NEET-UG EXAMINATION PAPER-2011

(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:

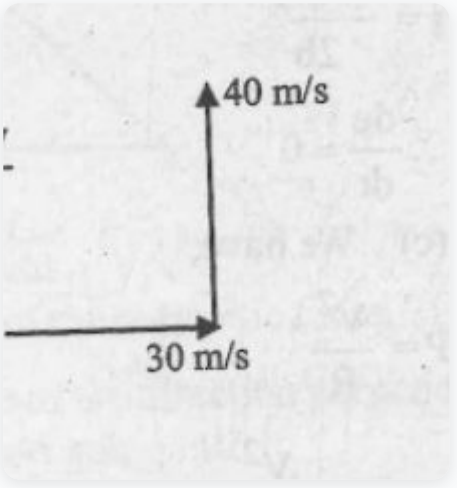
Average acceleration

<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) 5.0 m/s

(B) 40.0 m/s

(C) 10.0 m/s

(D) 20.0 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) 60m

(B) 20m

(C) 50m

(D) 40m

Explanation:

For maximum range, the angle of projection, θ = 45°.

∴ $R = u^2\sin(2\theta)/g$

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

= 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) 15 m/s^2

(B) 25 m/s^2

(C) 5 m/s^2

(D) 36 m/s^2

Explanation:

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

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) zero

(B) 2MV

(C) 1.5MV

(D) MV

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/s^2. If g=10 ms^{-2} the tension in the supporting cable is

[4 Marks]

(A) 9680N

(B) 8600N

(C) 11000N

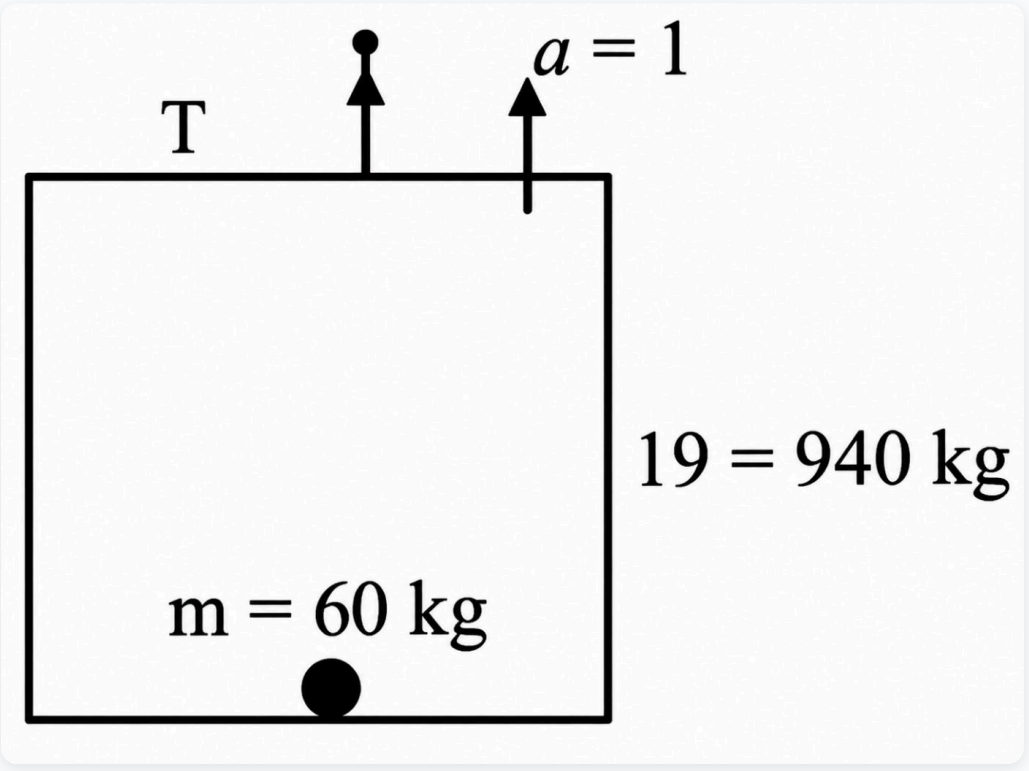
(D) 1200N

Explanation:

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

Let T be the tension in the supporting cable, then T - 1000g = 1000 × 1

⇒ T = 11000N.



Question 7.

The potential energy of a system increases if work is done

[4 Marks]

(A) upon the system by a conservative force

(B) by the system against a non conservative force

(C) upon the system by a non conservative force

(D) by the system against a conservative force

Explanation:

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

Question 8.

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) it remains constant all through

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

(C) at the highest position of the body

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

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 9.

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 = 1s

(D) t = 0.5s

Explanation:

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

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

$= 12t - 12 = 0$

$\therefore t = 1$ s

Question 10.

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) $I_0 + ML^2/2$

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

(D) $I_0 + 2ML^2$

Explanation:

By theorem of parallel axes,

$I = I_cm + Md^2$

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

Question 11.

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

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

(C) r_2/r_1

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

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 12.

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

[4 Marks]

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

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

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

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

Explanation:

According to question work done by gas is given -150J so that according to it answer will be 150 J of heat has been added to the gas

Question 13.

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) 8×104 cal/K

(B) 273 cal/K

(C) 80 cal/K

(D) 293 cal/K

Explanation:

Change in entropy is given by

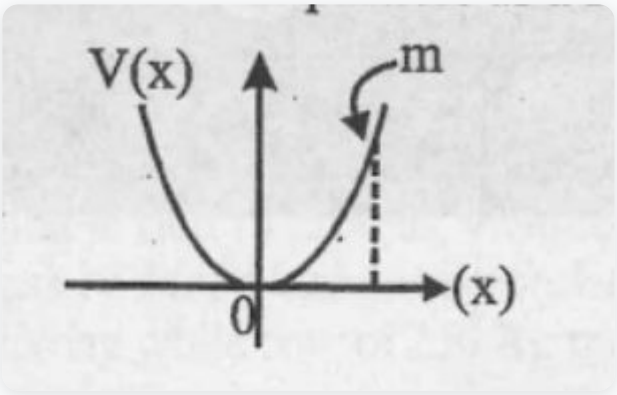
$\Delta S = dQ/T$ or $\Delta S = \Delta Q/T = mL_f / 273$

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

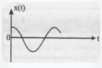
Question 14.

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)



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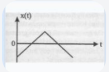
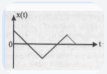
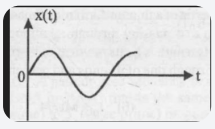


(C)



(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 15.

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 (A) and (B)

(B) Only (A) and (C)

(C) Only (D) does not represent SHM

(D) Only (A)

Explanation:

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

Question 16.

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) 1.0 radian

(B) 1.25 radian

(C) 1.57 radian

(D) 0.57 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 17.

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 20

(B) increases by a factor 10

(C) increases by a factor 20

(D) decreases by a factor 10

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 18.

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) be doubled

(B) remain the same

(C) increase four times

(D) be reduced to half

Explanation:

By Gauss's theorem,

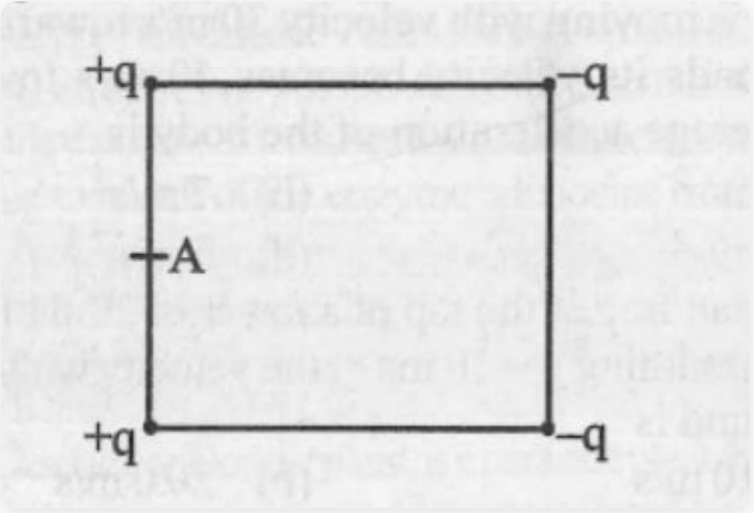
$\phi = Q_{in} / \varepsilon_0$.

