanium crystal then crystal becomes n-type semi conductor. Therefore, there will be more free electrons than holes in the semiconductor.

Question 48.

A transistor is operated in common emitter configuration at $V_c = 2V$ such that a change in the base current from 100 µA to 300 µA produces a change in the collector current from 10 mA to 20 mA. The current gain is

[4 Marks]

(A) 75

(B) 50

(C) 25

(D) 100

Explanation:

The current gain

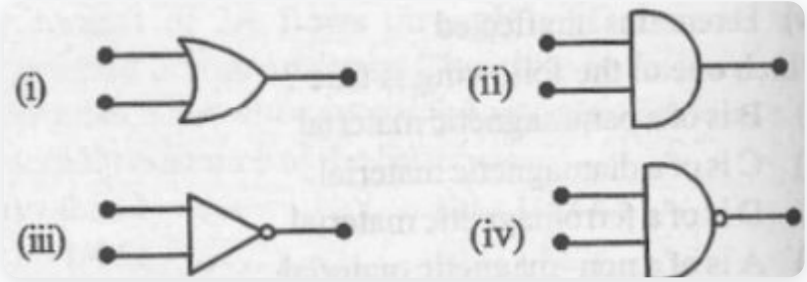
$\beta = \Delta I_C / \Delta I_B = 10mA / 200\mu A$

$= (10 \times 10^{-3}) / 200 = 50.$

Question 49.

Symbolic representation of four logic gates are shown as Pick out which ones are for AND, NAND and NOT gates, respectively

[4 Marks]



(A) (ii), (iii) and (iv)

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

(C) (iii), (iii) and (iv)

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

Explanation:

(ii), (iv) and (iii)

Question 50.

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

[4 Marks]

(A) ε_0 E A d

(B) 1/2 ε_0 E^2 A d

(C) 1/2 ε_0 E^2

(D) E^2 A d / ε_0

Explanation:

The energy stored by a capacitor $U = 1/2\ C\ V^2$ .....(i)

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

V = E.D.

The capacitance of the parallel plate capacitor

$C = A\varepsilon_0/d$

substituting the value of C in equation (i)

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

Question 51.

The energies E_1 and E_2 of two radiations are 25 eV and 50 eV, respectively. The relation between their wavelengths i.e., λ_1 and λ_2 will be:

[4 Marks]

(A) $\lambda_1 = 4\lambda_2$

(B) $\lambda_1 = 1/2\ \lambda_2$

(C) $\lambda_1 = \lambda_2$

(D) $\lambda_1 = 2\lambda_2$

Explanation:

Given $E_1 = 25$ eV $E_2 = 50$ eV

$E_1 = hc/\lambda_1$ and $E_2 = hc/\lambda_2$.

$\therefore E_1/E_2 = \lambda_2/\lambda_1$

$\therefore \lambda_2/\lambda_1 = 25/50 = 1/2$

$\therefore \lambda_1 = 2\lambda_2$.

Question 52.

If n = 6, the correct sequence for filling of electrons will be:

[4 Marks]

(A) ns → np → (n-1)d → (n-2)f

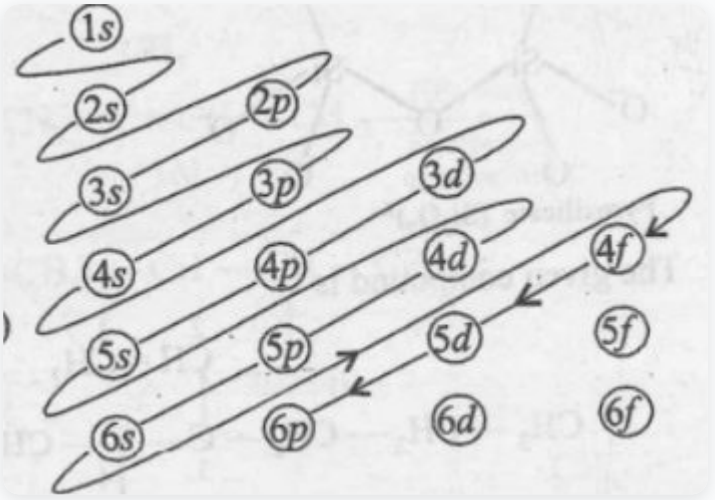
(B) ns → (n-1)d → (n-2)f → np

(C) ns → (n-2)f → (n-1)d → np

(D) ns → (n-2)f → np → (n-1)d

Explanation:

When n = 6, the sequence of filling of electrons: 6s → 4f → 5d → 6p or ns → (n-2)f → (n-1)d → np



Question 53.

The total number of atomic orbitals in fourth energy level of an atom is:

[4 Marks]

(A) 16

(B) 8

(C) 32

(D) 4

Explanation:

Total no. of atomic orbitals in a shell = n^2. Given n = 4, hence number of atomic orbitals in 4th shell will be 16.

Question 54.

Which of the two ions from the list given below that have the geometry that is explained by the same hybridization of orbitals, NO_2^-, NO_3^-, NH_2^-, NH_4^+, SCN^-?

[4 Marks]

(A) NO_2^- and NH_2^-

(B) SCN^- and NH_2^-

(C) NH_4^+ and NO_3^-

(D) NO_2^- and NO_3^-

Explanation:

NO_2^-, H = 1/2[5+0+1-0] = 3 (sp^2)

NO_3^-, H = 1/2[5+0+1-0] = 3 (sp^2) NH_2^-, H = 1/2[5+2+1-0] = 4 =(sp^3)

NH_4^+, H = 1/2[5+4+0-1] = 4 (sp^3)

SCN^-, H =1/2[4+0+0+0] = 2 = (sp)

∴ NO_2^- and NO_3^- have the same hybridization.

Question 55.

Considering the state of hybridization of carbon atoms, find out the molecule among the following which is linear?

[4 Marks]

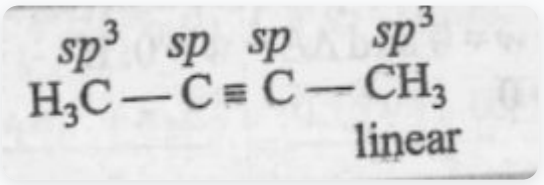
(A) CH_3-CH_2-CH_2-CH_3

(B) CH_2=CH-CH_2-C≡CH

(C) CH_3-CH=CH-CH_3

(D) CH_3-C≡C-CH_3

Explanation:



Question 56.

Which of the following has the minimum bond length?

[4 Marks]

(A) O_2^-

(B) O_2^+

(C) O_2^{2-}

(D) O_2

Explanation:

O_2 (16) : KK $(\sigma 2s)^2 (\sigma^* 2s)^2 (\sigma 2pz)^2 (\pi 2px)^2 (\pi 2py)^2, (\pi^* 2py)^1 = (\pi^* 2px)^1$, B.O. : 2

O_2^+ (15) : Remove one electron from $\pi^* 2py$ from O_2, B.O. : 2.5

O_2^- (17) : KK $(\sigma 2s)^2 (\sigma^* 2s)^2 (\sigma 2pz)^2 (\pi 2px)^2 (\pi 2py)^2, (\pi^* 2px)^2 (\pi^* 2py)^1$, B.O. : 1.5

O_2^{2-} (18) : KK $(\sigma 2s)^2 (\sigma^* 2s)^2 (\sigma 2pz)^2 (\pi 2px)^2 (\pi 2py)^2, (\pi^* 2px)^2 (\pi^* 2py)^2$

Since, the bond length decreases as the bond order increases, hence, O_2^+ have least bond length.

Question 57.

Two gases A and B having the same volume diffuse through a porous partition in 20 and 10 seconds respectively. The molecular mass of A is 49 u. Molecular mass of B will be:

[4 Marks]

(A) 25.00 u

(B) 6.50 u

(C) 12.25 u

(D) 50.00 u

Explanation:

rA / rB = √(M_B / M_A)

(V / 20) / (V / 10) = √(M_B / 49)

⇒ 1/2 = √(M_B / 49)

M_B = 1/4 × 49 = 12.25u

Question 58.

By what factor does the average velocity of a gaseous molecule increase when the temperature (in Kelvin) is doubled?

[4 Marks]

(A) 2.0

(B) 2.8

(C) 4.0

(D) 1.4

Explanation:

Average velocity $v = \sqrt{(8RT/\pi M)}$

i.e., $v \propto \sqrt{T}$

$\therefore V_2/V_1 = \sqrt{(2T/T)} = 1.41$.

Question 59.

A gaseous mixture was prepared by taking equal mole of CO and N_2. If the total pressure of the mixture was found 1 atmosphere, the partial pressure of the nitrogen (N_2) in the mixture is:

[4 Marks]

(A) 0.5 atm

(B) 0.8 atm

(C) 0.9 atm

(D) 1 atm

Explanation:

Given n_CO = n_N_2

P_CO + P_N_2 = 1 atm

Partial pressure of a gas

= mole fraction of gas × total pressure

$\therefore PN_2 = (nN_2 / (nCO + nN_2)) \times 1 = (nN_2 / 2nN_2) \times 1 = 1/2 = 0.5$ atm.

Question 60.

Which of the following is correct option for free expansion of an ideal gas under adiabatic condition?

[4 Marks]

(A) $q = 0, \Delta T < 0, w \neq 0$

(B) $q = 0, \Delta T = 0, w = 0$

(C) $q = 0, \Delta T \neq 0, w = 0$

(D) $q \neq 0, \Delta T = 0, w = 0$

Explanation:

For adiabatic process $\Delta Q = 0$.

In free expansion, external pressure is zero. Thus, work done $w = 0$ and $\Delta E = w = 0$. If $\Delta E = 0$, then $\Delta T = 0$.

Question 61.

Enthalpy change for the reaction, $4H(g) \rightarrow 2H_2(g)$ is -869.6 kJ. The dissociation energy of H-H bond is:

[4 Marks]

(A) -434.8 kJ

(B) -869.6 kJ

(C) +434.8 kJ

(D) +217.4 kJ

Explanation:

Given

$4H(g) \rightarrow 2H_2(g)$; $\Delta H = -869.6$ kJ.

or $2H_2(g) \rightarrow 4H(g)$; $\Delta H = 869.6$ kJ. $H_2(g) \rightarrow 2H(g)$; $\Delta H = 869.6 / 2$

= 434.8 kJ.

Question 62.

If the enthalpy change for the transition of liquid water to steam is 30 kJ mol^{-1} at 27°C, the entropy change for the process would be:

[4 Marks]

(A) 100 J $mol^{-1}K^{-1}$

(B) 0.1 J $mol^{-1}K^{-1}$

(C) 1.0 J $mol^{-1}K^{-1}$

(D) 10 J $mol^{-1}K^{-1}$

Explanation:

Given $\Delta H = 30\ kJ\ mol^{-1}$ $T = 273 + 27 = 300\ K$

$\Delta S_T = \Delta H_T / T$

$= (3 \times 10^4) / 300\ J\ mol^{-1}$

$= 100\ J\ mol^{-1}\ K^{-1}$

Question 63.

For the reaction $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$, the equilibrium constant is K_1. The equilibrium constant is K_2 for the reaction $2NO(g) + O_2(g) \rightleftharpoons 2NO_2(g)$. What is K for the reaction $NO_2(g) \rightleftharpoons 1/2\ N_2(g) + O_2(g)$?

