CBSE EXAMIN

NEE

Time allowed : 3 hours

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.

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Question 1.

A bus is moving with a speed of 10 ms^{-1} on a straight road. A scooterist wishes to overtake the bus in 100 s. If the bus is at a distance of 1 km from the scoote

(A) 25 ms^{-1}

(B) 20 ms^{-1}

(C) 40 ms^{-1}

(D) 10 ms^{-1}

Explanation:

Let v be the relative velocity of scooter w.r.t. bus.

$v = v_s - v_B$

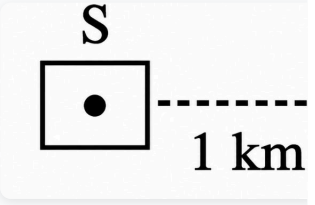
$1000/100 = 10\ ms^{-1}$

$v_B = 10\ ms^{-1}$

$\therefore v_s = v + v_B$

$= 10 + 10 = 20\ ms^{-1}$

$\therefore$ Velocity of scooter = 20 ms^{-1}



Question 2.

A body under the action of a force F vector = 6 î − 8 ĵ + 10 k̂, acquires an acceleration of 1 m/s². The mass of this body must be

(A) 10√2 kg

(B) 2√10 kg

(C) 20 kg

(D) 10 kg

Explanation:

□□ = 6î − 8ĵ + 10k̂

|□□| = √(6² + (−8)² + 10²) = √(36 + 64 + 100) = 10√2 N

(∵ F = √(F_x^2 + F_y^2 + F□²))

Given, a = 1 ms^{-2}

∴ F = ma

⇒ m = F/a

⇒ m = 10√2/1 = 10√2 kg

Question 3.

The mass of a lift is 2000 kg. When the tension in the supporting cable is 28000 N, then its acceleration is:

(A) 30 ms^{-2} downwards

(B) 4 ms^{-2} downwards

(C) 4 ms^{-2} upwards

(D) 14 ms^{-2} upwards

Explanation:

Net force,

F = T − mg

ma = T − mg

2000a = 28000 − 20000 = 8000

a = 8000/2000 = 4 ms^{-2} ↑

Question 4.

An engine pumps water continuously through a hose. Water leaves the hose with a velocity v and m is the mass per unit length of the water jet. What is the rat

(A) ½mv^3

(B) ½mv^2

(C) mv^2

(D) ½m^2v^2

Explanation:

m = mass per unit length

∴ Mass flowing per second = mv

Rate of K.E. = ½(mv)v² = ½mv³

Question 5.

A body of mass 1 kg is thrown upwards with a velocity 20 m/s. It momentarily comes to rest after attaining a height of 18 m. How much energy is lost due to air (g = 10 m/s²)

(A) 40 J

(B) 20 J

(C) 30 J

(D) 10 J

Explanation:

When the body is thrown upwards, its K.E. is converted into P.E.

The loss of energy due to air friction is the difference of K.E. and P.E.

½mv² − mgh

= ½ × 1 × 400 − 1 × 18 × 10

= 200 − 180

= 20 J

Question 6.

An explosion blows a rock into three parts. Two parts go off at right angles to each other. These two are, 1 kg first part moving with a velocity of 12 ms^{-1} and 2

(A) 17kg

(B) 5kg

(C) 7kg

(D) 3kg

Explanation:

Momentum of first part

⇒ 1 × 12 = 12

Momentum of second part

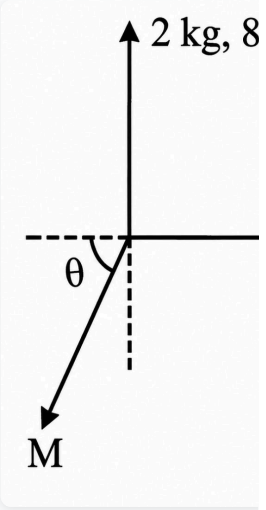
⇒ 2 × 8 = 16

Resultant momentum,

= √((12)² + (16)²) = 20

Then M_1 be the mass of third part M · 4 = 20

M = 20/4 = 5 kg



Question 7.

Two bodies of mass 1 kg and 3 kg have position vectors $\hat{i} + 2\hat{j} + \hat{k}$ and $-3\hat{i} - 2\hat{j} + \hat{k}$ respectively. The centre of mass of this system has a position vector:

(A) $-2\hat{i} - \hat{j} + \hat{k}$

(B) $2\hat{i} - \hat{j} - 2\hat{k}$

(C) $-\hat{i} + \hat{j} + \hat{k}$

(D) $-2\hat{i} + 2\hat{k}$

Explanation:

The position vector of the centre of mass of two particle system is given by

□□ cm = $(m_1 \square\square_1 + m_2 \square\square_2)/(m_1 + m_2)$

= $1/4\ [-8\hat{i} - 4\hat{j} + 4\hat{k}]$

= $-2\hat{i} - \hat{j} + \hat{k}$

Question 8.

A thin circular ring of mass M and radius R is rotating in a horizontal plane about an axis vertical to its plane with a constant angular velocity ω. If two objects e

(A) ωM/(M + m)

(B) ω(M − 2m)/(M + 2m)

(C) ωM/(M + 2m)

(D) ω(M + 2m)/M

Explanation:

In absence of external torque, L = Iω = constant

$I_1\omega_1 = I_2\omega_2$,

$I_1 = MR^2$,

$I_2 = MR^2 + 2mR^2$

(Moment of inertia of a thin circular ring about an axis vertical to its plane = MR^2)

$\therefore \omega_2 = (I_1/I_2)\omega$

= $(M/(M + 2m))\omega$

Question 9.