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 19.

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:

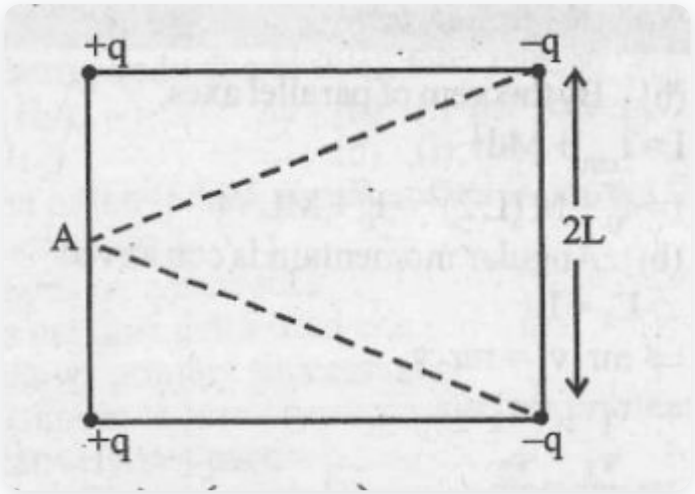
Distance of point A from the two +q charges = L.

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/√5).



Question 20.

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) 1 Ω

(B) 1/4 Ω

(C) 1/3 Ω

(D) 0.5 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

⇒ 1.5r = 0.5 ⇒ r = 1/3 Ω.

Question 21.

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

[4 Marks]

(A) is negative

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

(C) is zero

(D) is positive

Explanation:

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

⇒ $de/dt = a + 2bt$.

At neutral temperature,

$t = -a/2b$

∴ $de/dt = 0$.

Question 22.

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) speed will increase

(B) will turn towards left direction of motion

(C) speed will decrease

(D) will turn towards right of direction of motion

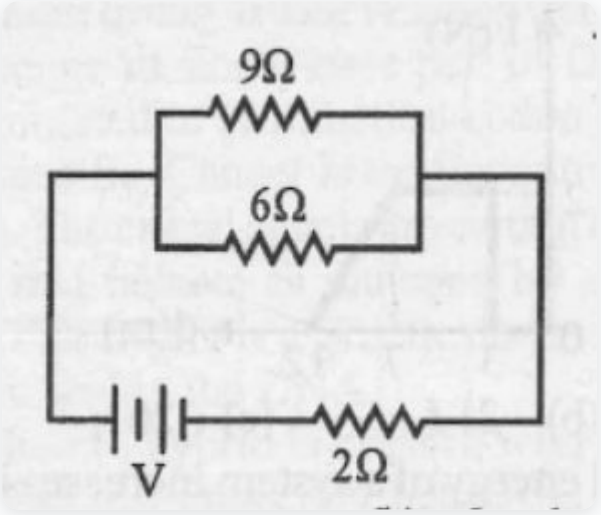
Explanation:

□□ 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 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) 10 volt

(C) 8 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.

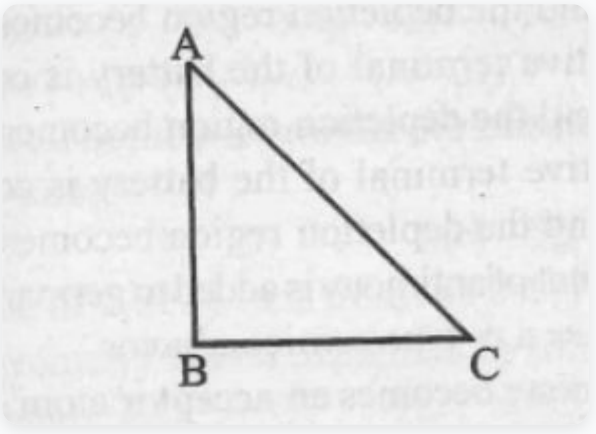
$\therefore i = 2\times15/6 = 5A$

Thus, Potential difference across 2Ω resistor is V = iR = 5 × 2 = 10V.

Question 24.

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) -□□

(B) √2 □□

(C) □□

(D) -√2 □□

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

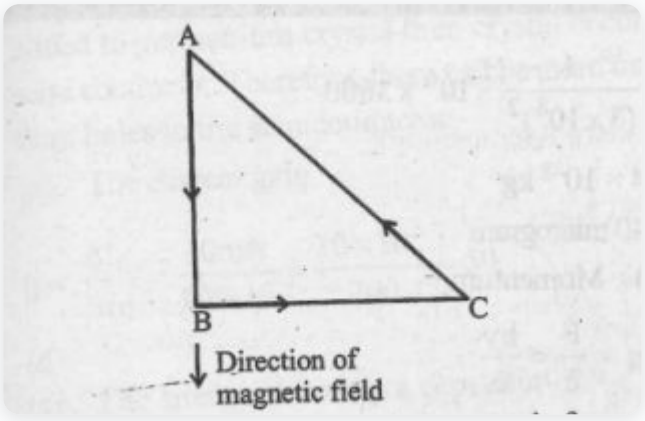
∴ Magnitude of force on AC

= 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 25.

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) B is of a paramagnetic material

(B) C is of a diamagnetic material

(C) A is of a non-magnetic material

(D) D is of a ferromagnetic material

Explanation:

A → diamagnetic,

B → paramagnetic,

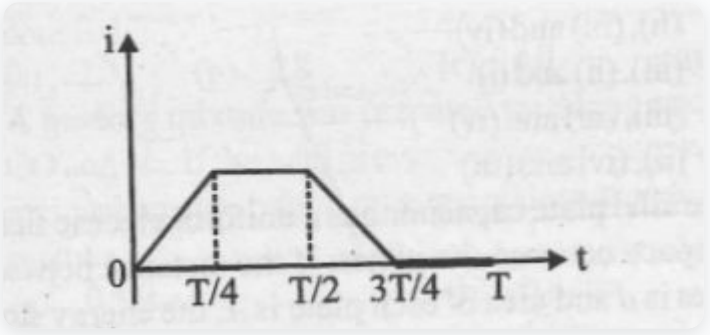
C → ferromagnetic,

D → non-magnetic.

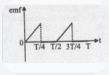
Question 26.

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)



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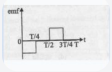
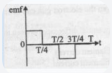
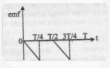


(C)



(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 27.

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) 10mA

(D) 100mA

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 28.

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 $\tan \phi = X_L / R = 3 / 3 = 1$.

→ ϕ = π/4

Question 29.

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 ĵ, □□ = B_0 î]

(B) [□□ = E_0 □□, □□ = B_0 î]

(C) [□□ = E_0 î, □□ = B_0 ĵ]

(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.

Question 30.

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) microwave, infrared, ultraviolet, gamma rays

(D) microwaves, gamma rays, infrared, ultraviolet

Explanation:

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

Question 31.

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

[4 Marks]

(A) Mirage on hot summer days

(B) Brilliance of diamond

(C) Difference between apparent and real depth of pond

(D) Working of optical fibre

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 32.