[4 Marks]

(A) $1 / (K_1K_2)$

(B) $[1 / (K_1K_2)]^{1/2}$

(C) $1 / (2K_1K_2)$

(D) $1 / (4K_1K_2)$

Explanation:

For the reaction $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$

$K_1 = [NO]^2 / ([N_2][O_2])$

For the reaction $2NO(g) + O_2(g) \rightleftharpoons 2NO_2(g)$

$K_2 = [NO_2]^2 / ([NO]^2[O_2])$

For the reaction $NO_2(g) \rightleftharpoons 1/2\ N_2(g) + O_2(g)$

$K = [N_2]^{1/2}[O_2] / [NO_2]$

Hence, $K = \sqrt{(1 / (K_1 \times K_2))}$

$K = ([N_2]^{1/2}[O_2]^{1/2} / [NO]) \times ([NO][O_2]^{1/2} / [NO_2]) = [N_2]^{1/2}[O_2] / [NO_2]$

Question 64.

Which of the following is least likely to behave as Lewis base?

[4 Marks]

(A) OH^-

(B) BF_3

(C) H_2O

(D) NH_3

Explanation:

BF_3 behaves as a Lewis acid because it is an electron-deficient species

Question 65.

A buffer solution is prepared in which the concentration of NH_3 is 0.30 M and the concentration of NH_4^+ is 0.20 M. If the equilibrium constant, K_b for NH_3 equals 1.8×10^{-5}, what is the pH of this solution? (log 2.7 = 0.433).

[4 Marks]

(A) 8.73

(B) 11.72

(C) 9.43

(D) 9.08

Explanation:

Given : $[NH_3] = 0.3$ M, $[NH_4^+] = 0.2$ M,

K_b = 1.8×10^{-5}

pOH = pK_b + log ([salt] / [base]) [pK_b = -log K_b; pK_b = -log 1.8×10^{-5}]

∴ pK_b = 4.74

pOH = 4.74 + log(0.2 / 0.3) = 4.74 + 0.3010 - 0.4771 = 4.56

pH = 14 - 4.56 = 9.436

Question 66.

Which of the following compounds has the lowest melting point?

[4 Marks]

(A) CaF_2

(B) CaI_2

(C) $CaBr_2$

(D) $CaCl_2$

Explanation:

Correct Answer: CaI2

Melting point of metal halides decreases as the sjze

of the halogen increases. The correct order is CaF_2,>$CaCl_2$, >$CaBr_2$, CaI_2

Question 67.

Which one of the following is present as an active ingredient in bleaching powder for bleaching action?

[4 Marks]

(A) $CaOCl_2$

(B) $Ca(OCl)_2$

(C) $CaCl_2$

(D) CaO_2Cl

Explanation:

The active ingredient in bleaching powder for bleaching action is $Ca(OCl)_2$.

Question 68.

Name the type of the structure of silicate in which one oxygen atom of $[SiO_4]^{4-}$ is shared?

[4 Marks]

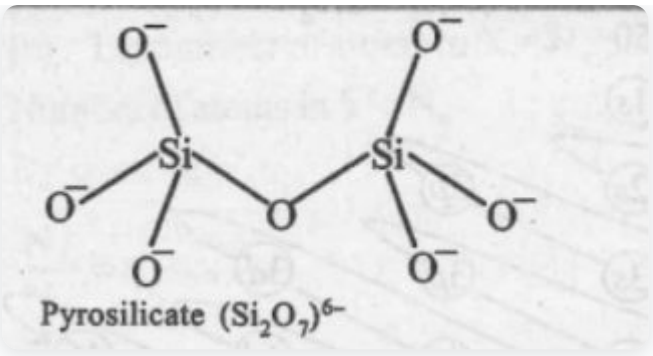
(A) Pyrosilicate

(B) Three dimensional

(C) Linear chain silicate

(D) Sheet silicate

Explanation:



Pyrosilicate $(Si_2O_7)^{6-}$

Question 69.

The correct order of increasing bond length of C-H, C-O, C-C and C=C is:

[4 Marks]

(A) C-O < C-H < C-C < C=C

(B) C-H < C-O < C-C < C=C

(C) C-H < C=C < C-O < C-C

(D) C-C < C=C < C-O < C-H

Explanation:

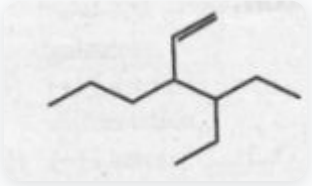
Bond length order is

$$\underset{1.10A^\circ}{C-H} < \underset{1.34A^\circ}{C=C} < \underset{1.40A^\circ}{C-O} < \underset{1.54A^\circ}{C-C}$$

Question 70.

The correct IUPAC name of the compound is:

[4 Marks]



(A) 3-(1-ethylpropyl) hex-1-ene

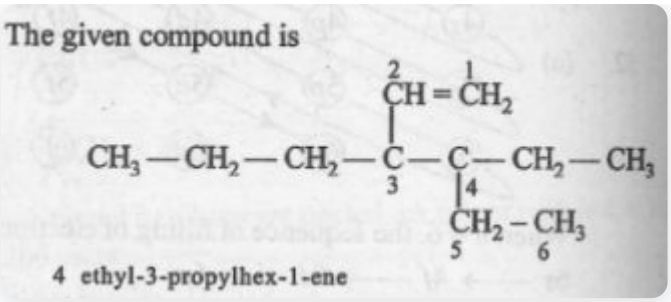
(B) 3-Ethyl-4-ethenyl heptane

(C) 3-Ethyl-4-propyl hex-1-ene

(D) 4-Ethyl-3-propyl hex-1-ene

Explanation:

The given compound is



4 ethyl-3-propylhex-1-ene

Question 71.

In Duma's method of estimation of nitrogen 0.35 g of an organic compound gave 55 mL of nitrogen collected at 300 K temperature and 715 mm pressure. The percentage composition of nitrogen in the compound would be: (Aqueous tension at 300 K = 15 mm)

[4 Marks]

(A) 15.45

(B) 16.45

(C) 14.45

(D) 17.45

Explanation:

Given wt of compound taken (w)=0.35g

Volume of nitrogen collected (V)= 55 mL.

Room temperature (tK)=300K

Atmospheric pressure (P) =715 mm

Aq. tension (p) = 15mm

Calculation -

Volume of N_2 at NTP= ((P - p) × V/ t) × 273 / 760mL

=((715 - 15) × 55 / 300) ×273 / 760

=46.098 mL

% of nitrogen

=28 x voL.of N_2 at NTP ×100 /

22400 × wt of organic compound

= 28 × 46.098 × 100 / 22400 × 0.35 =16.46%

Question 72.

The Lassaigne's extract is boiled with conc. HNO_3 while testing for halogens. By doing so it:

[4 Marks]

(A) increases the concentration of NO_3^- ions.

(B) increases the solubility product of AgCl.

(C) helps in the precipitation of AgCl.

(D) decomposes Na_2S and NaCN, if formed.

Explanation:

Conc. HNO_3 decomposes NaCN and Na_2S to avoid their interference.

$NaCN + HNO_3 \rightarrow NaNO_3 + HCN\uparrow$

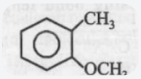
$Na_2S + 2HNO_3 \rightarrow 2NaNO_3 + H_2S\uparrow$

Question 73.

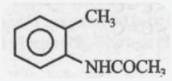
Which one of the following is most reactive towards electrophilic reagent?

[4 Marks]

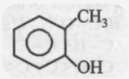
(A)



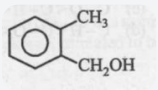
(B)



(C)



(D)



Explanation:

Due to +M effect of — OH group and hyperconjugation of — CH_3group.

Question 74.

Which one of the following statement is not true?

[4 Marks]

(A) pH of drinking water should be between 5.5-9.5.

(B) Concentration of DO below 6 ppm is good for the growth of fish.

(C) Clean water would have a BOD value of less than 5 ppm.

(D) Oxides of sulphur, nitrogen and carbon are the most widespread air pollutant.

Explanation:

The growth of fishes gets hindered if the concentration of (D.O.) is below 6 ppm.

Question 75.

The freezing point depression constant for water is -1.86 °C m^{-1}. If 5.00 g Na_2SO_4 is dissolved in 45.0 g H_2O, the freezing point is changed by -3.82 °C. Calculate the van't Hoff factor for Na_2SO_4.

[4 Marks]

(A) 0.381

(B) 3.11

(C) 2.05

(D) 2.63

Explanation:

Given K_f = - 1.86° cm^{-1}, mass of solute = 5.00 g, mass of solvent = 45.0 g

$\Delta T_f = i \times K_f . m$

3.82 = i × 1.86 × (5 × 1000) / (142 × 45) (Molecular mass of Na_2SO_4 = 142)

∴ i = 2.63

Question 76.

The van't Hoff factor i for a compound which undergoes dissociation in one solvent and association in other solvent is respectively:

[4 Marks]

(A) less than one and greater than one.

(B) less than one and less than one.

(C) greater than one and greater than one.

(D) greater than one and less than one.

Explanation:

If a compound dissociates in solvent i > 1 and on association i < 1.

Question 77.

Standard electrode potential of three metals X, Y and Z are -1.2 V, +0.5 V and -3.0 V, respectively. The reducing power of these metals will be:

[4 Marks]

(A) X > Y > Z

(B) Y > Z > X

(C) X > Z > Y

(D) Z > X > Y

Explanation:

As the value of standard reduction potential decreases, the reducing power increases i.e.,

Z (-3.0) > X (-1.2) > Y (+0.5).

Question 78.

The electrode potentials for

$Cu^{2+}(aq) + e^{-} \rightarrow Cu^{+}(aq)$

and $Cu^{+}(aq) + e^{-} \rightarrow Cu(s)$

are +0.15 V and +0.50 V, respectively. The value of E° _Cu^{2+}/Cu will be:

[4 Marks]

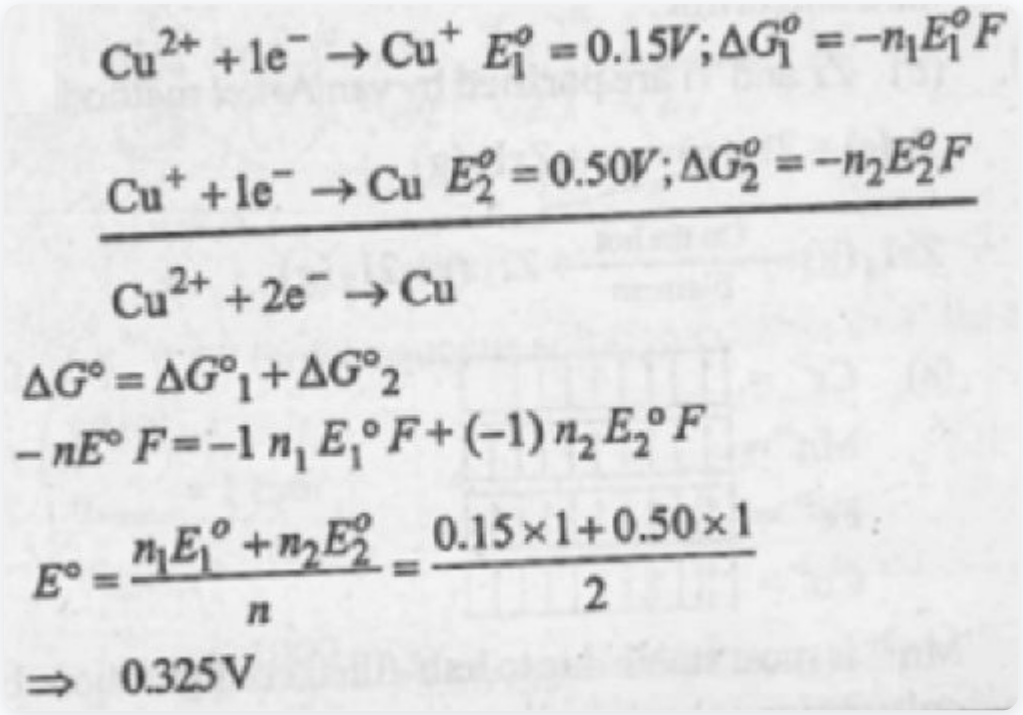
(A) 0.500 V

(B) 0.325 V

(C) 0.650 V

(D) 0.150 V

Explanation:



Question 79.