If □□ is the force acting on a particle having position vector □□ and τ vector be the torque of this force about the origin, then:

(A) □□ · τ vector = 0 and □□ · τ vector ≠ 0

(B) □□r · τ vector = 0 and □□ · τ vector = 0

(C) □□ · τ vector > 0 and □□ · τ vector < 0

(D) □□ · τ vector ≠ 0 and □□ · τ vector = 0

Explanation:

τ vector = □□ × □□

□□ · τ vector = 0

□□ · τ vector = 0

Since, τ vector is perpendicular to the plane of □□ and □□, hence the dot product of τ vector with □□ and □□ is zero.

Question 10.

Four identical thin rods each of mass M and length l, form a square frame. Moment of inertia of this frame about an axis through the centre of the square and p

(A) (2/3) Ml^2

(B) (13/3) Ml^2

(C) (4/3) Ml^2

(D) (1/3) Ml^2

Explanation:

Moment of inertia of a thin rod of length l about an axis passing through centre and perpendicular to the rod

= (1/12)Ml^2

Thus moment of inertia of the frame,

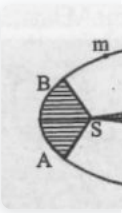
$Ml^2/12 + Ml^2/4 = (4Ml^2)/12 = Ml^2/3$

Total M.I. = $4 \times Ml^2/3$

= $4Ml^2/3$

Question 11.

The figure shows elliptical orbit of a planet m about the sun S. The shaded area SCD is twice the shaded area SAB. If t_1 is the time for the planet to move from



(A) $t_1 = 2t_2$

(B) $t_1 = 4t_2$

(C) $t_1 > t_2$

(D) $t_1 = t_2$

Explanation:

According to Kepler's law, the areal velocity of a planet around the sun always remains constant.

SCD : $A_1 – t_1$ (areal velocity constant)

SAB : $A_2 – t_2$

$A_1/t_1 = A_2/t_2$

$t_1 = t_2 \times A_1/A_2$

(given $A_1 = 2A_2$)

$= t_2 \times 2A_2/A_2$

$\therefore t_1 = 2t_2$

Question 12.

The two ends of a rod of length L and a uniform cross-sectional area A are kept at two temperatures T_1 and T_2 ($T_1 > T_2$). The rate of heat transfer, dQ/dt throug

(A) $dQ/dt = k(T_1 - T_2)/LA$

(B) $dQ/dt = kLA(T_1 - T_2)$

(C) $dQ/dt = kA(T_1 - T_2)/L$

(D) $dQ/dt = kL(T_1 - T_2)/A$

Explanation:

$dQ/dt = kA(T_1 - T_2)/L$

[$(T_1 - T_2)$ is the temperature difference]

Question 13.

A black body at 227°C radiates heat at the rate of 7 cals/cm²s. At a temperature of 727°C, the rate of heat radiated in the same units will be:

(A) 80

(B) 60

(C) 50

(D) 112

Explanation:

According to Stefan's law

$E = \sigma T^4$

$T_1 = 500$ K

$T_2 = 1000$ K

$E_2/E_1 = (T_2/T_1)^4 = (1000/500)^4 = 16$

$\therefore E_2 = 16 \times 7 = 112$ cal/cm²s

Question 14.

The internal energy change in a system that has absorbed 2 kcals of heat and done 500 J of work is:

(A) 6400 J

(B) 5400 J

(C) 7900 J

(D) 8900 J

Explanation:

According to first law of thermodynamics

$Q = \Delta U + W$

$\Delta U = Q - W$

$= 2 \times 4.2 \times 1000 - 500$

$= 8400 - 500$

$= 7900$ J

Question 15.

In thermodynamic processes which of the following statements is not true?

(A) In an isochoric process pressure remains constant

(B) In an adiabatic process the system is insulated from the surroundings

(C) In an isothermal process the temperature remains constant

(D) In an adiabatic process PV^{γ} = constant

Explanation:

In an isochoric process volume remains constant whereas pressure remains constant in isobaric process.

Question 16.

Which one of the following equations of motion represents simple harmonic motion?

(A) Acceleration = $-k_0x + k_1x^2$

(B) Acceleration = $k(x + a)$

(C) Acceleration = kx

(D) Acceleration = $-k(x + a)$

Explanation:

acceleration,

$a = -kX$,

where,

$X = x + a$.

In simple harmonic motion acceleration is directly proportional to the displacement from the mean position. Also the acceleration is in the opposite direction of

Question 17.

A simple pendulum performs simple harmonic motion about x = 0 with an amplitude a and time period T. The speed of the pendulum at x = a/2 will be:

(A) πa√3/T

(B) π

(C) πa√3/2T

(D) 3π²a/T

Explanation:

Speed,

$v = \omega\sqrt{(a^2 - x^2)}$, $x = a/2$

$\therefore v = \omega\sqrt{(a^2 - a^2/4)}$

$= \omega\sqrt{(3a^2/4)}$

$= (2\pi/T) \times (a\sqrt{3}/2)$

$= \pi a\sqrt{3}/T$

Question 18.

A block of mass M is attached to the lower end of a vertical spring. The spring is hung from a ceiling and has force constant value k. The mass is released fron

(A) Mg/2k

(B) 4Mg/k

(C) Mg/k

(D) 2Mg/k

Explanation:

Restoring force,

$f' = -kx$

where x is the extension produced in the spring.

Weight of the mass acting downward = Mg.

In equilibrium

$kx = Mg$

or

$x = Mg/k$

Question 19.