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) Real, inverted, height = 4 cm

(C) Virtual, upright, height = 0.5 cm

(D) Real, inverted, height = 1 cm

Explanation:

R = 20 cm

$h_o = 2$

u = - 30 cm

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

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

⇒ 1/f = (3/2-1) × 2/20

∴ f = 20 cm

1/f = 1/v - 1/u ⇒1/20 = 1/v + 1/ 30

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

v = 60 cm

$m = h_i / h_o = v/u$

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

= -4 cm.

So, image is inverted

Question 33.

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) decrease by 2 times

(B) increase by 2 times

(C) decrease by 4 times

(D) increase by 4 times

Explanation:

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

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

$⇒ \lambda_2 = \lambda_1/2$

Question 34.

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

[4 Marks]

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

(B) decreasing the filament current

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

(D) increasing the filament current

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 35.

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

[4 Marks]

(A) intensity

(B) frequency

(C) wavelength

(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 36.

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 37.

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) 0.5V

(C) 1.8V

(D) 2.3V

Explanation:

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

Question 38.

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) 3

(B) 1

(C) 4

(D) 2

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, $\lambda_1 = \lambda_2$,

$\Rightarrow (1/1 - 1/2) = Z^2(1/4 - 1/16)$

or Z = 2

Question 39.

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) 10 microgram

(B) 20 microgram

(C) 1 microgram

(D) 40 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 40.

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

[4 Marks]

(A) Mc^2 - hv

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

(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 41.

Fusion reaction takes place at high temperature because

[4 Marks]

(A) nuclei break up at high temperature

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

(C) atoms get ionised at high temperature

(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 42.

The half life 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) 250years

(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 43.

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

[4 Marks]

(A) $^{m-4}_{n-2}Y$

(B) $^{m-4}_{n}X$

(C) $^{m-6}_{n}Z$

(D) $^{m-6}_{n-4}Z$

Explanation:

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

Question 44.

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 thin

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

(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 n-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.

An ideal junction diode when forward biased offers zero resistance. Voltage drop across such a junction diode is zero. In reverse bias diode offers infinite resistance and voltage drop across it is equal to voltage applied.

Question 45.

If a small amount of antimony is added to germanium crysts

[4 Marks]

(A) the antimony becomes an acceptor atom

(B) It becomes a p-type semiconductor

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

(D) its resistance is increased

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 46.

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) 25

(B) 50

(C) 100

(D) 75

Explanation:

The current gain

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

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

Question 47.

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) $1/2\ \varepsilon_0 E^2$

(B) $E^2 A d / \varepsilon_0$

(C) $1/2\ \varepsilon_0 E^2 A d$

(D) $\varepsilon_0 E A d$

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)

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

Question 48.

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

(B) $\lambda_1 = 4\lambda_2$

(C) $\lambda_1 = 2\lambda_2$

(D) $\lambda_1 = \lambda_2$

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 49.

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

[4 Marks]

(A) ns → np → (n-1)d → (n-2)f

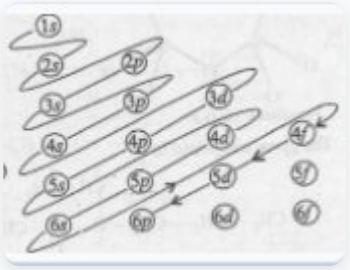
(B) ns → (n-1)d → (n-2)f → np

(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 50.

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

[4 Marks]

(A) 4

(B) 32

(C) 8

(D) 16

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 51.

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 NO_3^-

(B) NH_4^+ and NO_3^-

(C) SCN^- and NH_2^-

(D) NO_2^- and NH_2^-

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 52.

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-C≡C-CH_3

(D) CH_3-CH=CH-CH_3

Explanation:

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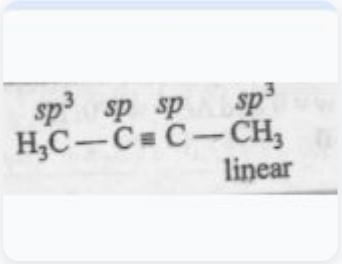


Question 53.

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 $(\sigma 2s)^2 (\sigma^* 2s)^2 (\sigma 2p_z)^2 (\pi 2p_x)^2 (\pi 2p_y)^2, (\pi^*_2 p_y)^1 = (\pi^*_2 p_x)^1$, B.O. : 2

O_2^+ (15) : Remove one electron from π*2p_y from O_2, B.O. : 2.5

O_2^- (17) : KK $(\sigma 2s)^2 (\sigma^* 2s)^2 (\sigma 2p_z)^2 (\pi 2p_x)^2 (\pi 2p_y)^2, (\pi^* 2p_x)^2 (\pi^* 2p_y)^1$, B.O. : 1.5

O_2^{2-} (18) : KK $(\sigma 2s)^2 (\sigma^* 2s)^2 (\sigma 2p_z)^2 (\pi 2p_x)^2 (\pi 2p_y)^2, (\pi^* 2p_x)^2 (\pi^* 2p_y)^2$

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

Question 54.

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) 50.00 u

(B) 12.25 u

(C) 25.00 u

(D) 6.50 u

Explanation:

$r_A / r_B = \sqrt{(M_B / M_A)}$

$(V / 20) / (V / 10) = \sqrt{(M_B / 49)}$

$\Rightarrow 1/2 = \sqrt{(M_B / 49)}$

$M_B = 1/4 \times 49 = 12.25u$

Question 55.

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

[4 Marks]

(A) 2.8

(B) 2.0

(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 56.

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) 1 atm

(D) 0.9 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

∴ $P_N_2 = ({}^{n}N_2 / ({}^{n}CO + {}^{n}N_2)) \times 1 = ({}^{n}N_2 / {}^{2n}N_2) \times 1 = 1/2 = 0.5$ atm.

Question 57.

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

[4 Marks]

(A) q = 0, ΔT = 0, w = 0

(B) q = 0, ΔT < 0, w ≠ 0

(C) q = 0, ΔT ≠ 0, w = 0

(D) q ≠ 0, ΔT = 0, w = 0

Explanation:

For adiabatic process ΔQ = 0.

In free expansion, external pressure is zero. Thus, work done w = 0 and ΔE = w = 0. If ΔE = 0, then ΔT = 0.

Question 58.

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) +217.4 kJ

(B) +434.8 kJ

(C) -434.8 kJ

(D) -869.6 kJ

Explanation:

Given

$4H(g) \rightarrow 2H_2(g)$; ΔH = -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 59.

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

(B) 100 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 60.

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) $1 / (4K_1K_2)$

(B) $1 / (2K_1K_2)$

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

(D) $1 / (K_1K_2)$

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 61.

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

[4 Marks]

(A) OH

(B) BF_3

(C) NH_3

(D) H_2O

Explanation:

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

Question 62.

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) 9.43

(B) 9.08

(C) 11.72

(D) 8.73

Explanation:

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

$K_b = 1.8 \times 10^{-5}$

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 63.

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

[4 Marks]

(A) CaO_2Cl

(B) $CaCl_2$

(C) $Ca(OCl)_2$

(D) $CaOCl_2$

Explanation:

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

Question 64.

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

[4 Marks]

(A) Linear chain silicate

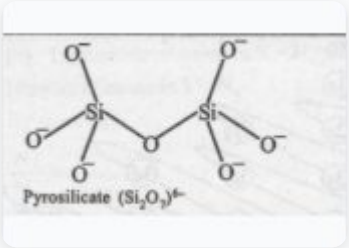
(B) Sheet silicate

(C) Three dimensional

(D) Pyrosilicate

Explanation:

.