Standard electrode potential for Sn^{4+}/Sn^{2+} couple is +0.15 V and that for the Cr^{3+}/Cr couple is -0.74 V. These two couples in their standard state are connected to make a cell. The cell potential will be:

[4 Marks]

(A) +1.83 V

(B) +0.18 V

(C) +0.89 V

(D) +1.19 V

Explanation:

The couple for which SRP value is high, will act as cathode and the other couple will act as an anode.

E°_cell = E°_cathode - E°_anode = 0.15 V - (-0.74 V) = +0.89 V

Question 80.

If the E°_cell for a given reaction has a negative value, then which of the following gives the correct relationships for the values of ΔG° and K_eq?

[4 Marks]

(A) $\Delta G^\circ > 0; K_{eq} < 1$

(B) $\Delta G^\circ < 0; K_{eq} < 1$

(C) $\Delta G^\circ > 0; K_{eq} > 1$

(D) $\Delta G^\circ < 0; K_{eq} > 1$

Explanation:

Standard Gibbs free energy is given as

$\Delta G^\circ = -nE^\circ F$

If $E^\circ_{cell} < 0$ i.e. -ve

$\Delta G^\circ > 0$

Further $\Delta G^\circ = -RT \ln K_{eq}$

$\therefore \Delta G^\circ > 0$ when $K_{eq} < 1$

Question 81.

Which one of the following statements for the order of a reaction is incorrect?

[4 Marks]

(A) Order of reaction is always whole number.

(B) Order of reaction is sum of power to the concentration terms of reactants to express the rate of reaction.

(C) Order can be determined only experimentally.

(D) Order is not influenced by stoichiometric coefficient of the reactants.

Explanation:

Order of reaction can be zero, whole number, or fractional.

Question 82.

If x is amount of adsorbate and m is amount of adsorbent, which of the following relations is not related to adsorption process?

[4 Marks]

(A) $x/m = f(p)$ at constant T.

(B) x/m = f(T) at constant p.

(C) p = f(T) at constant (x/m).

(D) x/m = p × T

Explanation:

x/m = f(P) at constant T and

x/m = f(T) at constant T

Thus, it can be stated that for constant value of x/m, pressure and temperature can take different values or P = f(T) at constant (x/m).

But x/m ≠ P × T

Question 83.

Which of the following elements is present as the impurity to the maximum extent in the pig iron?

[4 Marks]

(A) Manganese

(B) Carbon

(C) Silicon

(D) Phosphorus

Explanation:

Pig iron or cast iron contains 3 – 5% carbon and varying amounts of Mn, Si, P and S which makes the iron hard and brittle.

Question 84.

Which of the following pairs of metals is purified by van Arkel method?

[4 Marks]

(A) Ga and In

(B) Ag and Au

(C) Zr and Ti

(D) Ni and Fe

Explanation:

Zr and Ti are purified by van Arkel method.

$Zr(s) + 2I_2(g) \longrightarrow ZrI_4(g)$

$ZrI_4(g)$ —— On the hot filament ——> $Zr(s) + 2I_2(g)$

Question 85.

For the four successive transition elements (Cr, Mn, Fe and Co), the stability of +2 oxidation state will be there in which of the following order?

[4 Marks]

(A) Cr > Mn > Co > Fe

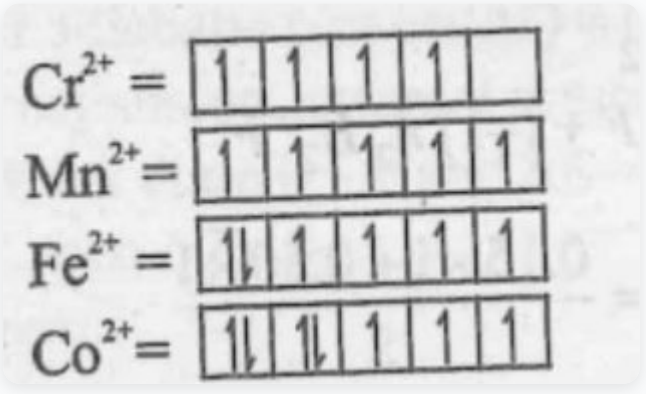
(B) Co > Mn > Fe > Cr

(C) Mn > Fe > Cr > Co

(D) Fe > Mn > Co > Cr

Explanation:

Mn^{2+} is most stable due to half-filled configuration.



Question 86.

Acidified $K_2Cr_2O_7$ solution turns green when Na_2SO_3 is added to it. This is due to the formation of:

[4 Marks]

(A) $Cr_2(SO_3)_3$

(B) $CrSO_4$

(C) CrO_4^{2-}

(D) $Cr_2(SO_4)_3$

Explanation:

The green colour appears due to the formation of Cr^{3+} ion

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

Question 87.

The complexes $[Co(NH_3)_6][Cr(CN)_6]$ and $[Cr(NH_3)_6][Co(CN)_6]$ are the examples of which type of isomerism?

[4 Marks]

(A) Linkage isomerism

(B) Geometrical isomerism

(C) Coordination isomerism

(D) Ionization isomerism

Explanation:

Interchange of ligand between the complexes give isomers e.g. $[Co(NH_3)_6]$ $[Cr(CN)_6]$ is an isomer of $[Co(CN)_6]$ $[Cr(NH_3)_6]$

Question 88.

The complex, $[Pt(Py)(NH_3)BrCl]$ will have how many geometrical isomers?

[4 Marks]

(A) 4

(B) 3

(C) 2

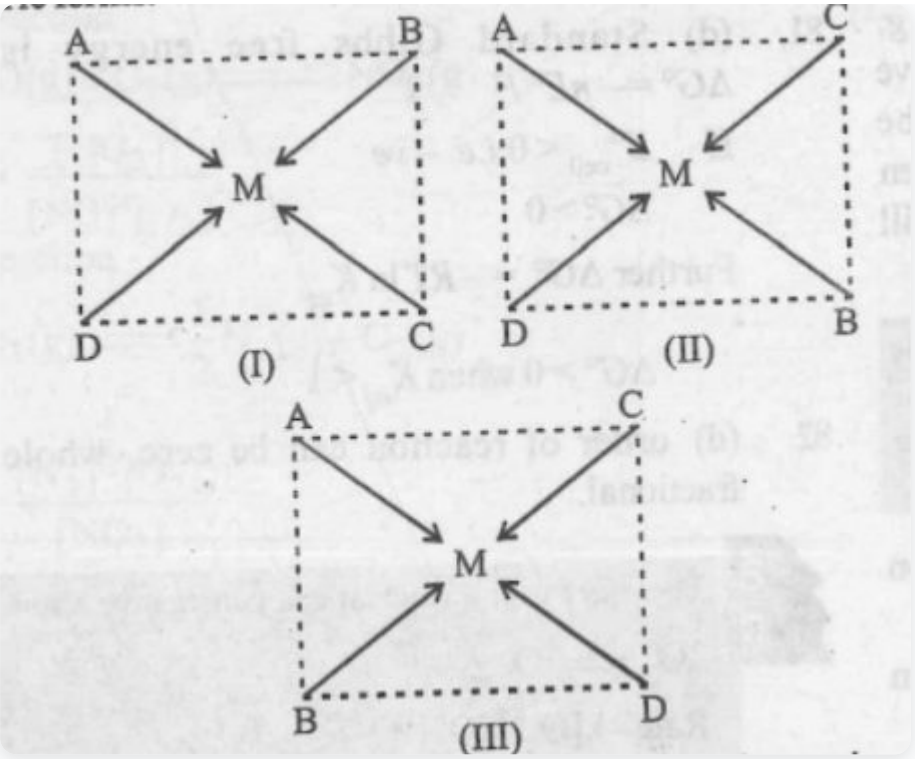
(D) 0

Explanation:

Complexes of the type [M_ABCD] may exist in three isomeric forms.

Similarly, $[Pt(Py)(NH_3)BrCl]$ may exist in three isomeric form in which

M = Pt, A = Py, B = NH_3, C = Br, D = Cl.



Question 89.

Of the following complex ions, which is diamagnetic in nature?

[4 Marks]

(A) $[CoF_6]^{3-}$

(B) $[CuCl_4]^{2-}$

(C) $[NiCl_4]^{2-}$

(D) $[Ni(CN)_4]^{2-}$

Explanation:

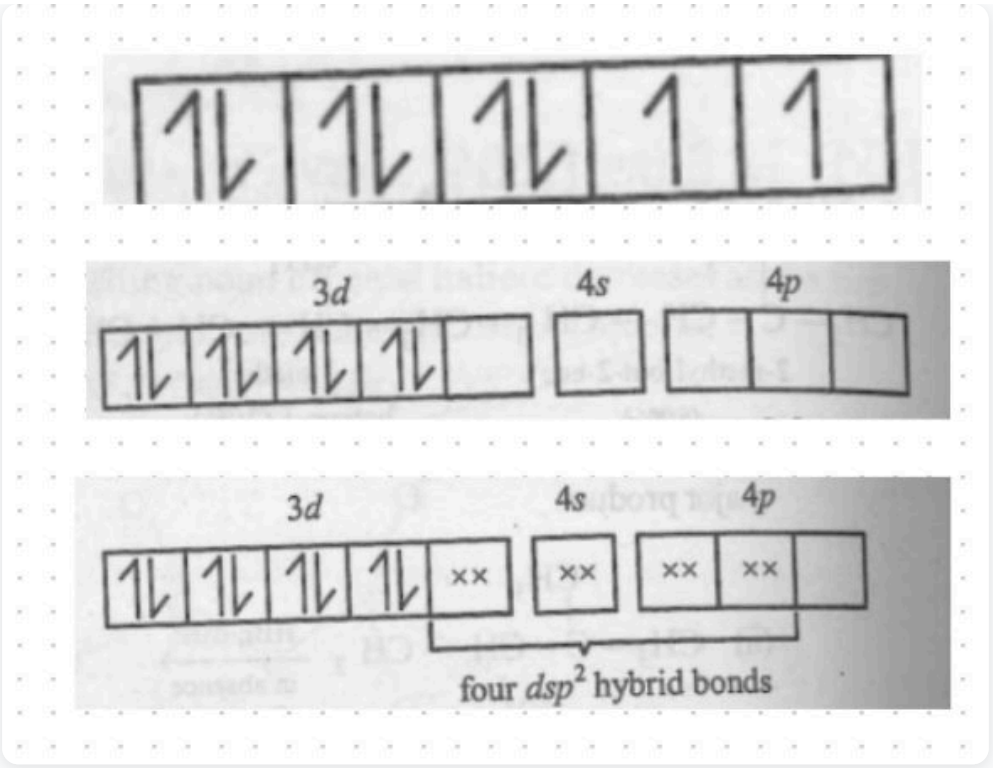
$Ni^{2+} = 3d^8\ 4s^0$

Since, the coordination number of Ni in this complex is 4, the configuration of Ni^{2+} at first sight shows that the complex is paramagnetic with two unpaired electron. However, experiments show that the complex is diamagnetic. This is possible when the 3d electrons rearrange against the Hund's rule as shown below. This is in accordance with the fact that the ligand involved here is strong i.e., CN^- ion.
Ni^{2+} (after rearrangement)

Hence, now dsp^2 hybridization involving one 3d, one 4s and two 4p orbitals, takes place leading to four dsp^2 hybrid orbitals, each of which accepts four electron pairs from CN^- ion forming $[Ni(CN)_4]^{2-}$ ion.