A wave in a string has an amplitude of 2 cm. The wave travels in the +ve direction of x axis with a speed of 128 m/sec and it is noted that 5 complete waves fit

(A) y = (0.02) m sin (15.7x − 2010t)

(B) y = (0.02) m sin (15.7x + 2010t)

(C) y = (0.02) m sin (7.85x − 1005t)

(D) y = (0.02) m sin (7.85x + 1005t)

Explanation:

A = 2 cm,

$\omega/k = 128\ ms^{-1}$,

$5\lambda = 4$,

$\lambda = 4/5$ m

$y = A \sin(kx - \omega t)$,

$k = 2\pi/\lambda$

$\Rightarrow (2\pi \times 5)/4$

$= 31.4/4$

$= 7.85$

$y = 0.02 \text{ m } \sin(7.85x - 1005t)$

$\omega = 128 \times 7.85$

$= 1005$

Question 20.

Each of the two strings of length 51.6 cm and 49.1 cm are under tension separately by 20 N force. Mass per unit length of both strings is same and equal to 1

(A) 3

(B) 8

(C) 7

(D) 5

Explanation:

The frequency of vibration of a string is given by,

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

where m is mass per unit length.

$f_1 = 1/(2l_1) \sqrt{(T/m)}$, $f_2 = 1/(2l_2) \sqrt{(T/m)}$

$f_2 - f_1 = ½ \sqrt{(T/m)} \times (l_1 - l_2)/(l_1 l_2)$

$\sqrt{(T/m)} = \sqrt{(20/10^{-3})} = \sqrt{2} \times 10^2 = 1.414 \times 100$

$= 141.4$

$(l_1 - l_2)/(l_1 l_2) = ((51.6 - 49.1) \times 10^2)/(51.6 \times 49.1)$

$= (2.5 \times 10^2)/(50 \times 50)$

$= 1/10$

$\therefore f_2 - f_1 = ½ \times 141.4 \times 1/10 = 7$ beats

Question 21.

The driver of a car travelling with speed 30 m/s towards a hill sounds a horn of frequency 600 Hz. If the velocity of sound in air is 330 m/s, the frequency of refl

(A) 500 Hz

(B) 555.5 Hz

(C) 550 Hz

(D) 720 Hz

Explanation:

From the given condition

f′ is the apparent frequency received by an observer at the hill. f″ is the frequency of reflected sound as heard by driver.

$f' = v/(v - 30)\ f$

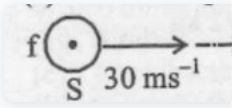
and

$f'' = (v + 30)/v \times f'$

$\Rightarrow (v + 30)/(v - 30)\ f$

$= (360/300) \times 600$

$= 720$ Hz



Question 22.

The mean free path of electrons in a metal is 4×10^{-8} m. The electric field which can give on an average 2 eV energy to an electron in the metal will be in unit

(A) 5×10^{-11}

(B) 8×10^{-11}

(C) 8×10^{7}

(D) 5×10^{7}

Explanation:

Energy = 2 eV

$\Rightarrow eV_0 = 2$ eV

$\Rightarrow V_0 = 2$ volt

$E = V_0/d$

$= 2/(4 \times 10^{-8})$

$= 0.5 \times 10^{8}$

$= 5 \times 10^{7}\ Vm^{-1}$

Question 23.

Three concentric spherical shells have radii a, b and c (a < b < c) and have surface charge densities σ, −σ and σ respectively. If V_a, V subscript (B) and V□ de

(A) V□ = V subscript (B) ≠ V_a

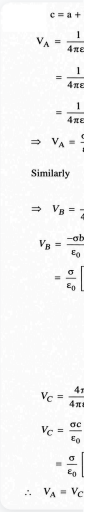
(B) V□ ≠ V subscript (B) ≠ V_a

(C) V□ = V subscript (B) = V_a

(D) V□ = V_a ≠ V subscript (B)

Explanation:

.



Question 24.

The electric potential at a point (x, y, z) is given by V = $-x^2y - xz^3 + 4$.

The electric field □□ at that point is

(A) □□ = $\hat{i}z^3 + \hat{j}xyz + \hat{k}z^2$

(B) □□ = $\hat{i}(2xy - z^3) + \hat{j}xy^2 + \hat{k}3z^2x$

(C) □□ = $\hat{i}(2xy + z^3) + \hat{j}x^2 + \hat{k}3xz^2$

(D) □□ = $\hat{i}(2xy + z^3) + \hat{j}(x^2 + y^2) + \hat{k}(3xz - y^2)$

Explanation:

The electric field at a point is equal to negative of potential gradient at that point.

□□ = $-\partial V/\partial r$

= $-[(\partial V/\partial x)\hat{i} + (\partial V/\partial y)\hat{j} + (\partial V/\partial z)\hat{k}]$

= $[(2xy + z^3)\hat{i} + \hat{j}x^2 + \hat{k}3xz^2]$

Question 25.

Three capacitors each of capacitance C and of breakdown voltage V are joined in series. The capacitance and breakdown voltage of the combination will be

(A) 3C, V/3

(B) C/3, 3V

(C) C/3, V/3

(D) 3C, 3V

Explanation:

In series combination of capacitors

V_eff = V + V + V = 3V

1/C_eff = 1/C + 1/C + 1/C

⇒ C_eff = C/3

Thus, the capacitance and breakdown voltage of the combination will be C/3 and 3V.

Question 26.