Question 65.

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) 17.45

(B) 14.45

(C) 15.45

(D) 16.45

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 66.

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) decomposes Na_2S and NaCN, if formed.

(D) helps in the precipitation of AgCl.

Explanation:

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

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

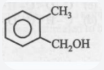
$Na_2S + 2HNO_3 \rightarrow 2NaNO_3 + H_2S\uparrow$

Question 67.

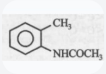
Which one of the following is most reactive towards electrophilic reagent?

[4 Marks]

(A)



(B)



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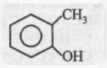
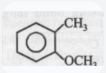


(D)



Explanation:

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

Question 68.

Which one of the following statement is not true?

[4 Marks]

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

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

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

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

Explanation:

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

Question 69.

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) 2.05

(C) 2.63

(D) 3.11

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 70.

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) greater than one and less than one.

(B) greater than one and greater than one.

(C) less than one and less than one.

(D) less than one and greater than one.

Explanation:

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

Question 71.

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) Z > X > Y

(B) X > Z > Y

(C) Y > Z > X

(D) X > Y > Z

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 72.

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) 0.325 V

(B) 0.500 V

(C) 0.150 V

(D) 0.650 V

Explanation:

.

$$Cu^{2+} + 1e^- \rightarrow Cu^+ \quad E_1^o = 0.15V; \Delta G_1^o = -n_1 E_1^o F$$

$$Cu^+ + 1e^- \rightarrow Cu \quad E_2^o = 0.50V; \Delta G_2^o = -n_2 E_2^o F$$

$$Cu^{2+} + 2e^- \rightarrow Cu$$

$$\Delta G^o = \Delta G^o{}_1 + \Delta G^o{}_2$$

$$-nE^o F = -1\, n_1 E_1{}^o F + (-1)\, n_2 E_2{}^o F$$

$$E^o = \frac{n_1 E_1{}^o + n_2 E_2^o}{n} = \frac{0.15 \times 1 + 0.50 \times 1}{2}$$

$$\Rightarrow \quad 0.325\,V$$

Question 73.

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) +1.19 V

(D) +0.89 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 74.

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 75.

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 can be determined only experimentally.

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

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

Explanation:

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

Question 76.

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 = p × T

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

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

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

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 77.

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

[4 Marks]

(A) Phosphorus

(B) Carbon

(C) Silicon

(D) Manganese

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 78.

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

[4 Marks]

(A) Ni and Fe

(B) Zr and Ti

(C) Ga and In

(D) Ag and Au

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 79.

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

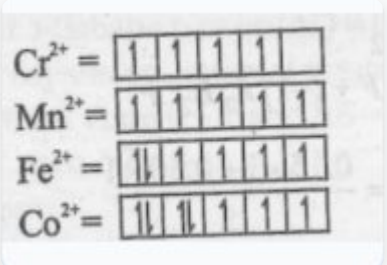
(B) Mn > Fe > Cr > Co

(C) Fe > Mn > Co > Cr

(D) Co > Mn > Fe > Cr

Explanation:

.



Question 80.

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) CrO_4^{2-}

(C) $CrSO_4$

(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 81.

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) Geometrical isomerism

(B) Linkage isomerism

(C) Ionization isomerism

(D) Coordination 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 82.

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

[4 Marks]

(A) 4

(B) 2

(C) 4

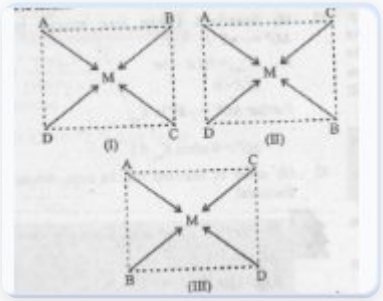
(D) 3

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 83.

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

[4 Marks]

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

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

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

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

Explanation:

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

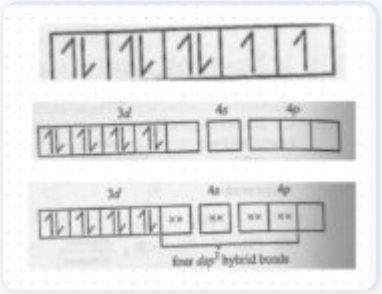
Since, the coordination number of Ni in this complex is 4, the configuration of Ni^{2+} at first sight shows that the complex is paramagnetic with two unpaired electron. However, experiments show that the

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 84.

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

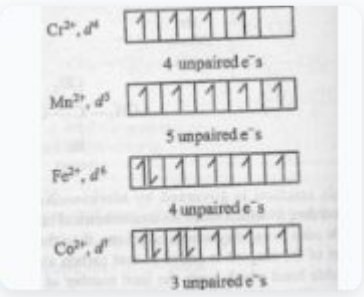
(B) $[Co(H_2O)_6]^{2+}$

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

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

Explanation:

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



Question 85.

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

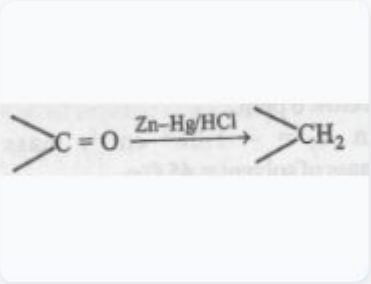
(B) Glycol with KOH

(C) $LiAlH_4$

(D) Zn-Hg with HCl

Explanation:

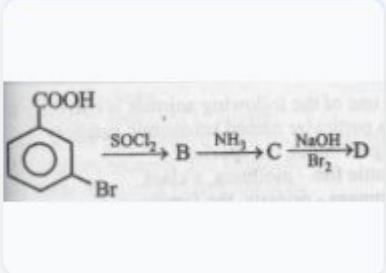
Clemmensen reduction is



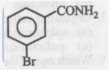
Question 86.

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

[4 Marks]



(A)



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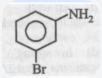

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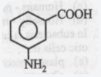

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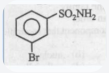
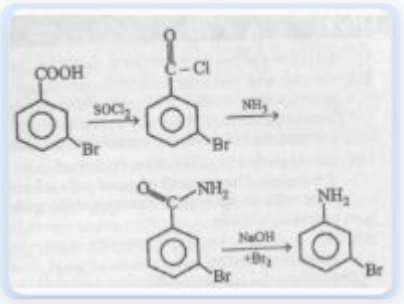


Explanation:

Clemmensen reduction is

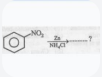


Question 87.

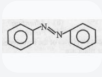
What is the product obtained in the following reaction:

[4 Marks]

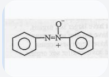
(A)



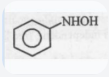
(B)



(C)

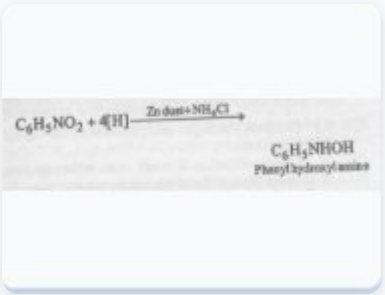


(D)



Explanation:

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



Question 88.

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 89.

Of the following which one is classified as polyester polymer?

[4 Marks]

(A) Nylon-66

(B) Melamine

(C) Bakelite

(D) Terylene

Explanation:

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

Question 90.

Which one of the following is employed as Antihistamine?

[4 Marks]

(A) Diphenyl hydramine

(B) Chloramphenicol

(C) Norethindrone

(D) Omeprazole

Explanation:

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

Question 91.

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) 552 s

(B) 414 s

(C) 276 s

(D) 690 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 92.

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

[4 Marks]

(A) 0.1770

(B) 1.7700

(C) 0.0177

(D) 0.0344

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 93.