$[Ni(CN)_4]^{2-}$

Thus, the complex is diamagnetic as it has no unpaired electron.



Question 90.

The d-electron configurations of Cr^{2+}, Mn^{2+}, Fe^{2+} and Co^{2+} are d^4, d^5, d^6 and d^7 respectively. Which one of the following will exhibit minimum paramagnetic behaviour?

[4 Marks]

(A) $[Fe(H_2O)_6]^{2+}$

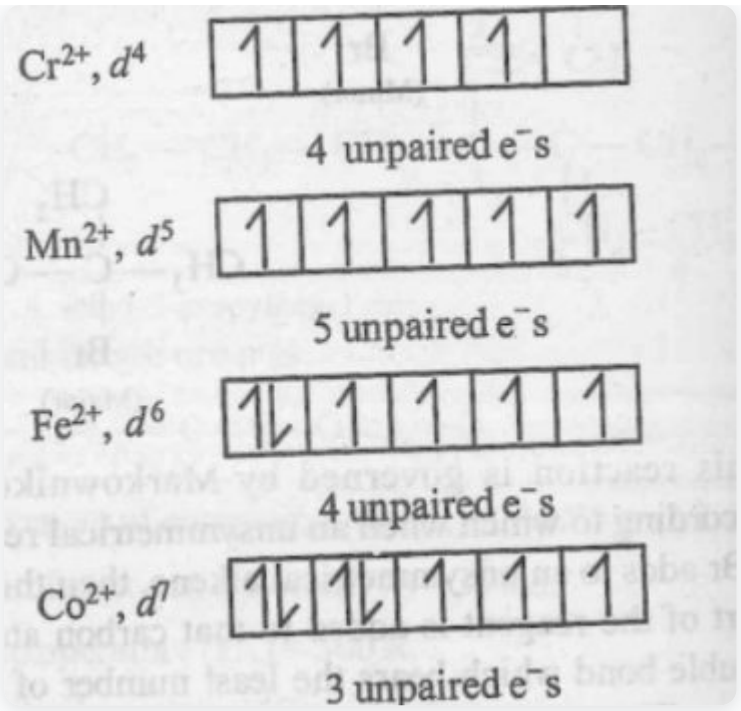
(B) $[Mn(H_2O)_6]^{2+}$

(C) $[Cr(H_2O)_6]^{2+}$

(D) $[Co(H_2O)_6]^{2+}$

Explanation:

Minimum paramagnetic behaviour. $=[Co(H_2O)_6]^{2+}$



Question 91.

Clemmensen reduction of a ketone is carried out in the presence of which of the following?

[4 Marks]

(A) H_2 and Pt as catalyst

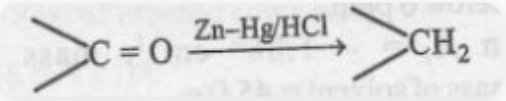
(B) $LiAlH_4$

(C) Zn-Hg with HCl

(D) Glycol with KOH

Explanation:

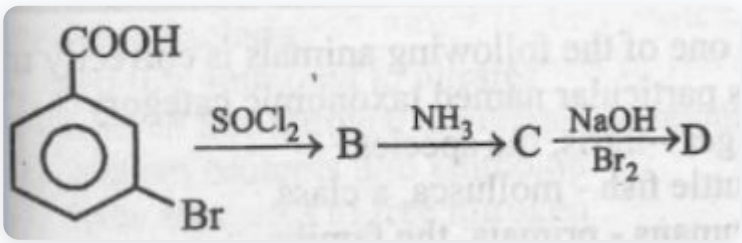
Clemmensen reduction is



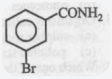
Question 92.

In a set of reactions m-bromobenzoic acid gave a product D. Identify the product D.

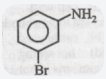
[4 Marks]



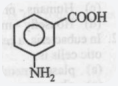
(A)



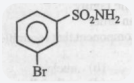
(B)



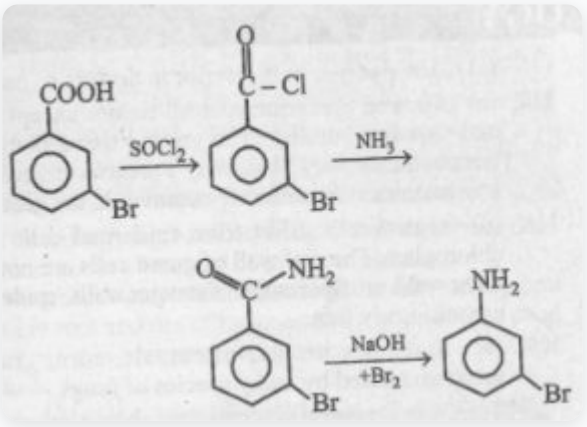
(C)



(D)



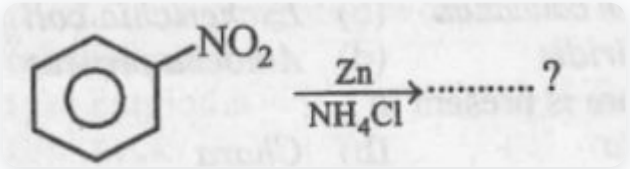
Explanation:



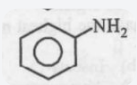
Question 93.

What is the product obtained in the following reaction:

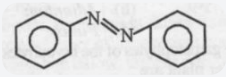
[4 Marks]



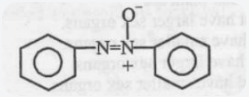
(A)



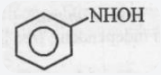
(B)



(C)

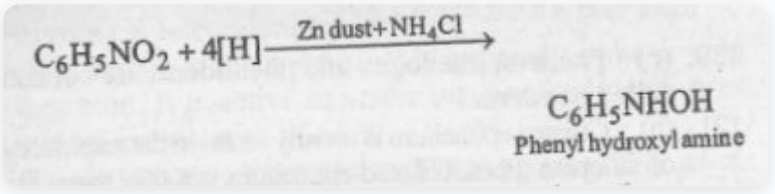


(D)



Explanation:

When a nitro compound is reduced with a neutral reducing agent (Zn dust + NH_4Cl), the corresponding hydroxyl amine is formed.



Question 94.

Which one of the following statements is not true regarding (+) Lactose?

[4 Marks]

(A) (+) Lactose, $C_{12}H_{22}O_{11}$, contains 8 -OH groups.

(B) (+) Lactose is a reducing sugar and does not exhibit mutarotation.

(C) (+) Lactose is a β-glycoside formed by the union of a molecule of D(+) glucose and a molecule of D(+) galactose.

(D) On hydrolysis (+) Lactose gives equal amount of D(+) glucose and D(+) galactose.

Explanation:

All reducing sugars shows mutarotation.

Question 95.

Of the following which one is classified as polyester polymer?

[4 Marks]

(A) Terylene

(B) Bakelite

(C) Melamine

(D) Nylon-66

Explanation:

Polyesters are condensation polymers of a diabasic acid and a diol. e.g., Terylene.

Question 96.

Which one of the following is employed as Antihistamine?

[4 Marks]

(A) Chloramphenicol

(B) Diphenyl hydramine

(C) Omeprazole

(D) Norethindrone

Explanation:

Diphenyl hydramine, also known as Benadryl, is an antihistamine.

Question 97.

The half life of a substance in a certain enzyme-catalysed reaction is 138 s. The time required for the concentration of the substance to fall from 1.28 mg L^{-1} to 0.04 mg L^{-1} is:

[4 Marks]

(A) 276 s

(B) 690 s

(C) 552 s

(D) 414 s

Explanation:

For a first order reaction

Total time T = no. of half lives (n) × half life ($t_1/_2$)

$N / N_0 = (1/2)n$

where n = no. of half lives

Give N_0 (original amount) = 1.28 mg/l

N (amount of substance left after time T) = 0.04 mgL-1

$\therefore 0.04 / 1.28 = (1/2)^n ; 1 / 32 = (1/2)^n ; (1/2)^5 = (1/2)^n$

n = 5

T = 5 × 138 = 690

Question 98.

Mole fraction of the solute in a 1.00 molal aqueous solution is:

[4 Marks]

(A) 0.0344

(B) 0.0177

(C) 1.7700

(D) 0.1770

Explanation:

1.00 molal aqueous solution contain mole in 1000 g water

n_{solute} = 1 mol

$w_{solvent}$ = 1000 g

$n_{solvent} = 1000 / 18 = 55.56$ mol

$x_{solute} = 1 / (1 + 55.56) = 0.0177$

Question 99.

Which one of the following animals is correctly matched with its particular named taxonomic category?

[4 Marks]

(A) Cuttle fish - mollusca, a class

(B) Tiger - tigris, the species

(C) Housefly - musca, an order

(D) Humans - primata, the family

Explanation:

Tiger and tigris both are from same genus with a particular taxonomic category.

Question 100.

In eubacteria, a cellular component that resembles eukaryotic cells is:

[4 Marks]

(A) plasma membrane

(B) nucleus

(C) ribosomes

(D) cell wall

Explanation:

Eubacteria are prokaryotic but eubacteria are enclosed by plasma membrane like eukaryotic cells.

Question 101.

Organisms called methanogens are most abundant in a:

[4 Marks]

(A) cattle yard

(B) sulphur rock

(C) polluted stream

(D) hot spring

Explanation:

Methanogens are archaebacteria, abundant in cattle yard and paddy fields.

Question 102.

Which one of the following organisms is not an example of eukaryotic cells?

[4 Marks]

(A) Paramecium caudatum

(B) Escherichia coli

(C) Amoeba proteus

(D) Euglena viridis

Explanation:

E. coli is a prokaryotic gram negative bacterium.

Question 103.