A wire of resistance 12 ohms per meter is bent to form a complete circle of radius 10 cm. The resistance between its two diametrically opposite points, A and B



(A) 0.6πΩ

(B) 6πΩ

(C) 3Ω

(D) 6Ω

Explanation:

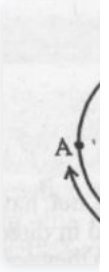
Length of wire = 2πr = 2π(0.1) = 0.2π m

Resistance of complete circle/wire = 12 × 0.2π = 2.4π Ω

∴ Resistance of each semi-circle = 1.2π Ω

Hence, equivalent resistance,

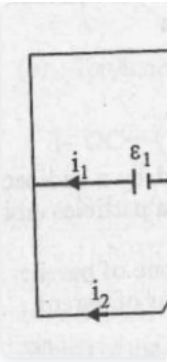
R Subscript (AB) = 1.2π/2 = 0.6π Ω



Question 27.

See the electric circuit shown in the figure.

Which of the following equations is a correct equation for it?



(A) $\varepsilon_2 - (i_1 + i_2)R + i_2r_2 = 0$

(B) $\varepsilon_2 - i_2r_2 - \varepsilon_1 - i_1r_1 = 0$

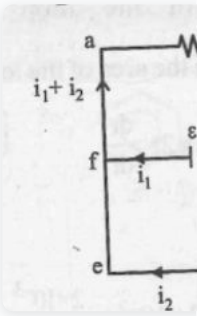
(C) $\varepsilon_1 - (i_1 + i_2)R + i_1r_1 = 0$

(D) $\varepsilon_1 - (i_1 + i_2)R - i_1r_1 = 0$

Explanation:

Applying Kirchhoff's rule in loop abcfa

$\varepsilon_1 - (i_1 + i_2)R - i_1r_1 = 0.$



Question 28.

A student measures the terminal potential difference (V) of a cell (of emf E and internal resistance r) as a function of the current (I) flowing through it. The slope

(A) r and −E

(B) −r and E

(C) E and −r

(D) −E and r

Explanation:

The terminal potential difference of a cell is given by

V + Ir = E

or

V = V_A − V_B

V = E − Ir

⇒ dV/dI = −r

Also for, i = 0 then V = E

∴ slope = −r, intercept = E

Question 29.

The magnetic force acting on a charged particle of charge −2 μC in a magnetic field of 2T acting in y direction, when the particle velocity is $(2\hat{i} + 3\hat{j}) \times 10^6$ ms^{-1}

(A) 8 N in y direction

(B) 4 N in z direction

(C) 8 N in −z direction

(D) 8 N in z direction

Explanation:

The magnetic force acting on the charged particle is given by

□□ = q(□□ × □□)

$= (-2 \times 10^{-6})[\{(2\hat{i} + 3\hat{j}) \times 10^6\} \times (2\hat{j})]$

$= -4(2\hat{k}) = -8\hat{k}$

∴ Force is of 8 N along negative z-axis.

Question 30.

Under the influence of a uniform magnetic field, a charged particle moves with constant speed v in a circle of radius R. The time period of rotation of the particl

(A) depends on R and not on v

(B) is independent of both v and R

(C) depends on both v and R

(D) depends on v and not on R

Explanation:

The time period of the charged particle is given by,

$T = 2\pi m/qB$

Thus, time period is independent of both v and R.

Question 31.

A galvanometer having a coil resistance of 60 Ω shows full scale deflection when a current of 1.0 amp passes through it. It can be converted into an ammeter t

(A) putting in parallel a resistance of 15 Ω

(B) putting in parallel a resistance of 240 Ω

(C) putting in series a resistance of 240 Ω

(D) putting in series a resistance of 15 Ω

Explanation:

G = 60Ω, I_g = 1.0 A, I = 5 A.

Let S be the shunt resistance connected in parallel to galvanometer.

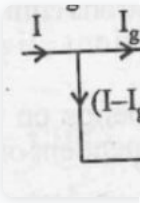
$I_g G = (I - I_9)S$

$S = I_g G/(I - I_g)$

= (1/(5 − 1)) × 60

= 15Ω

Thus by putting 15Ω in parallel, the galvanometer can be converted into an ammeter.



Question 32.

A bar magnet having a magnetic moment of 2 × 10^4 JT^{-1} is free to rotate in a horizontal plane. A horizontal magnetic field B = 6 × 10^{-4} T exists in the space. T

(A) 12 J

(B) 6 J

(C) 0.6 J

(D) 2 J

Explanation:

Work done

= MB(cos θ_1 − cos θ_2)

= MB(cos 0° − cos 60°)

= MB(1 − 1/2)

= (2 × 10^4 × 6 × 10^{-4})/2

= 6 J

Question 33.

If a diamagnetic substance is brought near the north or the south pole of a bar magnet, it is:

(A) repelled by both the poles

(B) attracted by both the poles

(C) attracted by the north pole and repelled by the south pole

(D) repelled by the north pole and attracted by the south pole

Explanation:

Diamagnetic substances do not have any unpaired electron. And they are magnetised in direction opposite to that of magnetic field. Hence, when they are bro

Question 34.

A rectangular, a square, a circular and an elliptical loop, all in the (x−y) plane, are moving out of a uniform magnetic field with a constant velocity, □□ = vî. The

(A) only the elliptical loop.

(B) the circular and the elliptical loops.

(C) any of the four loops.

(D) the rectangular, circular and elliptical loops.

Explanation:

The induced emf will remain constant only in the case of rectangular and square loops. In case of the circular and the elliptical loops, the rate of change of are

Question 35.

A conducting circular loop is placed in a uniform magnetic field of 0.04 T with its plane perpendicular to the magnetic field. The radius of the loop starts shrinkir

(A) 3.2 πμV

(B) 1.6 πμV

(C) 4.8 μV

(D) 0.8 πμV

Explanation:

Induced emf in the loop is given by

$e = -B \cdot dA/dt$

where A is the area of the loop.