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

[4 Marks]

(A) Tiger - tigris, the species

(B) Cuttle fish - mollusca, a class

(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 94.

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

[4 Marks]

(A) plasma membrane

(B) nucleus

(C) cell wall

(D) ribosomes

Explanation:

Eubacteria are prokaryotic but eubacteria are

enclosed by plasma membrane like eukaryotic cells.

Question 95.

Organisms called methanogens are most abundant in a

[4 Marks]

(A) ‘sulphur rock

(B) cattle yard

(C) hot spring

(D) polluted stream

Explanation:

Methanogens are archacbacteria, abundant in cattle

yard and paddy fields.

Methanogens produce methane as a metabolic byproduct in hypoxic conditions. They are prokaryotic and belong to the domain of archaea.

Question 96.

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

[4 Marks]

(A) Escherichia coli

(B) Paramecium caudatum

(C) Euglena viridis

(D) Amoeba proteus

Explanation:

E.coliis a prokaryotic gram negative bacterium

Question 97.

Archegoniophore is present in :

[4 Marks]

(A) Funaria

(B) Adiantum

(C) Chara

(D) Marchantia

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 98.

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

[4 Marks]

(A) Adiantum

(B) Polytrichum

(C) archantia

(D) Pinus

Explanation:

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

Question 99.

Compared with the gametophytes of the bryophytes the game□tophytes of vascular plant are

[4 Marks]

(A) smaller and have smaller sex organs.

(B) larger and have larger sex organs.

(C) smaller but have larger sex organs.

(D) larger but have smaller sex organs.

Explanation:

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

Question 100.

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

[4 Marks]

(A) Birds

(B) Angiosperms

(C) Insects

(D) Fungi

Explanation:

In nature insects have the highest number of species 1t (30 million). Fungi have 100,000, angiosperms have 260000 and birds have 10,000 species.

Question 101.

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

[4 Marks]

(A) Male shark-Claspers borne on pelvic fins

(B) Female cockroach-Anal cerci

(C) Male frog-A copulatory pad on the firstdigit of the hind imb

(D) Female Ascaris- Sharply curved posterior end

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 102.

Which one of the following groups of animals is correctly

matched with its one characteristic feature without even a

single exception?

[4 Marks]

(A) Mammalia : give birth to young one.

(B) Chondrichthyes : possess cartilagious endoskeleton

(C) Chordata': possess 2 mouth provided with an upper I and lower jaw

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

Explanation:

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

Question 103.

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

[4 Marks]

(A)

(d)	*Aurelia*	(i)	Cnidoblasts	Coelen-terata
		(ii)	Organ level of organization	

(B)

(c)	*Ptero-pus*	(i)	Skin possesses hair	Mammalia
		(ii)	Oviparous	

(C)

(b)	Sala-mandra	(i)	A tympanum rep-resents ear	Amphibia
		(ii)	Fertilization is external	

(D)

	Genus name		Two characters	Class/ phylum
(a)	*Ascaris*	(i)	Body segmented	Annelida
		(ii)	Males and females distinct	

Explanation:

The characteristics and phylum of Preropus is accurate.

Question 104.

Flowers are zygomorphic 1n

[4 Marks]

(A) datura

(B) tomato

(C) mustard

(D) gulmohur

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 105.

'Which one of the following statements is correct?

[4 Marks]

(A) In tomato, fruit is a capsule

(B) Seeds of orchids have oil-rich endosperm

(C) Flower of tulip is a modified shoot

(D) Placentation in primose is basal

Explanation:

Tulips are most popular and wildly grown flowers.

Tulips are bulbs, possessing modified stems and leaves.

Question 106.

'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) 21

(B) 63

(C) 84

(D) 42

Explanation:

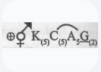
Aleurone cells are the outer cell layer of the endo sperm, usually only one cell thick in wheat and the only endosperm tissue alive at maturity. The cell layers of this layer are responsible for the de-novo synthesis of enzyme needed during germination. The chromosome number is 63 of a plant with 42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

Question 107.

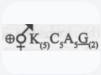
The correct floral formula of chilli is;

[4 Marks]

(A)



(B)



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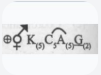
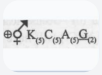
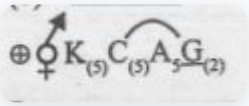


(D)



Explanation:

Floral formula of chilli is



Question 108.

The ovary is half inferior in flowers of

[4 Marks]

(A) peach

(B) guava

(C) cucumber

(D) cotton

Explanation:

The ovary is half-inferior in flowers of peach.

Question 109.

Ground tissue includes

[4 Marks]

(A) all tissues internal to endodermis

(B) epidermis and cortex

(C) all tissues except epidermis and vascular bundles

(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 110.

In land plants, the guard cells differ from other epidrmal 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 are uniformly thin.

Question 111.

'Which one of the following is wrongly matched?

[4 Marks]

(A) Root - Exarch protoxylem

(B) Root pressure - Guttation

(C) Cassia - Imbricate aestivation 9

(D) Puccinia - Smut

Explanation:

Smut is a disease of cereals, corn, grasses and

sorghum caused by many species of fungi.

Question 112.

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

[4 Marks]

(A) phellem

(B) periderm

(C) phelloderm

(D) phellogen

Explanation:

Phellem, phellogen and phelloderm are collectively called periderm.

Question 113.

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

[4 Marks]

(A) eustachian tube and stomach lining

(B) bile duct and oesophagus

(C) bronchioles and fallopian tubes

(D) fallopian tubes and urethra

Explanation:

Ciliated epithelium is usually found in the respiratory tract and 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 cells.

Question 114.

Which of the following is correctly stated as it happens It 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 115.

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

(D) it has a long dorsal tubular heart

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 116.

. 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 117.

Peptide synthesis inside a cell takes place in:

[4 Marks]

(A) ‘mitochondria

(B) chloroplast

(C) chromoplast

(D) ribosomes

Explanation:

Peptide synthesis takes place in ribosome of the cell.

Question 118.

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

[4 Marks]

(A) Base pairs

(B) Nucleosomes

(C) Nucleotides

(D) Genes

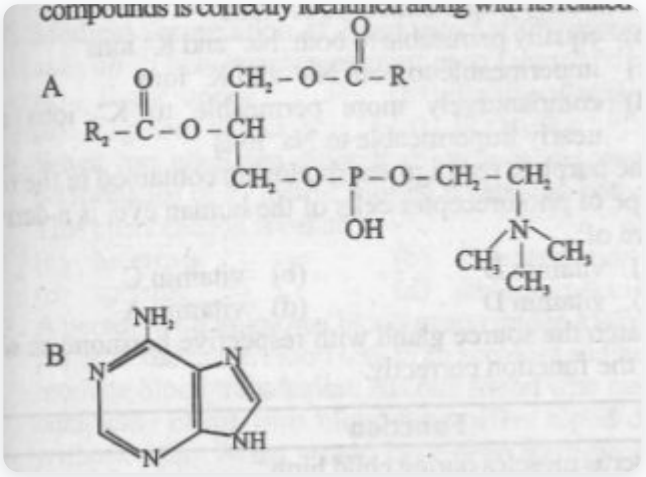
Explanation:

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 119.