Archegoniophore is present in:

[4 Marks]

(A) Marchantia

(B) Chara

(C) Adiantum

(D) Funaria

Explanation:

Archegoniophore is the female sex organ of bryophytes (*Marchantia*) and pteridophytes. Its neck region is made up of 4-6 vertical rows of cells.

Question 104.

The gametophyte is not an independent, free living generation in:

[4 Marks]

(A) Polytrichum

(B) Adiantum

(C) Marchantia

(D) Pinus

Explanation:

Unlike bryophytes and pteridophytes, in gymnosperms the male and female gametophytes do not have an independent free-living existence. They remain within the sporangia retained on the sporophytes.

Question 105.

Compared with the gametophytes of the bryophytes the gametophytes of vascular plant are:

[4 Marks]

(A) smaller and have smaller sex organs.

(B) larger but have smaller sex organs.

(C) larger and have larger sex organs.

(D) smaller but have larger sex organs.

Explanation:

The gametophyte of bryophytes are smaller but have large sex organs.

Question 106.

Which one of the following have the highest number of species in nature?

[4 Marks]

(A) Fungi

(B) Insects

(C) Birds

(D) Angiosperms

Explanation:

In nature insects have the highest number of species (30 million). Fungi have 100,000, angiosperms have 260000 and birds have 10,000 species.

Question 107.

What will you look for to identify the sex of the following?

[4 Marks]

(A) Female Ascaris - Sharply curved posterior end

(B) Male frog - A copulatory pad on the first digit of the hind limb

(C) Male shark - Claspers borne on pelvic fins

(D) Female cockroach - Anal cerci

Explanation:

A male shark possesses a pair of claspers which are inserted into a female shark's cloaca (an opening on the underside of the body) at the time of mating. Claspers are located on the inner edge of

the pelvic fins near the male's cloaca. The function of claspers is to introduce sperm into a female shark's body for the purpose of fertilizing her eggs. Female sharks do not have claspers.

Question 108.

Which one of the following groups of animals is correctly matched with its one characteristic feature without even a single exception?

[4 Marks]

(A) Chordata: possess a mouth provided with an upper and lower jaw

(B) Reptilia: possess 3 chambered heart with one incompletely divided ventricle

(C) Chondrichthyes: possess cartilaginous endoskeleton

(D) Mammalia: give birth to young one.

Explanation:

Chondrichthyes are the cartilaginous fish with a flexible skeleton made of cartilage rather than bone.

Question 109.

Flowers are zygomorphic in:

[4 Marks]

(A) mustard

(B) gulmohur

(C) tomato

(D) datura

Explanation:

When a flower can be divided into two similar halves only in one particular vertical plane, it is zygomorphic, e.g. pea, gulmohar, bean, etc.

Question 110.

Which one of the following statements is correct?

[4 Marks]

(A) Seeds of orchids have oil-rich endosperm

(B) In tomato, fruit is a capsule

(C) Placentation in primose is basal

(D) Flower of tulip is a modified shoot

Explanation:

Tulips are most popular and wildly grown flowers. Tulips are bulbs, possessing modified stems and leaves.

Question 111.

What would be the number of chromosomes of the aleurone cells of a plant with 42 chromosomes in its root tip cells?

[4 Marks]

(A) 42

(B) 63

(C) 21

(D) 84

Explanation:

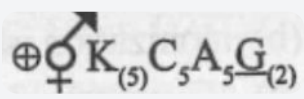
Aleurone cells are the outer cell layer of the endosperm, usually only one cell thick in wheat and the only endosperm tissue alive at maturity. The cell layers of this layer are responsible for the de-novo synthesis of enzyme needed during germination. The chromosome number is 63 of a plant with 42 chromosome in its root tip cells.

Question 112.

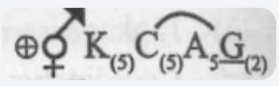
The correct floral formula of chilli is;

[4 Marks]

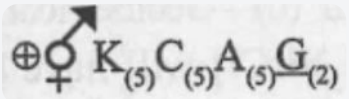
(A)



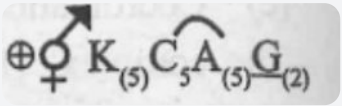
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(C)

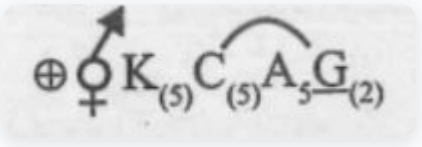


(D)



Explanation:

Floral formula of chilli is



Question 113.

The ovary is half inferior in flowers of

[4 Marks]

(A) cucumber

(B) peach

(C) guava

(D) cotton

Explanation:

The ovary is half-inferior in flowers of peach.

Question 114.

Ground tissue includes

[4 Marks]

(A) all tissues except epidermis and vascular bundles

(B) all tissues internal to endodermis

(C) epidermis and cortex

(D) all tissues external to endodermis

Explanation:

Ground tissue includes all tissues except epidermis and vascular bundles. The ground tissue comprises the bulk of the primary plant body. Parenchyma, collenchyma and sclerenchyma cells are common in the ground tissue.

Question 115.

In land plants, the guard cells differ from other epidermal cells in having:

[4 Marks]

(A) endoplasmic reticulum

(B) chloroplasts

(C) mitochondria

(D) cytoskeleton

Explanation:

Guard cells differ from epidermal cells in having chloroplast. The cell wall of guard cells are not uniform, inner walls are thicker than the outer walls, epidermal cells are uniformly thin.

Question 116.

Which one of the following is wrongly matched?

[4 Marks]

(A) Puccinia - Smut

(B) Root pressure - Guttation

(C) Cassia - Imbricate aestivation

(D) Root - Exarch protoxylem

Explanation:

Smut is a disease of cereals, corn, grasses and sorghum caused by many species of fungi.

Question 117.

The cork cambium, cork and secondary cortex are collectively called:

[4 Marks]

(A) phellogen

(B) phelloderm

(C) periderm

(D) phellem

Explanation:

Phellem, phellogen and phelloderm are collectively called periderm.

Question 118.

The ciliated columnar epithelial cells in humans are known to occur in:

[4 Marks]

(A) bronchioles and fallopian tubes

(B) eustachian tube and stomach lining

(C) bile duct and oesophagus

(D) fallopian tubes and urethra

Explanation:

Ciliated epithelium is usually found in the respiratory tract of fallopian tubes. Ciliated epithelium is a thin tissue that has hair-like structures on it. These hairs, called cilia, move back and forth to help move particles out of our body. We find ciliated epithelial tissue in our respiratory tract and in the fallopian tubes of women. Ciliated epithelium performs the function of moving particles or fluid over the epithelial surface in such structures as the trachea, bronchial tubes, and nasal cavities. It often occurs in the vicinity of mucus-secreting goblet cell

Question 119.

One very special feature in the earthworm Pheretima is that

[4 Marks]

(A) fertilisation for eggs occurs inside the body

(B) the typhlosole greatly increases the effective absorption area of the digested food in the intestine

(C) it has a long dorsal tubular heart

(D) the S-shaped setae embedded in the integument are the defensive weapons used against the enemies

Explanation:

The intestine of an earthworm has a peculiar fold of tissue that forms a pocket in the intestine that is visible when viewing a cross section. This space, which runs almost the whole length of the body dorsally is known as the typhlosole and it serves to increase the surface area of the intestine for absorption.

Question 120.

Which of the following is correctly stated as it happens in the common cockroach?

[4 Marks]

(A) Malpighian tubules are excretory organs projecting out from the colon

(B) Oxygen is transported by haemoglobin in blood

(C) Nitrogenous excretory product is urea

(D) The food is ground by mandibles and gizzard

Explanation:

Cockroach intake the food after grounding it by its mandibles and gizzard.

Question 121.

Important site for formation of glycoproteins and glycolipids is

[4 Marks]

(A) vacuole

(B) golgi apparatus

(C) plastid

(D) lysosome

Explanation:

Golgi apparatus is the important site for formation of glycoprotein and glycolipid.

Question 122.

Peptide synthesis inside a cell takes place in:

[4 Marks]

(A) chloroplast

(B) mitochondria

(C) chromoplast

(D) ribosomes

Explanation:

Peptide synthesis takes place in ribosome of the cell.

Question 123.

What are those structures that appear as beads-on-string in the chromosomes when viewed under electron microscope?

[4 Marks]

(A) Genes

(B) Nucleotides

(C) Nucleosomes

(D) Base pairs

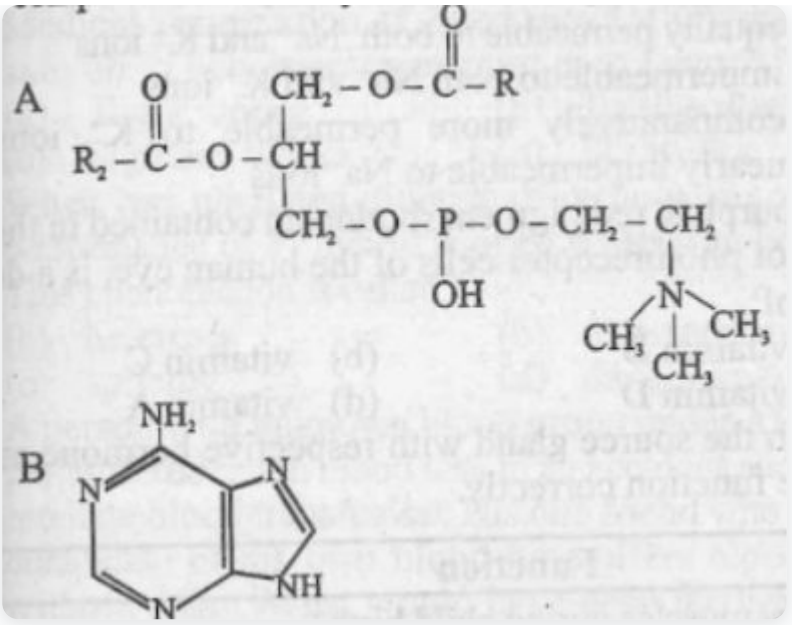
Explanation:

Under electron microscope the nucleosomes appear as beads on a string in chromosome, due to a short length of DNA wrapped around a core of histone proteins.

Question 124.

Which one of the following structural formulae of two organic compounds is correctly identified along with its related function?