$e = -B \cdot d/dt (\pi r^2)$

$= -B\pi 2r \cdot dr/dt$

$r = 2 \text{ cm} = 2 \times 10^{-2} \text{ m}$

$dr = 2 \text{ mm} = 2 \times 10^{-3} \text{ m}$

$dt = 1 \text{ s}$

$e = -0.04 \times 3.14 \times 2 \times 2 \times 10^{-2} \times (2 \times 10^{-3})/1 \text{ V}$

$= 0.32\pi \times 10^{-5} \text{ V}$

$= 3.2\pi \times 10^{-6} \text{ V}$

$= 3.2\pi \text{ μV}$

Question 36.

Power dissipated in an LCR series circuit connected to an a.c source of emf ε is

(A) $\varepsilon^2 R/\sqrt{[R^2 + (L\omega - 1/C\omega)^2]}$

(B) $\varepsilon^2 R/[R^2 + (L\omega - 1/C\omega)^2]$

(C) $\varepsilon^2[R^2 + (L\omega - 1/C\omega)^2]/R$

(D) $\varepsilon^2\sqrt{[R^2 + (L\omega - 1/C\omega)^2]}/R$

Explanation:

Power dissipated in series LCR;

$P = I^2R$

$= \varepsilon^2/(Z^2) R$

$= \varepsilon^2 R/[R^2 + (\omega L - 1/\omega C)^2]$

Question 37.

The electric field part of an electromagnetic wave in a medium is represented by $E_x = 0$;

$E_y = 2.5\ N/C \cos[(2\pi \times 10^6\ rad/m)t - (\pi \times 10^{-2}\ rad/s)x]$; E□ = 0. The wave is:

(A) moving along y direction with frequency $2\pi \times 10^6$ Hz and wavelength 200 m.

(B) moving along −x direction with frequency 10^6 Hz and wavelength 200 m.

(C) moving along x direction with frequency 10^6 Hz and wavelength 200 m.

(D) moving along x direction with frequency 10^6 Hz and wavelength 100 m.

Explanation:

Comparing with the equation of wave.

$E_y = E_0 \cos(\omega t - kx)$

$\omega = 2\pi f = 2\pi \times 10^6$

$\therefore f = 10^6$ Hz

$2\pi/\lambda = k = \pi \times 10^{-2}\ m^{-1}$

$\therefore \lambda = 200$ m

Question 38.

The number of photo electrons emitted for light of a frequency ν (higher than the threshold frequency ν_0) is proportional to:

(A) Frequency of light (ν)

(B) $\nu - \nu_0$

(C) Intensity of light

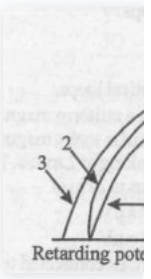
(D) Threshold frequency (ν_0)

Explanation:

The number of photoelectrons emitted is proportional to the intensity of incident light.
Saturation current ∝ intensity.

Question 39.

The figure shows a plot of photo current versus anode potential for a photo sensitive surface for three different radiations. Which one of the following is a corre



(A) Curves (2) and (3) represent incident radiations of different frequencies and different intensities.

(B) Curves (1) and (2) represent incident radiations of same frequency but of different intensities.

(C) Curves (2) and (3) represent incident radiations of same frequency having same intensity.

(D) Curves (1) and (2) represent incident radiations of different frequencies and different intensities.

Explanation:

Retarding potential depends on the frequency of incident radiation but is independent of intensity.

Question 40.

Monochromatic light of wavelength 667 nm is produced by a helium neon laser. The power emitted is 9 mW. The number of photons arriving per sec on the av

(A) 9×10^{17}

(B) 3×10^{19}

(C) 9×10^{15}

(D) 3×10^{16}

Explanation:

$\lambda = 667 \times 10^{-9}$ m, $P = 9 \times 10^{-3}$ W

$P = Nhc/\lambda$, N = No. of photons emitted/sec.

$N = (9 \times 10^{-3} \times 667 \times 10^{-9})/(6.6 \times 10^{-34} \times 3 \times 10^{8})$

$= (9 \times 6.67 \times 10^{-10})/(3 \times 6.6 \times 10^{-26})$

$= 3 \times 10^{16}$ /sec

Question 41.

In a Rutherford scattering experiment when a projectile of charge Z_1 and mass M_1 approaches a target nucleus of charge Z_2 and mass M_2, the distance of clos

(A) directly proportional to $M_1 \times M_2$

(B) directly proportional to mass M_1

(C) directly proportional to Z_1Z_2

(D) inversely proportional to Z_1

Explanation:

The kinetic energy of the projectile is given by

$\frac{1}{2}mv^2 = Ze(2e)/(4\pi\varepsilon_0 r_0)$

$= Z_1Z_2/(4\pi\varepsilon_0 r_0)$

Thus energy of the projectile is directly proportional to Z_1Z_2.

Question 42.

The ionization energy of the electron in the hydrogen atom in its ground state is 13.6 eV. The atoms are excited to higher energy levels to emit radiations of 6 v

(A) n = 3 to n = 2 states

(B) n = 2 to n = 1 states

(C) n = 3 to n = 2 states

(D) n = 4 to n = 3 states

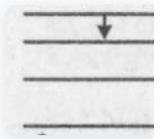
Explanation:

$n(n - 1)/2 = 6$

$n^2 - n - 12 = 0$

(n − 4)(n + 3) = 0

or n = 4



Question 43.

The number of beta particles emitted by a radioactive substance is twice the number of alpha particles emitted by it. The resulting daughter is an

(A) isobar of parent

(B) isotone of parent

(C) isotope of parent

(D) isomer of parent

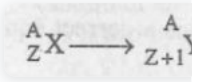
Explanation:

A radioactive substance when emits one alpha particle ($^{4}_{2}He$), its mass number reduces by 4 and charge no. reduces by

Question 44.