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

[4 Marks]



(A) A: Lecithin— a component of cell membrane

(B) B: Uracil —a component of DNA

(C) A: Triglyceride — major source of energy

(D) B :Adenine — a nucleotide that makes up nucleic acids

Explanation:

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

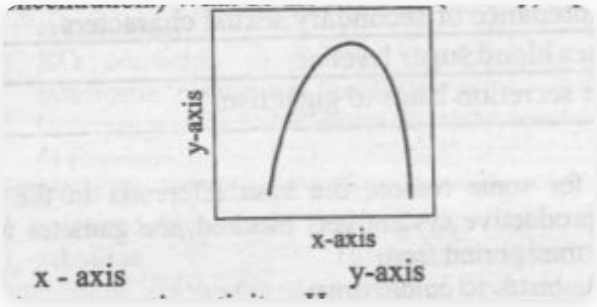
Question 120.

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) enzymatic activity temperature

(B) substrate concentration enzymatic activity

(C) enzymatic activity pH

(D) temperature enzyme activit

Explanation:

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

Question 121.

Select the correct option with respect to mitosis.

[4 Marks]

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

(B) Chromatids sart moving fowards opposite poles inelophase

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

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

Explanation:

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

Question 122.

Which one of the following elements in plants is not re- ‘mobilised?

[4 Marks]

(A) Sulphur

(B) Potassium

(C) Calcium

(D) Phosphorus

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 123.

A prokaryotic autotrophic nitrogen fixing symboint is found in

[4 Marks]

(A) Pisum

(B) Cicer

(C) Cycas

(D) Alnus

Explanation:

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

Question 124.

Nitrifying bacteria :

[4 Marks]

(A) convert free nitrogen to nitrogen compounds

(B) oxidize ammoenia to nitrates

(C) convert proteins into ammonia

(D) reduce nitrates to free nitrogen

Explanation:

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

Question 125.

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

[4 Marks]

(A) oxygen removal

(B) nodule differentiation

(C) expression of nif gene

(D) inhibition of nitrogenase activity

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 126.

CAM helps the plants in

[4 Marks]

(A) conserving water

(B) secondary growth

(C) disease resistance

(D) reproduction

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 127.

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

[4 Marks]

(A) diaphragm

(B) neck

(C) epiglottis

(D) tongue

Explanation:

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

Question 128.

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

[4 Marks]

(A) Pepsin

(B) Remnin

(C) Lipase

(D) Trypsin

Explanation:

Rennin is an enzyme that is essential for the protein

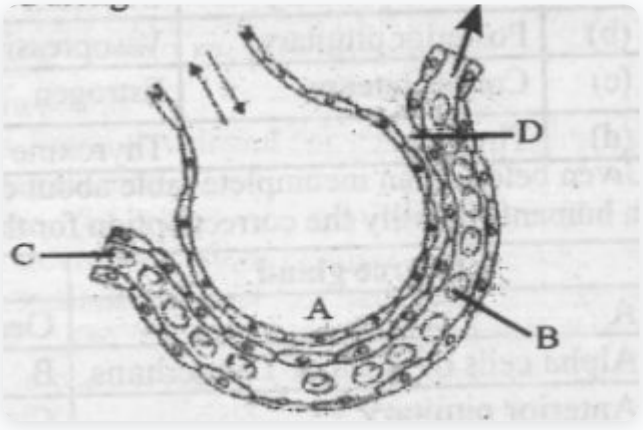
digestion. It is active in acidic medium and inactive in

normal gastric juice of adult.

Question 129.

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) O_2 and CO_2 B: red blood cell CO_2 mainly -transport of

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

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

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

Explanation:

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

Question 130.

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) helps in releasing more O_2 to the epithelial tissues.

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

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

(D) acts as a reserve during muscular exercise

Explanation:

A large portion of oxygen is left unused in the human

'blood even after its uptake by the body tissues. This O, acts as a reserve during muscular exercise.

Question 131.

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

[4 Marks]

(A) an albumin

(B) serum amylase

(C) fibrinogen

(D) serum amylase

Explanation:

Fibrinogen, the protein of blood plasma is converted into 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 132.

'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 133.

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 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 134.

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

(D) 105/50 mm Hg makes one very active

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 135.

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 136.

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

[4 Marks]

(A) Peritubular capillaries

(B) Convoluted tubules

(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 137.

Which one of following correctly explain 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 substancesfrom the glomerular filtrat

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

(D) Distal convoluted tubule: reabsorption of K^+ ions into the surrounding blood capillaries

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 138.

Which one of the following statement is correct with regard 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 139.

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

[4 Marks]

(A) impermeable to both Na^+ and K^+ ions.

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

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

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

Explanation:

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

Question 140.

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 141.

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

[4 Marks]

(A)

(d)	Thyroid	Thyroxine	Regulates blood calcium level

(B)

(c)	Corpus luteum	Estrogen	Supports pregnancy

(C)

(a)	Anterior pituitary	Oxytocin	Contraction of uterus muscles during child birth

(D)

(b)	Posterior pituitary	Vasopressin	Stimulates reabsorption of water in the distal tubules in the nephron

Explanation:

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

Question 142.

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-Ovary; B-Insulin; C-Calcitonin

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

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

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

Explanation:

Anterior pituitary secretes growth hormone. Ovary secretes oestrogen hormone. Alpha cells of islets of Langerhans secrete glucagon.

Question 143.

The “Eyes” of the potato tuber are

[4 Marks]

(A) flower buds

(B) root buds

(C) axillary buds

(D) shootbuds

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 144.

Filiform apparatus is a characteristic feature of

[4 Marks]

(A) suspensor

(B) synergid

(C) zygote

(D) egg

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 145.

In which one of the following pollination is autogamous?

[4 Marks]

(A) Geitonogamy

(B) Xenogamy

(C) Cleistogamy

(D) Chasmogamy

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 crosspollination.

Question 146.

Wind pollination is common in

[4 Marks]

(A) legumes

(B) orchids

(C) grasses

(D) lilies

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 147.

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 148.

Nucellar polyembryony is reported in species of

[4 Marks]

(A) Triticum

(B) Brassica

(C) Citrus

(D) Gossypium

Explanation:

Nucellar polyembryony is reported in a *Citrus* species.

Question 149.

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

[4 Marks]

(A) vagina to uterus

(B) ovary to uterus

(C) testes to epididymis

(D) eididymis to vas deferens

Explanation:

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

Question 150.

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

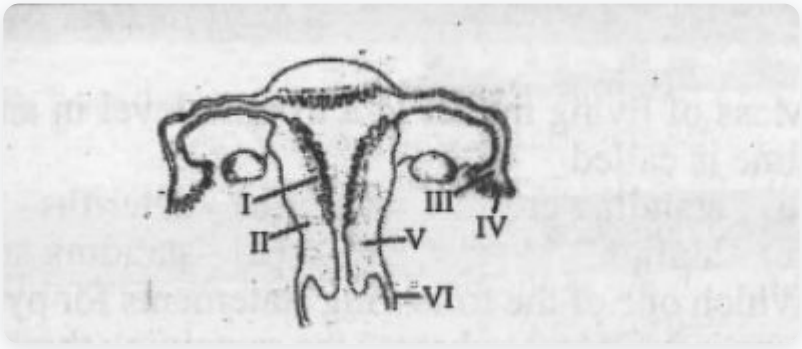
Explanation:

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

Question 151.

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

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

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

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

Explanation:

In the given figure

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

V - marked portion is Cervix

Question 152.

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

[4 Marks]

(A) Cervical caps

(B) IUDs. (Intra uterine devices)

(C) Tubectomy

(D) Diaphragms

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 153.

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

[4 Marks]

(A) Twelve weeks

(B) Eight weeks

(C) Eighteen weeks

(D) Six weeks

Explanation:

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

Question 154.

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) metamorphosis

(D) splicing

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 155.

A person with unknown blood group under ABO system, has suffered much blood loss in an accident and needs im- mediate 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) TypeB

(B) Type AB

(C) TypeO

(D) TypeA

Explanation:

TypeO

Question 156.