[4 Marks]



(A) B: Adenine - a nucleotide that makes up nucleic acids

(B) A: Triglyceride - major source of energy

(C) A: Lecithin - a component of cell membrane

(D) B: Uracil - a component of DNA

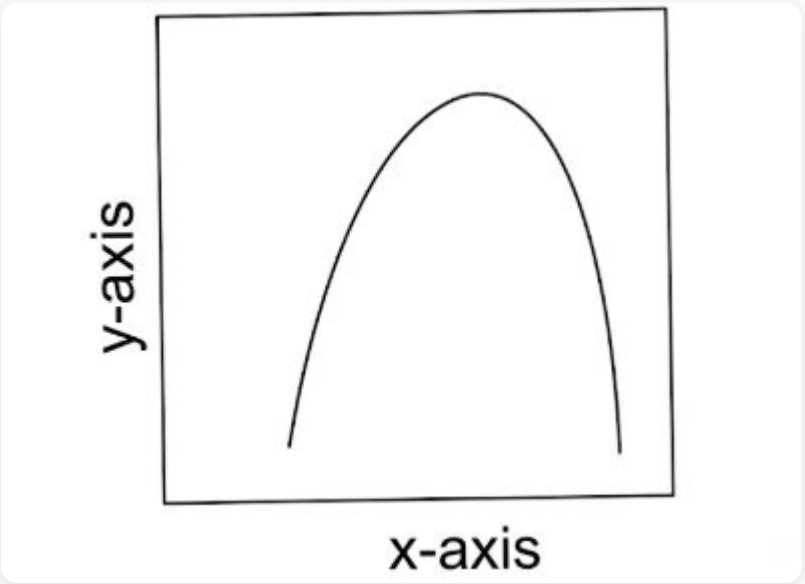
Explanation:

Lecithin is a fat like substance (a phospholipid), which is a part of plasma membrane.

Question 125.

The curve given below shows enzymatic activity with relation to three conditions (pH, temperature and substrate concentration.) What do the two axes (x and y) represent?

[4 Marks]



(A) temperature - enzyme activity

(B) enzymatic activity - pH

(C) substrate concentration - enzymatic activity

(D) enzymatic activity - temperature

Explanation:

In the given curve, the relation between temperature and enzyme activity is shown.

Question 126.

Select the correct option with respect to mitosis.

[4 Marks]

(A) Chromatids separate but remain in the centre of the cell in anaphase.

(B) Chromatids start moving towards opposite poles in telophase.

(C) Golgi complex and endoplasmic reticulum are still visible at the end of prophase.

(D) Chromosomes move to the spindle equator and get aligned along equatorial plate in metaphase

Explanation:

In mitosis, chromosomes move to the equator and get aligned along equatorial plate in metaphase.

Question 127.

Which one of the following elements in plants is not remobilised?

[4 Marks]

(A) Phosphorus

(B) Calcium

(C) Potassium

(D) Sulphur

Explanation:

Calcium is not remobilized from the leaves to the fruits, like potassium, phosphorus and sulphur. It occurs abundantly in a non-exchangeable form such as anorthite ($CaAl_2Si_2O_8$).

Question 128.

A prokaryotic autotrophic nitrogen fixing symboint is found in:

[4 Marks]

(A) Alnus

(B) Cycas

(C) Cicer

(D) Pisum

Explanation:

A prokaryotic autotrophic nitrogen fixing symbiont is found in *Cycas*.

Question 129.

Nitrifying bacteria:

[4 Marks]

(A) oxidize ammonia to nitrates

(B) convert proteins into ammonia

(C) reduce nitrates to free nitrogen

(D) convert free nitrogen to nitrogen compounds

Explanation:

The nitrifying bacteria bring about transformations of ammonia to nitrite and of nitrite to nitrate.

Question 130.

The function of leg haemoglobin in the root nodules of legumes is:

[4 Marks]

(A) inhibition of nitrogenase activity

(B) oxygen removal

(C) nodule differentiation

(D) expression of nif gene

Explanation:

Leghaemoglobin is the haemoglobin like red pigment found in root nodules of legumes and reported to function as an oxygen-carrying pigment in symbiotic nitrogen fixation.

Question 131.

CAM helps the plants in:

[4 Marks]

(A) reproduction

(B) disease resistance

(C) conserving water

(D) secondary growth

Explanation:

CAM plants are most common in arid environments. Being able to keep stomata closed during the hottest and driest part of the day reduces the loss of water through evapotranspiration.

Question 132.

Two friends are eating together on a dining table. One of them suddenly starts coughing while swallowing some food. This coughing would have been due to improper movement of:

[4 Marks]

(A) epiglottis

(B) neck

(C) tongue

(D) diaphragm

Explanation:

The coughing would have been due to improper movement of epiglottis.

Question 133.

Which one of the following enzymes carries out the initial step in the digestion of milk in humans?

[4 Marks]

(A) Pepsin

(B) Rennin

(C) Lipase

(D) Trypsin

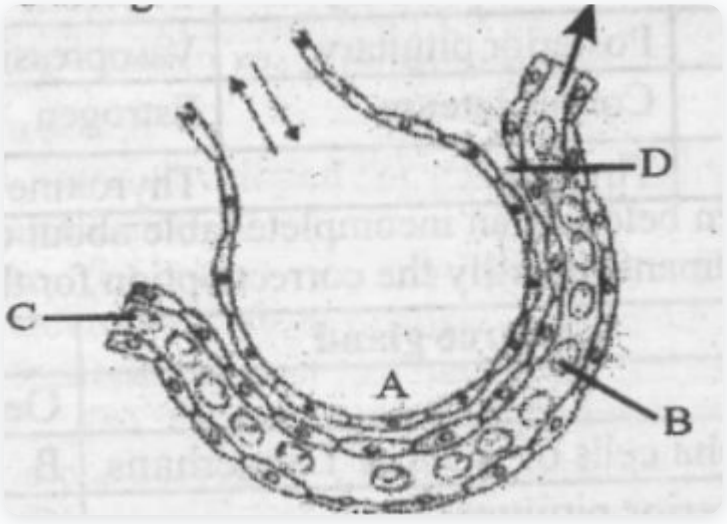
Explanation:

Rennin is an enzyme that is essential for the protein digestion. It is active in acidic medium and inactive in normal gastric juice of adult.

Question 134.

The figure given below shows a small part of human lung where exchange of gases takes place. In which one of the options given below, the one part A, B, C or D is correctly identified along with its function?

[4 Marks]



(A) D: capillary wall O_2 and CO_2 - exchange of takes place here.

(B) B: red blood cell - transport of CO_2 mainly

(C) C: arterial capillary - passes oxygen to tissues

(D) A: alveolar cavity - main site of exchange of respiratory gases

Explanation:

In the given figure the exchange of respiratory gases occurs in alveolar cavity.

Question 135.

A large proportion of oxygen is left unused in the human blood even after its uptake by the body tissues. This O_2:

[4 Marks]

(A) acts as a reserve during muscular exercise

(B) raise the pCO_2 of blood to 75 mm of Hg.

(C) is enough to keep oxyhaemoglobin saturation at 96%

(D) helps in releasing more O_2 to the epithelial tissues.

Explanation:

A large portion of oxygen is left unused in the human blood even after its uptake by the body tissues. This O_2 acts as a reserve during muscular exercise.

Question 136.

Which one of the following plasma proteins is involved in the coagulation of blood?

[4 Marks]

(A) an albumin

(B) serum amylase

(C) a globulin

(D) fibrinogen

Explanation:

Fibrinogen, the protein of blood plasma is converted to insoluble protein fibrin during the clotting process. The fibrinogen free fluid, obtained after removal of the clot, called blood serum, is plasma minus fibrinogen.

Question 137.

'Bundle of His' is a part of which one of the following organs in humans?

[4 Marks]

(A) Brain

(B) Heart

(C) Pancreas

(D) Kidney

Explanation:

'Bundle of His' are a typical cardiac muscle fibres, connecting the atria with ventricle.

Question 138.

Arteries are best defined as the vessels which:

[4 Marks]

(A) supply oxygenated blood to the different organs.

(B) break up into capillaries which reunite to form one visceral organ.

(C) break up into capillaries which reunite to form a vein.

(D) carry blood blo from one visceral organ to another visceral organ.

Explanation:

Arteries are the vessels which break up into capillaries which reunite to form one visceral organ.

Question 139.

Which one of the following statements is correct regarding blood pressure?

[4 Marks]

(A) 130/90 mmHg is considered high and requires treatment.

(B) 100/55 mmHg is considered an ideal blood pressure.

(C) 105/50 mm Hg makes one very active.

(D) 190/110 mmHg may harm vital organs like brain and kidney.

Explanation:

190/110 mmHg may harm vital organs like brain and kidney. This is called hypertension which can give rise to increased heart rate and palpitation.

Question 140.

Uricotelic mode of passing out nitrogenous wastes is found in

[4 Marks]

(A) Reptiles and Bird

(B) Birds and Annelids

(C) Amphibians and Reptiles

(D) Insects and Amphibians

Explanation:

Organisms which excrete nitrogenous wastes in the form of urea are called ureotelic organisms whereas the organisms which excrete nitrogenous wastes in the form of uric acid are called uricotelic organisms. Uric acid is the least poisonous and the least soluble in water, relative to Ammonia and Urea.

Question 141.

Which one of the following is not a part of a renal pelvis?

[4 Marks]

(A) Convoluted tubules

(B) Peritubular capillaries

(C) Collecting ducts

(D) Loops of Henle

Explanation:

Renal pelvis is the innermost portion of kidney. So, collecting ducts are not a part of renal pelvis.

Question 142.

Which one of the following correctly explains the function of a specific part of a human nephron?

[4 Marks]

(A) Podocytes: create minute spaces (slite pores) for the filtration of blood into the Bowman's capsule

(B) Henle's loop: most reabsorption of the major substances from the glomerular filtrate

(C) Distal convoluted tubule: reabsorption of K ions into the surrounding blood capillaries

(D) Afferent arteriole: carries the blood away from the glomerular towards renal vein.

Explanation:

The pituitary gland is located in a bony cavity called sella tursica and is attached to hypothalamus by a stalk. It is divided anatomically into an adenohypophysis and a

neurohypophysis. The latter is also called pars nervosa or posterior pituitary. The latter is also called pars nervosa or posterior pituitary. It stores and releases two hormone

called oxytocin and vasopressin, which are actually synthesized by the hypothalamus and are transported axonally to neurohypophysis. Vasopressin acts mainly at the kidney and stimulates resorption of water and

electrolytes by the distal tubules in the nephron and thereby reduced loss of water through urine (divresis). Hence, it is also called as anti-divretic hormone (ADH).

Question 143.

Which one of the following statements is correct with respect to kidney function regulation?

[4 Marks]

(A) When someone drinks lot of water, ADH release is suppressed.

(B) Exposure to cold temperature blood flow stimulates formation of Angiotensin II.

(C) During summer when body loses lot of water by evaporation, the release of ADH is suppressed.

(D) An increase in glomerular blood flow stimulates formation of Angiotensin II.

Explanation:

Podocytes are highly specialized cells with a complex cytoarchitecture plays a major role in establishing the selective permeability of glomerular filtration barrier.

Question 144.

When a neuron is in resting state i.e., not conducting any impulse, the axonal membrane is:

[4 Marks]

(A) comparatively more permeable to Na^+ ions and nearly impermeable to K^+ ions

(B) equally permeable to both Na^+ and K^+ ions

(C) comparatively more permeable to K^+ ions and nearly impermeable to Na^+

(D) impermeable to both Na^+ and K^+ ions

Explanation:

When some one drinks lots of water, kidney release of ADH is suppressed.

Question 145.

The purplish red pigment rhodopsin contained in the rods type of photoreceptor cells of the human eye, is a derivative of:

[4 Marks]

(A) vitamin B_1

(B) vitamin C

(C) vitamin D

(D) vitamin A

Explanation:

When a neuron is in resting state i.e., not conducting any impulse, the axonal membrane is comparatively more permeable to K^+ ion and nearly impermeable to Na^+ ions.