In the nuclear decay given below:

the particles emitted in the sequence are



(A) β, α, γ

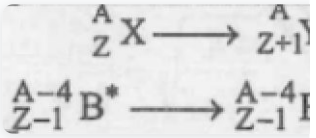
(B) α, β, γ

(C) γ, β, α

(D) β, γ, α

Explanation:

.



Question 45.

A p-n photodiode is fabricated from a semiconductor with a band gap of 2.5 eV. It can detect a signal of wavelength

(A) 4000 nm

(B) 6000 nm

(C) 4000 Å

(D) 6000 Å

Explanation:

$\lambda_{max} = hc/E$

= $(6.6 \times 10^{-34} \times 3 \times 10^{8})/(2.5 \times 1.6 \times 10^{-19})$

= 5000 Å

The wavelength detected by photodiode should be less than λ_{max}. Hence it can detect a signal of wavelength 4000 Å.

Question 46.

Sodium has body centred packing. Distance between two nearest atoms is 3.7 Å. The lattice parameter is

(A) 3.0 Å

(B) 4.3 Å

(C) 8.6 Å

(D) 6.8 Å

Explanation:

d = (√3/2)a

3.7 = (√3/2)a

a = (2 × 3.7)/√3

= 4.3 Å

Question 47.

A transistor is operated in common-emitter configuration at VSubscript (C) = 2 V such that a change in the base current from 100 μA to 200 μA produces a cha

(A) 100

(B) 150

(C) 50

(D) 75

Explanation:

ΔI Subscript (E) = ΔI Subscript (B) + ΔI Subscript (C)

β = ΔI Subscript (C)/ΔI Subscript (B)

ΔI Subscript (C) = $(10 - 5) \times 10^{-3}$

= 5×10^{-3} A

ΔI Subscript (B) = $(200 - 100) \times 10^{-6}$

= 100×10^{-6} A

β = $(5 \times 10^{-3})/(100 \times 10^{-6})$

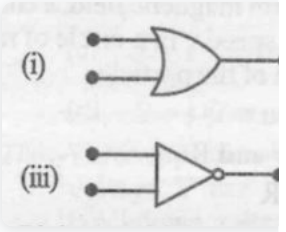
= (5/100) × 1000

= 50

Question 48.

Symbolic representation of four logic gate are shown as

Pick out which ones are for AND, NAND and NOT gates, respectively



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

(B) (iii), (iii) and (iv)

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

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

Explanation:

the correct one is (ii), (iv) and (iii).

Question 49.

Which one of the following is employed as a tranquilizer?

(A) Naproxen

(B) Equanil

(C) Chlorpheniramine

(D) Tetracycline

Explanation:

The drugs which are used to reduce anxiety and for the treatment of mental diseases, are called tranquilizers. These drugs are also known as psychotherapeu

Question 50.

What is the [OH] in the final solution prepared by mixing 20.0 mL of 0.050 M HCl with 30.0 mL of 0.10 M $Ba(OH)_2$?

(A) 0.12 M

(B) 0.10 M

(C) 0.0050 M

(D) 0.40 M

Explanation:

No. of milli equivalent of HCl

= 20 × 0.05 = 1.0

No. of milli equivalent of $Ba(OH)_2$

= 30 × 0.1 × 2 = 6.0

After neutralization, no. of milli equivalents in 50 mL of solution

= (6 − 1) = 5

Total volume of the solution = 20 + 30 = 50 mL

∴ No. of equivalent of OH^- in 50 mL is

$[OH^-] = (5 \times 1000/50) \times 10^{-3} = 0.1$ M

Question 51.

10 g of hydrogen and 64 g of oxygen were filled in a steel vessel and exploded. Amount of water produced in this reaction will be:

(A) 2 mol

(B) 1 mol

(C) 4 mol

(D) 3 mol

Explanation:

$H_2 + ½O_2 \longrightarrow H_2O$

10 g 64 g

(5 mol) (2 mol)

In this reaction oxygen is the limiting agent. Hence, amount of H_2O produced depends on the amount of O_2 taken.

∵ 0.5 mol of O_2 gives H_2O = 1 mol

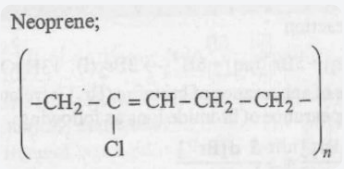
∴ 2 mol of O_2 gives H_2O = 4 mol

Question 52.

Structures of some common polymers are given. Which one is not correctly presented?

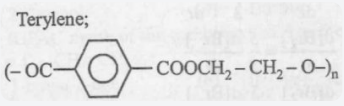
(A)

Neoprene;



(B)

Terylene;



(C)

Nylon 6, 6;

$[-NH(CH_2)_6NHCO(CH_2)_4CO-]_n$

(D)

Teflon; $(-CF_2-CF_2-)_n$

Explanation:

Neoprene is a polymer of chloroprene.

Question 53.

Which of the following hormones contains iodine?

(A) Testosterone

(B) Adrenaline

(C) Insulin

(D) Thyroxine

Explanation:

Thyroxine is the only hormone among the given choices that contains iodine. Its structure is as follows:



Question 54.

The segment of DNA which acts as the instrumental manual for the synthesis of the protein is:

(A) nucleoside

(B) nucleotide

(C) gene

(D) ribose

Explanation:

The DNA sequence that codes for a specific protein is called a Gene and thus every protein in a cell has a corresponding gene.

Question 55.