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

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

Explanation:

XO type of sex chromosomes determine male sex in grasshopper

Question 157.

Mutations can be induced with :

[4 Marks]

(A) I AA

(B) ethylene

(C) gamma radiations

(D) infra red radiations

Explanation:

Mutation can be induced by gamma radiation.

Question 158.

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) Palindromic sequence-of base pairs

(B) Deletion mutation

(C) Replication completed

(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 159.

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 catalystina bammal cell.

Question 160.

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

[4 Marks]

(A) Upright posture

(B) Shortening of jaws

(C) Increasing brain capacity

(D) Binocular vision

Explanation:

Increasing brain capacity

Question 161.

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

[4 Marks]

(A) saliva of infected female Anopheles mosquito

(B) Red blood corpuscles of humans suffering from malaria

(C) Salivary glands of freshly moulted female Anopheles mosquito

(D) Spleen of infected humans

Explanation:

Saliva of infected female *Anopheles* mosquito

Question 162.

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

[4 Marks]

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

(B) The female Anopheles bites and sucks blood from human

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

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

Explanation:

Headlouse is an obligate ectoparasite of human scalp and as well as laying egg on human hair.

Question 163.

'Which one of the following acts as a physiological barrier to the entry of isms in human body?

[4 Marks]

(A) Tears

(B) Monocytes

(C) Skin

(D) Epithelium of urogenital tract

Explanation:

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

Question 164.

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

[4 Marks]

(A) When the infecting retrovirus enters host cell

(B) When viral DNA is produced by reverse trancriptase

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

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

Explanation:

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

Question 165.

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

[4 Marks]

(A) MRI

(B) ELISA

(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 166.

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 167.

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 168.

Ethanol is commercially produced through a particular species of :

[4 Marks]

(A) Saccharomyces

(B) Clostridium

(C) Aspergillus

(D) Trichoderma

Explanation:

Saccharomyces

Question 169.

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 170.

Which one of the following is not a biofertilizer?

[4 Marks]

(A) Agrobacterium

(B) Rhizobium

(C) Nostoc

(D) Mycorrhiza

Explanation:

Agrobacterium

Question 171.

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 172.

A garose extracted from sea weeds finds use in:

[4 Marks]

(A) Spectrophotometry

(B) Tissue culture

(C) PCR

(D) Gel electrophoresis

Explanation:

Gel electrophoresis

Question 173.

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

[4 Marks]

(A) corn meal

(B) soya meal

(C) molasses

(D) ground gram

Explanation:

molasses

Question 174.

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

[4 Marks]

(A) nematodes

(B) viruses

(C) fungi

(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 sllencm, phenomenon

Question 175.

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 176.

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 177.

Large woody vines are more commonly found in:

[4 Marks]

(A) tropical rainforests

(B) alpine forests

(C) mangroves

(D) temperate forest

Explanation:

tropical rainforests

Question 178.

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) (ii), (iv)

(B) (i), (ii)

(C) (i) and (iii)

(D) (iii), (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 179.

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

[4 Marks]

(A) It occursona deforested site.

(B) It begins on a bare rock.

(C) It follows primary succession.

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

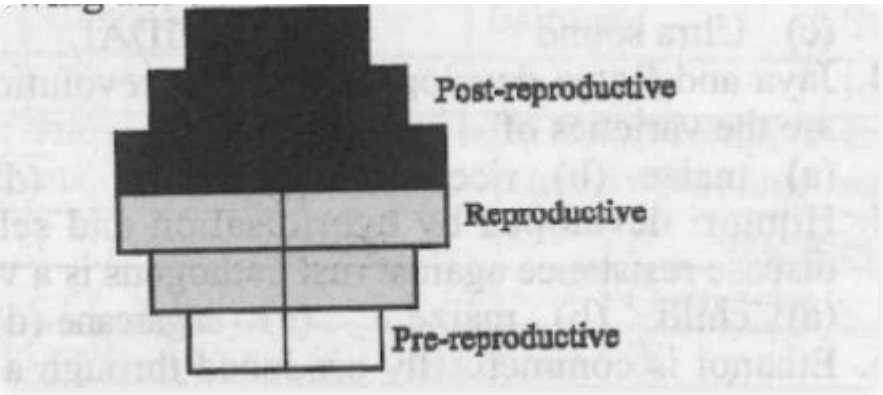
Explanation:

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 180.

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

[4 Marks]



(A) Expanding population

(B) Declining population

(C) Stable population

(D) Vanishing population

Explanation:

Declining population

Question 181.

Of the total incident solar radiation the proportion of PAR

[4 Marks]

(A) about 70%

(B) about 60%

(C) less than 50%

(D) more than 80%

Explanation:

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

Question 182.

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

[4 Marks]

(A) standing crop

(B) humus

(C) standing state

(D) deteritus

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 183.

'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 shows energy content of different trophic level organisms

(C) It is upright in shape

(D) It is inverted in shape

Explanation:

It is inverted in shape

Question 184.

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

[4 Marks]

(A) Rice

(B) Groundnut

(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 185.

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 186.

Secondary sewage treatment is mainly a

[4 Marks]

(A) mechanical process

(B) chemical process

(C) biological process

(D) physical process

Explanation:

biological process

Question 187.

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

[4 Marks]

(A) Propane

(B) Laughing gas

(C) Marsh gas

(D) Mustard

Explanation:

Marsh gas is another term for methanc produced by plants decomposmg under water.

Question 188.

Eutrophication is often seen in

[4 Marks]

(A) deserts

(B) fresh water lakes

(C) ocean

(D) mountains

Explanation:

fresh water lakes

Question 189.

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

[4 Marks]

(A) Thousands of human beings died

(B) Methyl Isocyanate gas leakage took place

(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 190.

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

[4 Marks]

(A) EPA=Environmental Pollution Agency

(B) IPCC =Intemational Panel for Climate Change

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

(D) 'UNEP = United Nations Environment Policy

Explanation:

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

Question 191.

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

[4 Marks]

(A) CO_2 and N_2O

(B) CFCs and SO_2

(C) CO_2 and O_3

(D) CO_2 and CO

Explanation:

CO_2 and N_2O are major green house gases

Question 192.

A drupe develops in :

[4 Marks]

(A) Mango

(B) Tomato

(C) Wheat

(D) Pea

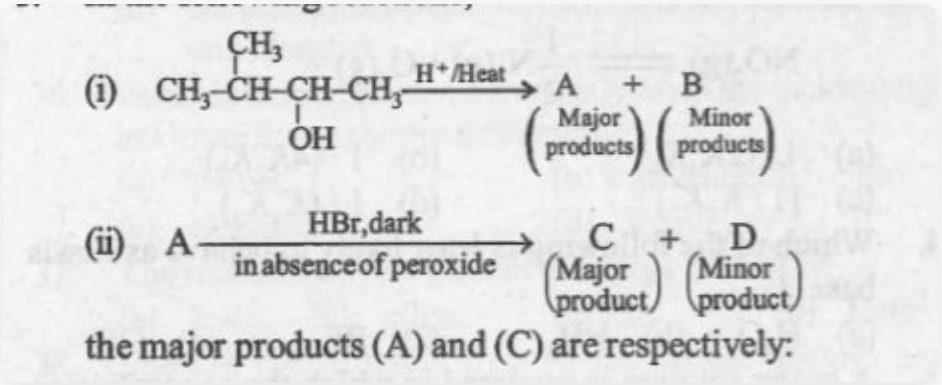
Explanation:

Mango

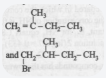
Question 193.