Question 146.

The "Eyes" of the potato tuber are

[4 Marks]

(A) root buds

(B) flower buds

(C) shoot buds

(D) axillary buds

Explanation:

The axillary buds of the potato tuber are called "eyes" in common language. They are found at the nodes of the stem tuber.

Question 147.

Filiform apparatus is a characteristic feature of

[4 Marks]

(A) zygote

(B) egg

(C) suspensor

(D) synergid

Explanation:

A synergid cell wall forms a highly thickened structure called the filiform apparatus at the micropylar end consisting of numerous finger like projections into synergid cytoplasm. These synergid cells are necessary for pollen tube guidance in ovule.

Question 148.

In which one of the following pollination is autogamous?

[4 Marks]

(A) Xenogamy

(B) Geitonogamy

(C) Chasmogamy

(D) Cleistogamy

Explanation:

Cleistogamy is autogamous pollination. When pollination and fertilization occur in unopened flower bud, it is known as cleistogamy. It ensures self-pollination and prevents cross-pollination.

Question 149.

Wind pollination is common in

[4 Marks]

(A) legumes

(B) lilies

(C) orchids

(D) grasses

Explanation:

Wind pollination is common in grasses. Grasses produce large amount of pollen which by the help of wind reach to opposite sex for reproduction.

Question 150.

A drupe develops in

[4 Marks]

(A) mango

(B) wheat

(C) pea

(D) tomato

Explanation:

Some fleshy fruits such as mango, plum etc. usually have a single hard stone that encloses a seed, called drupe

Question 151.

Nucellar polyembryony is reported in species of

[4 Marks]

(A) Gossypium

(B) Citrus

(C) Brassica

(D) Triticum

Explanation:

Nucellar polyembryony is reported in a *Citrus* species.

Question 152.

If for some reason, the vasa efferentia in the human reproductive system gets blocked, the gametes will not be transported from

[4 Marks]

(A) testes to epididymis

(B) epididymis to vas deferens

(C) ovary to uterus

(D) vagina to uterus

Explanation:

If the vasa efferentia in the human reproductive system get blocked the gametes will not be transformed from testes to epididymis.

Question 153.

The testes in humans are situated outside the abdominal cavity insides pouch called scrotum. The purpose served is for

[4 Marks]

(A) maintaining the scrotal temperature lower than the internal body temperature

(B) escaping any possible compression by the visceral organs

(C) providing more space for the growth of epididymis

(D) providing a secondary sexual feature for exhibiting the male sex

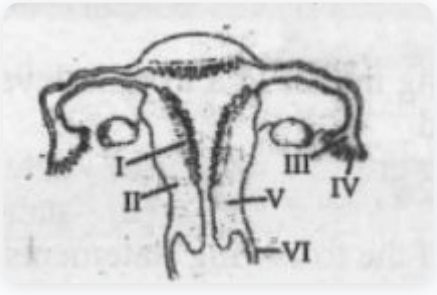
Explanation:

The testes are present in the scrotum which maintains the scrotal temperature below 2°C of the internal body temperature.

Question 154.

The figure given below depicts a diagrammatic sectional view of the female reproductive system of humans. Which one set of three parts out of I-VI have been correctly identified?

[4 Marks]



(A) (III) Infundibulum, (IV) Fimbriae, (V) Cervix

(B) (IV) Oviducal funnel, (V) Uterus, (VI) Cervix

(C) (I) Perimetrium, (II) Myometrium, (III) Fallopian tube

(D) (II) Endometrium, (III) Infundibulum, (IV) Fimbriae

Explanation:

In the given figure

III - marked portion is Infundibulum IV - marked portion is Fimbriae

V - marked portion is Cervix

Question 155.

Which one of the following is the most widely accepted method of contraception in India, as at present?

[4 Marks]

(A) Cervical caps

(B) Tubectomy

(C) Diaphragms

(D) IUDs. (Intra uterine devices)

Explanation:

Intra uterine device (IUD) is a method of contraception in India. The IUD is inserted in the woman's uterus through the cervix.

Question 156.

Medical Termination of Pregnancy (MTP) is considered safe up to how many weeks of pregnancy?

[4 Marks]

(A) Eight weeks

(B) Twelve weeks

(C) Eighteen weeks

(D) Six weeks

Explanation:

Medical termination of pregnancy is considered safe up to twelve weeks of pregnancy.

Question 157.

When two unrelated individuals or lines are crossed, the performance of F_1 hybrid is often superior to both parents. This phenomenon is called:

[4 Marks]

(A) heterosis

(B) transformation

(C) splicing

(D) metamorphosis

Explanation:

Heterosis or hybrid vigor occurs when two unrelated individuals or lines are crossed, the performance of F_1 hybrid, which is often superior to both the parents.

Question 158.

A person with unknown blood group under ABO system, has suffered much blood loss in an accident and needs immediate blood transfusion. His one friend who has a valid certificate of his own blood type offers blood donation without delay. What would have been the type of blood group of the donor friend?

[4 Marks]

(A) Type B

(B) Type AB

(C) Type O

(D) Type A

Explanation:

Type O

Question 159.

Which one of the following conditions correctly describes the manner of determining the sex in the given example?

[4 Marks]

(A) Homozygous sex chromosomes (ZZ) determine female sex in birds.

(B) XO type of sex chromosomes determine male sex in grasshopper

(C) Homozygous sex chromosomes (XX) produce male in Drosophila.

(D) XO condition in human as found in Turner syndrome, determines female sex.

Explanation:

XO type of sex chromosomes determine male sex in grasshopper.

Question 160.

Mutations can be induced with:

[4 Marks]

(A) IAA

(B) infra red radiations

(C) ethylene

(D) gamma radiations

Explanation:

Mutation can be induced by gamma radiation.

Question 161.

Given below is a sample of a portion of DNA strand. What is so special shown in it? 5' ---------- GAATTC----------3'

3' ---------- CTTAAG ---------- 5'

[4 Marks]

(A) Replication completed

(B) Deletion mutation

(C) Palindromic sequence of base pairs

(D) Start codon at the 5' end

Explanation:

The sample of a portion of DNA strand shown in the figure is palindromic sequence of base pairs.

Question 162.

Which one of the following also acts as a catalyst in a bacterial cell?

[4 Marks]

(A) 5s rRNA

(B) sn RNA

(C) hn RNA

(D) 23s rRNA

Explanation:

23S rRNA acts as a catalyst in a bacterial cell.

Question 163.

What was the most significant trend in evolution of modern man (Homo sapiens) from his ancestors?

[4 Marks]

(A) Upright posture

(B) Shortening of jaws

(C) Binocular vision

(D) Increasing brain capacity

Explanation:

Increasing brain capacity

Question 164.

Where will you look for the sporozoites of the malarial parasite?

[4 Marks]

(A) Spleen of infected humans

(B) Saliva of infected female Anopheles mosquito

(C) Red blood corpuscles of humans suffering from malaria

(D) Salivary glands of freshly moulted female Anopheles mosquito

Explanation:

Saliva of infected female Anopheles mosquito

Question 165.

Which one of the following is categorised as a parasite in true sense ?

[4 Marks]

(A) The female Anopheles bites and sucks blood from humans

(B) Human foetus developing inside the uterus draws nourishment from the mother

(C) Head louse living on the human scalp as well as laying eggs on human hair

(D) The cuckoo (koel) lays its eggs in crow's nest.

Explanation:

Head louse living on the human scalp as well as laying eggs on human hair

Question 166.

Which one of the following acts as a physiological barrier to the entry of micro-organisms in human body?

[4 Marks]

(A) Tears

(B) Epithelium of urogenital tract

(C) Monocytes

(D) Skin

Explanation:

Skin has a metabolic function to prevent non- resident bacteria from developing.

Question 167.

At which stage of HIV infection does one usually show symptoms of AIDS?

[4 Marks]

(A) When HIV replicates rapidly in helper T-lymphocytes and damages large number of these

(B) When viral DNA is produced by reverse trancriptase

(C) When the infecting retrovirus enters host cells

(D) Within 15 day of sexual contact with an infected person.

Explanation:

When HIV replicates rapidly in helper T-lymphocytes and damages large number of these

Question 168.

A certain patient is suspected to be suffering from Acquired Immuno Deficiency Syndrome. Which diagnostic technique will you recommend for its detection?

[4 Marks]

(A) ELISA

(B) MRI

(C) Ultra sound

(D) WIDAL

Explanation:

ELISA is an fundamental tool of clinical immunology and is used as an initial screen for HIV detection.

Question 169.

Jaya and Ratna developed for green revolution in India are the varieties of

[4 Marks]

(A) maize

(B) rice

(C) wheat

(D) bajra

Explanation:

rice

Question 170.

Himgiri developed by hybridisation and selection for disease resistance against rust pathogens is a variety of

[4 Marks]

(A) chilli

(B) maize

(C) sugarcane

(D) wheat

Explanation:

'Himgiri' developed by hybridisation and selection for disease resistance against rust pathogens is a variety of wheat. It is resistant to leaf/stripe rust and hill bunt.

Question 171.

Ethanol is commercially produced through a particular species of:

[4 Marks]

(A) Saccharomyces

(B) Clostridium

(C) Trichoderma

(D) Aspergillus

Explanation:

Saccharomyces

Question 172.

Which one of the following help in absorption of phosphorus from soil by plants?

[4 Marks]

(A) Glomus

(B) Rhizobium

(C) Frankia

(D) Anabaena

Explanation:

Glomus

Question 173.

Which one of the following is not a biofertilizer?

[4 Marks]

(A) Agrobacterium

(B) Nostoc

(C) Rhizobium

(D) Mycorrhiza

Explanation:

Agrobacterium

Question 174.

There is a restriction endonuclease called EcoRI. What does "co" part in it stand for?

[4 Marks]

(A) colon

(B) coelom

(C) coenzyme

(D) coli

Explanation:

EcoRI is an endonuclease enzyme isolated from strains of *E.coli* and a part of restriction modified system. So *co* part stands for *coli*.

Question 175.

Agarose extracted from sea weeds finds use in:

[4 Marks]

(A) Tissue culture

(B) Spectrophotometry

(C) Gel electrophoresis

(D) PCR

Explanation:

Gel electrophoresis

Question 176.

The most common substrate used in distilleries for the production of ethanol is

[4 Marks]

(A) corn meal

(B) soya meal

(C) ground gram

(D) molasses

Explanation:

molasses

Question 177.

The process of RNA interference has been used in the development of plants resistant to

[4 Marks]

(A) nematodes

(B) fungi

(C) viruses

(D) insects

Explanation:

RNA interference has been used to develop plants, resistant to nematodes. RNA interference is a double stranded RNA (dsRNA) induced for gene silencing phenomenon.

Question 178.

Continuous addition of sugars in 'fed batch' fermentation is done to:

[4 Marks]

(A) produce methane

(B) obtain antibiotics

(C) purify enzymes

(D) degrade sewage

Explanation:

purify enzymes

Question 179.

Maximum number of existing transgenic animals is of:

[4 Marks]

(A) fish

(B) mice

(C) cow

(D) pig

Explanation:

In the world maximum number of existing transgenic animals is mice.

Question 180.