Nitrobenzene can be prepared from benzene by using a mixture of conc. HNO_3 and conc. H_2SO_4; in the mixture, nitric acid acts as a/an:

(A) reducing agent

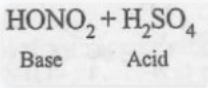
(B) catalyst

(C) base

(D) acid

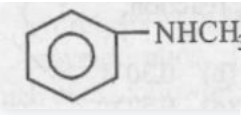
Explanation:

Nitric acid acts as a base by accepting a proton.



Question 56.

Predict the product:



(A)



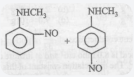
(B) 1



(C)

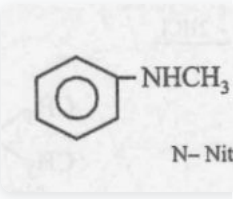


(D)



Explanation:

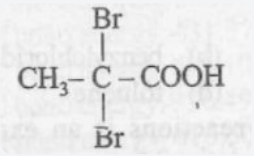
Secondary amine with ($NaNO_2$ + HCl) gives a nitroso product.



Question 57.

Propionic acid with Br_2|P yields a dibromo product. Its structure would be:

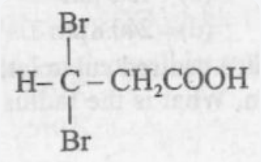
(A)



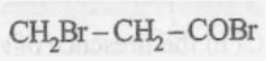
(B)



(C)

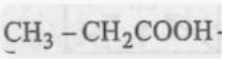


(D)



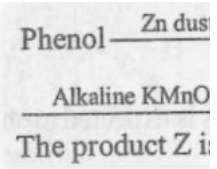
Explanation:

This reaction is an example of Hell–Volhard–Zelinsky reaction. In this reaction acids containing α–H on treatment with X_2/P give di-halo substituted acid.



Question 58.

Consider the following reaction:



(A) benzoic acid

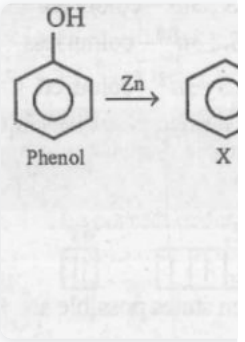
(B) benzaldehyde

(C) benzene

(D) toluene

Explanation:

.



Question 59.

$H_2COH \cdot CH_2OH$ on heating with periodic acid gives:

(A)



(B) 2 CO_2

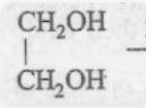
(C) 2 HCOOH

(D)



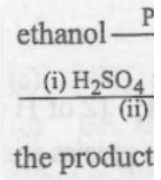
Explanation:

1,2–Diols, when treated with an aqueous solution of periodic acid, give aldehyde or ketones.



Question 60.

Consider the following reaction,



(A) $CH_3–CH_2–O–SO_3H$

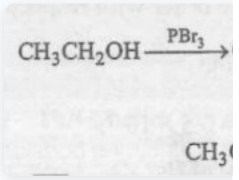
(B) $CH_3CH_2–O–CH_2–CH_3$

(C) CH_3CH_2OH

(D) $CH_2=CH_2$

Explanation:

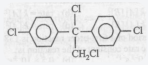
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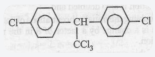
Question 61.

Trichloroacetaldehyde, CCl_3CHO reacts with chlorobenzene in presence of sulphuric acid and produces:

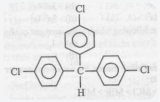
(A)



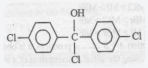
(B)



(C)

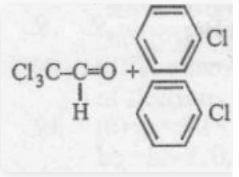


(D)



Explanation:

.



Question 62.

Benzene reacts with CH_3Cl in the presence of anhydrous $AlCl_3$ to form:

(A) chlorobenzene

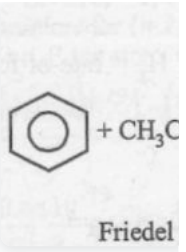
(B) benzylchloride

(C) xylene

(D) toluene

Explanation:

.



Question 63.

Which of the following reactions is an example of nucleophilic substitution reaction?

(A) $RX + H_2 \rightarrow RH + HX$

(B) $2RX + 2Na \rightarrow R–R + 2NaX$

(C) $RX + KOH \rightarrow ROH + KX$

(D) $RX + Mg \rightarrow RMgX$

Explanation:

In nucleophilic substitution, a nucleophile provides an electron pair to the substrate and the leaving group departs with an electron pair.



Question 64.

Which of the following complex ions is expected to absorb visible light?

(At.no. Zn = 30, Sc = 21, Ti = 22, Cr = 24)

(A) $[Sc(H_2O)_3(NH_3)_3]^{3+}$

(B) $[Zn(NH_3)_6]^{2+}$

(C) $[Ti(en)_2(NH_3)_2]^{4+}$

(D) $[Cr(NH_3)_6]^{3+}$

Explanation:

Since Cr^{3+} in the complex has unpaired electrons in the d orbital, hence will be coloured.

$Ti = [Ar]3d^2 4s^2$; $Ti^{4+} = 3d^0$

$Cr = [Ar]3d^5 4s^1$; $Cr^{3+} = 3d^3$

$Zn = [Ar]3d^{10} 4s^2$; $Zn^{2+} = 3d^{10}$

$Sc = [Ar]3d^1 4s^2$; $Sc^{3+} = 3d^0$

Question 65.

Which of the following does not show optical isomerism?