In the following reactions,

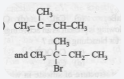
[4 Marks]



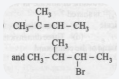
(A)



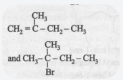
(B)



(C)



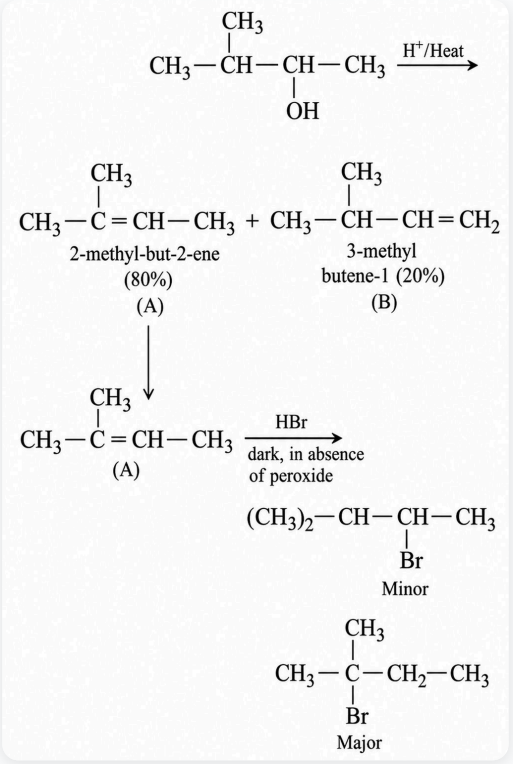
(D)



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.

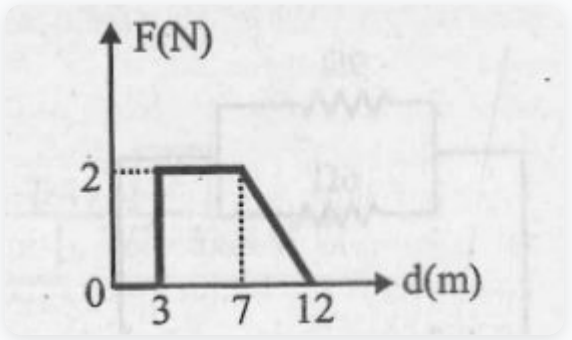
This reaction is governed by Markownikoff's rule according to which when an unsymmetrical reagent e.g. HBr adds to an unsymmetrical alkene, then the negative part of the reagent is added to that carbon atom of the double bond which bears the least number of hydrogen atom. Thus, in above case 2-methyl-2-bromobutane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



Question 194.

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) 18J

(B) 21J

(C) 13J

(D) 26J

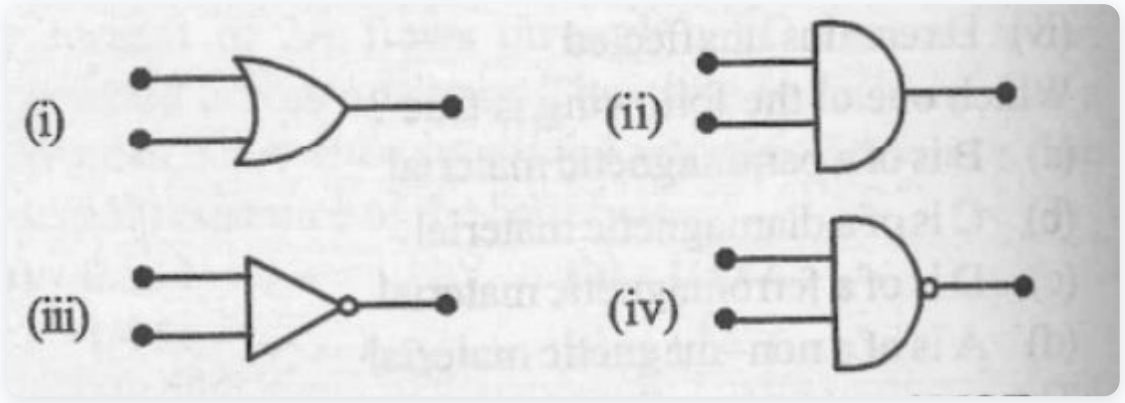
Explanation:

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

Question 195.

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)

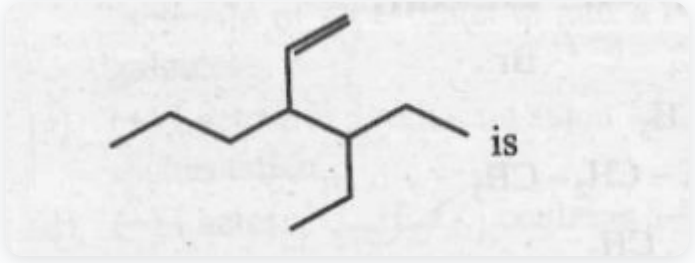
Explanation:

(ii), (iv) and (iii)

Question 196.

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

[4 Marks]



(A) 4-Ethyl-3-propylhex-1-ene

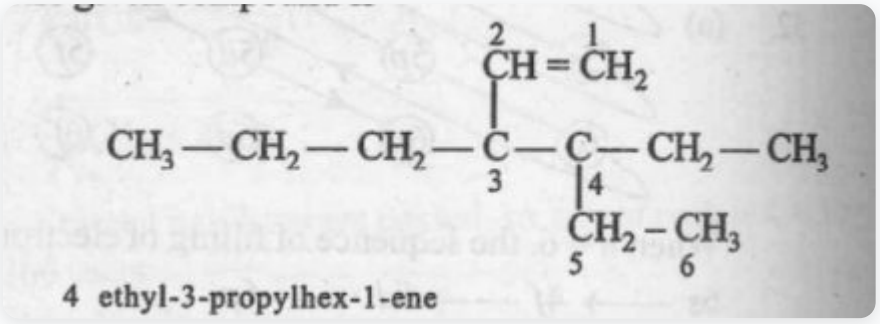
(B) 3-Ethyl-4-propylhex-1-ene

(C) 3-Ethyl-4-ethenylheptane

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

Explanation:

The given compound is



Question 197.

The momentum of a photon of energy hv will be

[4 Marks]

(A) hv/c

(B) hv

(C) c/hv

(D) hv/c^2

Explanation:

hv/c is correct answer.

Question 198.

Which of the following compounds has the lowest melting point ?

[4 Marks]

(A) $CaCl_2$

(B) CaI_2

(C) $CaBr_2$

(D) CaF_2

Explanation:

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 199.

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–C < C=C < C–O < C–H

(C) C–H < C–O < C–C < C=C

(D) C–H < C=C < C–O < C–C

Explanation:

Bond length order is

C–C < C=C < C–O < C–H

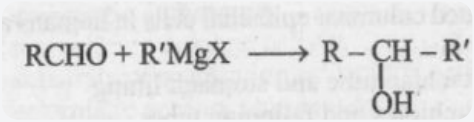
1.10A° 1.34A° 1.40A° 1.54A°

Question 200.

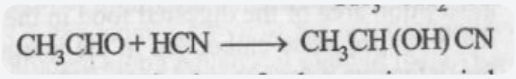
Which one is a nucleophilic substitution reaction among the following?

[4 Marks]

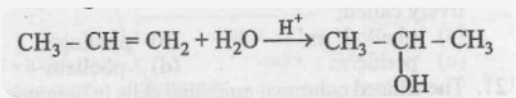
(A)



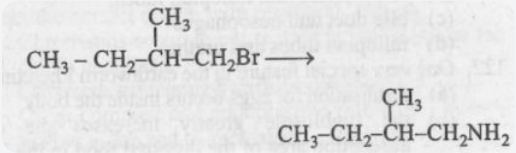
(B)



(C)



(D)



Explanation:

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