Large woody vines are more commonly found in:

[4 Marks]

(A) mangroves

(B) tropical rainforests

(C) alpine forests

(D) temperate forest

Explanation:

tropical rainforests

Question 181.

Consider the following four conditions (i) - (iv) and select the correct pair of them as adaptation to environment in desert lizards. (i) Burrowing in soil to escape high temperature (ii) Losing heat rapidly from the body during high temperature (iii) Bask in sun when temperature is low (iv) Insulating body due to thick fatty dermis

[4 Marks]

(A) (iii), (iv)

(B) (i) and (iii)

(C) (i), (ii)

(D) (ii), (iv)

Explanation:

Some species make permanent burrows deep into the soil to escape high temperature or sunlight and some cold blooded animals often like to bask in the sun to warm up their body.

Question 182.

Which one of the following statements is correct for secondary succession?

[4 Marks]

(A) It begins on a bare rock.

(B) It occurs on a deforested site.

(C) It is similar to primary succession except that it has a relatively fast pace.

(D) It follows primary succession.

Explanation:

Secondary succession refers to the regrowth of a habitat in the area where disruptive event has occurred and eliminated the existing, above ground plant life of the natural habitat. So, it occurs on a deforested site.

Question 183.

Of the total incident solar radiation the proportion of PAR is:

[4 Marks]

(A) more than 80%

(B) less than 50%

(C) about 60%

(D) about 70%

Explanation:

Out of total incident solar radiation, about 50% of it forms Photosynthetically Active Radiation (PAR).

Question 184.

Mass of living matter at a trophic level in an area at any time is called

[4 Marks]

(A) standing crop

(B) deteritus

(C) standing state

(D) humus

Explanation:

A standing crop is the quantity or total weight or energy content of the organism, which are in a particular location at a particular time.

Question 185.

Which one of the following statements for pyramid of energy is incorrect, whereas the remaining three are correct?

[4 Marks]

(A) Its base is broad

(B) It is upright in shape

(C) It shows energy content of different trophic level organisms

(D) It is inverted in shape

Explanation:

It is inverted in shape

Question 186.

Which one of the following shows maximum genetic diversity in India?

[4 Marks]

(A) Groundnut

(B) Rice

(C) Maize

(D) Mango

Explanation:

In India maximum genetic diversity is seen in rice. Total of 23 variety of irrigated ecology and 8 varieties of rainfed ecology has been invented in India.

Question 187.

A collection of plants and seeds having diverse alleles of all the genes of a crop is called

[4 Marks]

(A) germplasm

(B) gene library

(C) genome

(D) herbarium

Explanation:

germplasm

Question 188.

Secondary sewage treatment is mainly a

[4 Marks]

(A) physical process

(B) mechanical process

(C) biological process

(D) chemical process

Explanation:

biological process

Question 189.

Which of the following is mainly produced by the activity of anaerobic bacteria on sewage?

[4 Marks]

(A) Laughing gas

(B) Mustard gas

(C) Propane

(D) Marsh gas

Explanation:

Marsh gas is another term for methane, produced by plants decomposing under water.

Question 190.

Eutrophication is often seen in

[5 Marks]

(A) deserts

(B) fresh water lakes

(C) mountains

(D) ocean

Explanation:

fresh water lakes

Question 191.

Which one of the following statements is wrong in case of Bhopal tragedy?

[4 Marks]

(A) Methyl Isocyanate gas leakage took place

(B) Thousands of human beings died

(C) Radioactive fall out engulfed Bhopal

(D) It took place in the night of December 2/3 1984.

Explanation:

The Bhopal gas tragedy occured on the night of December 2-3, 1984 at the Union carbide India Limited pesticide plant in Bhopal, M.P. A leak of methyl isocyanate gas and other chemicals from the plant resulted in the exposure of thousands of people.

Question 192.

Which one of the following expanded forms of the following acronyms is correct?

[5 Marks]

(A) IPCC = International Panel for Climate Change

(B) UNEP = United Nations Environment Policy

(C) IUCN = International Union for Conservation of Nature and Natural Resources

(D) EPA = Environmental Pollution Agency

Explanation:

The correct acronym of IUCN is International Union for Conservation of Nature and Natural resources.

Question 193.

Which one of following pairs of gases are the major cause of "Greenhouse effect"?

[3 Marks]

(A) CO_2 and O_3

(B) CO_2 and CO

(C) CFCs and SO_2

(D) CO_2 and N_2O

Explanation:

CO_2 and N_2O are major green house gases.

Question 194.

A drupe develops in :

[4 Marks]

(A) Tomato

(B) Mango

(C) Pea

(D) Wheat

Explanation:

Mango

Question 195.

Given below is an incomplete table about certain hormones, their source glands and one major effect of each on the body in humans. Identify the correct option for the three blanks A, B and C.

[4 Marks]

Source gland	Hormone	Function
A	Oestrogen	Maintenance of secondary sexual characters
Alpha cells of islets of Langerhans	B	Raises blood sugar level
Anterior pituitary	C	Over secretion leads to gigantism

(A) A-Placenta; B-Glucagon; C-Calcitonin

(B) A-Ovary; B-Insulin; C-Calcitonin

(C) A-Placenta; B-Insulin; C-Vasopressin

(D) A-Ovary; B-Glucagon; C-Growth hormone

Explanation:

Anterior pituitary secrets growth hormone. Ovary secrets oestrogen hormone. Alpha cells of islets of langerhans secrets glucagon.

Question 196.

Match the source gland with respective hormone as well as the function correctly.

[4 Marks]

	Source gland	Hormone	Function
(a)	Anterior pituitary	Oxytocin	Contraction of uterus muscles during child birth
(b)	Posterior pituitary	Vasopressin	Stimulates reabsorption of water in the distal tubules in the nephron
(c)	Corpus luteum	Estrogen	Supports pregnancy
(d)	Thyroid	Thyroxine	Regulates blood calcium level

(A) a

(B) b

(C) c

(D) d

Explanation:

Rhodopsin contained in the rod type of photoreceptor cells of human eye is a derivative of vitamin A.

Question 197.

In which one of the following, the genus name, its two characters and its class/phylum are correctly matched?

[3 Marks]

	Genus name		Two characters	Class/phylum
(a)	*Ascaris*	(i)	Body segmented	Annelida
		(ii)	Males and females distinct	
(b)	*Salamandra*	(i)	A tympanum represents ear	Amphibia
		(ii)	Fertilization is external	
(c)	*Pteropus*	(i)	Skin possesses hair	Mammalia
		(ii)	Oviparous	
(d)	*Aurelia*	(i)	Cnidoblasts	Coelenterata
		(ii)	Organ level of organization	

(A) a

(B) b

(C) c

(D) d

Explanation:

The characteristics and phylum of *Pteropus* is accurate.

Question 198.

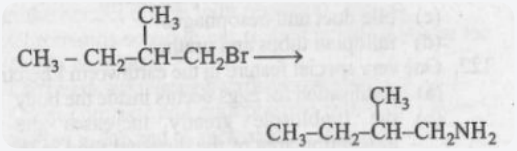
Which one is a nucleophilic substitution reaction among the following?

[4 Marks]

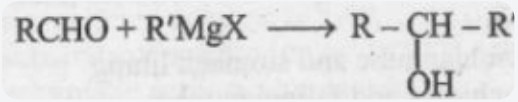
(A)



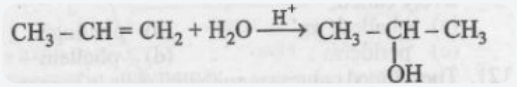
(B)



(C)



(D)



Explanation:

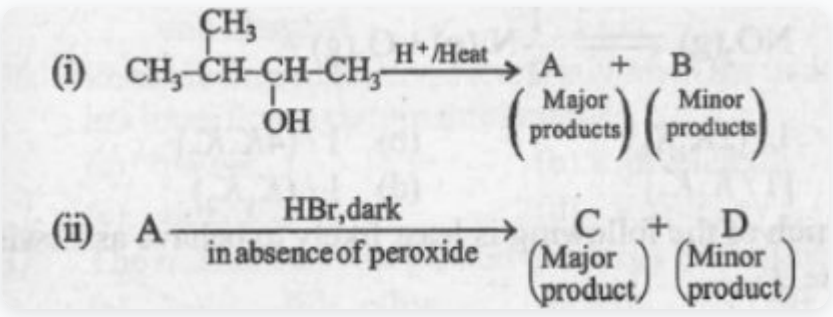
Nucleophilic substitution reactions are the most common reactions of alkyl halides.

Question 199.

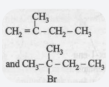
In the following reactions,

the major products (A) and (C) are respectively:

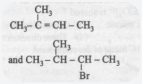
[4 Marks]



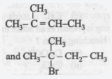
(A)



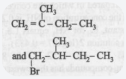
(B)



(C)



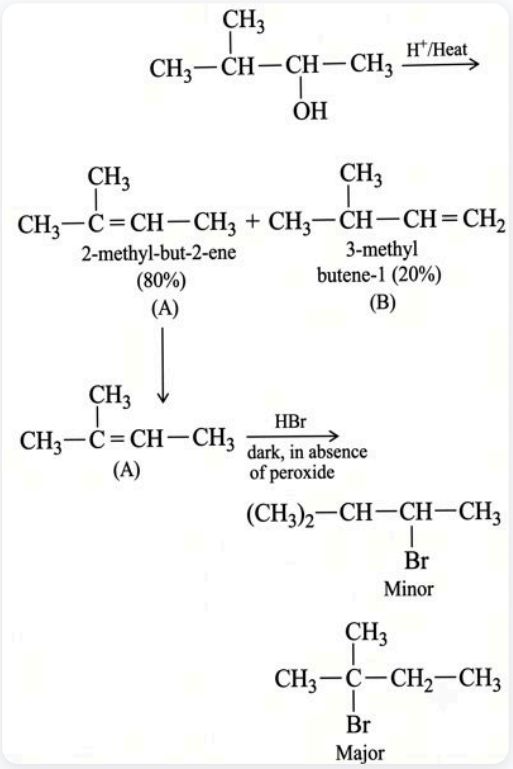
(D)



Explanation:

In this case, dehydration is governed by Saytzeff's rule, according to which hydrogen is preferentially eliminated from the carbon atom with fewer number of hydrogen atoms i.e., poor becomes poorer. Thus, 2-methyl-but-2-ene is the major product.

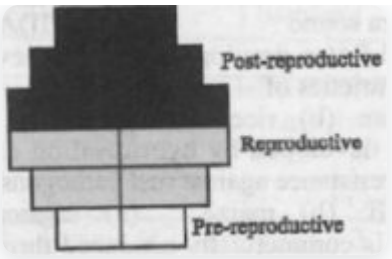
This reaction is governed by Markownikoff's rule according to which when an unsymmetrical reagent e.g. HBr adds to an unsymmetrical alkene, then the negative part of the reagent is added to that carbon atom of the double bond which bears the least number of hydrogen atom. Thus, in above case 2-methyl-2-bromobutane will be the major product.



Question 200.

What type of human population is represented by the following age pyramid?

[4 Marks]



(A) Declining population

(B) Expanding population

(C) Stable population

(D) Vanishing population

Explanation:

Declining population