(en = ethylenediamine)

(A) $[Co(en)Cl_2(NH_3)_2]^+$

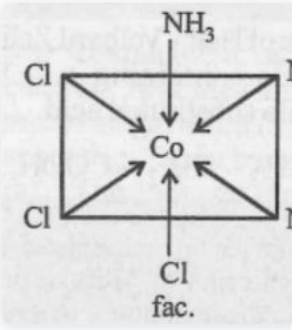
(B) $[Co(NH_3)_3Cl_3]^0$

(C) $[Co(en)_2Cl_2]^+$

(D) $[Co(en)_3]^{3+}$

Explanation:

The octahedral coordination compounds of the type MA_3B_3 exhibit fac-mer isomerism.



Question 66.

Out of TiF_6^{2-}, CoF_6^{3-}, Cu_2Cl_2 and $NiCl_4^{2-}$ (Z of Ti = 22, Co = 27, Cu = 29, Ni = 28), the colourless species are:

(A) Cu_2Cl_2 and $NiCl_4^{2-}$

(B) CoF_6^{3-} and $NiCl_4^{2-}$

(C) TiF_6^{2-} and Cu_2Cl_2

(D) TiF_6^{2-} and CoF_6^{3-}

Explanation:

In TiF_6^{2-} – Ti is in +4 O.S.; $3d^0$ – colourless

In CoF_6^{3-} – Co is in +3 O.S.; $3d^6$ – coloured

In Cu_2Cl_2 – Cu is in +1 O.S.; $3d^{10}$ – colourless

In $NiCl_4^{2-}$ – Ni is in +2 O.S.; $3d^8$ – coloured

Question 67.

Which one of the elements with the following outer orbital configurations may exhibit the largest number of oxidation states?

(A) $3d^34s^2$

(B) $3d^24s^2$

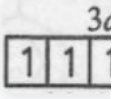
(C) $3d^54s^1$

(D) $3d^54s^2$

Explanation:

Mn – $3d^54s^2$

The no. of various oxidation states possible are +2, +3, +4, (+5), +6, +7.



Question 68.

Among the following which is the strongest oxidising agent?

(A) Br_2

(B) I_2

(C) F_2

(D) Cl_2

Explanation:

Standard reduction potential of halogens are positive and decreases from fluorine to iodine. Therefore, halogens act as strong oxidising agent and their oxidisi

Question 69.

In the case of alkali metals, the covalent character decreases in the order:

(A) MCl > MI > MBr > MF

(B) MI > MBr > MCl > MF

(C) MF > MCl > MI > MBr

(D) MF > MCl > MBr > MI

Explanation:

MI > MBr > MCl > MF.

As the size of the anion decreases covalency decreases.

Question 70.

For the reaction A + B ⟶ products, it is observed that:

(1) On doubling the initial concentration of A only, the rate of reaction is also doubled and

(2) On doubling the initial concentrations of both A and B, there is a change by a factor of 8 in the rate of the reaction.

The rate of this reaction is given by:

(A) rate = $k[A]^2[B]^3$

(B) rate = $k[A][B]^2$

(C) rate = k[A][B]

(D) rate = $k[A]^2[B]$

Explanation:

When concentration of A is doubled, rate is doubled. Hence order with respect to A is one.

When concentrations of both A and B are doubled, rate increases by 8 times hence order with respect to B is 2.

∴ rate = $k[A]^1[B]^2$

Question 71.

Half life period of a first-order reaction is 1386 seconds. The specific rate constant of the reaction is

(A) $5.0 \times 10^{-3}\ s^{-1}$

(B) $5.0 \times 10^{-2}\ s^{-1}$

(C) $0.5 \times 10^{-3}\ s^{-1}$

(D) $0.5 \times 10^{-2}\ s^{-1}$

Explanation:

For a first order reaction

$t_{1/2} = 0.693/k$

$k = 0.693/1386$

$= 0.5 \times 10^{-3}\ s^{-1}$

Question 72.

In the reaction
$BrO_3^-(aq) + 5Br^-(aq) + 6H^+ \longrightarrow 3Br_2(l) + 3H_2O(l)$

The rate of appearance of bromine (Br_2) is related to rate of disappearance of bromide ions as following:

(A) $d[Br_2]/dt = -3/5\ d[Br^-]/dt$

(B) $d[Br_2]/dt = 3/5\ d[Br^-]/dt$

(C) $d[Br_2]/dt = -5/3\ d[Br^-]/dt$

(D) $d[Br_2]/dt = 5/3\ d[Br^-]/dt$

Explanation:

Rate of disappearance of Br^- = Rate of appearance of Br_2

$\Rightarrow -1/5\ d[Br^-]/dt = 1/3\ d[Br_2]/dt$

$\Rightarrow d[Br_2]/dt = -3/5\ d[Br^-]/dt$

Question 73.

For the reaction, $N_2 + 3H_2 \longrightarrow 2NH_3$

$d[NH_3]/dt = 2 \times 10^{-4}\ mol\ L^{-1}\ s^{-1}$, the value of $-d[H_2]/dt$ would be:

(A) $1 \times 10^{-4}\ mol\ L^{-1}\ s^{-1}$

(B) $3 \times 10^{-4}\ mol\ L^{-1}\ s^{-1}$

(C) $6 \times 10^{-4}\ mol\ L^{-1}\ s^{-1}$

(D) $4 \times 10^{-4}\ mol\ L^{-1}\ s^{-1}$

Explanation:

Rate of disappearance of H_2 = Rate of formation of NH_3

$\Rightarrow -1/3\ d[H_2]/dt = 1/2\ d[NH_3]/dt$

$\Rightarrow -d[H_2]/dt = 3/2\ d[NH_3]/dt$

$= 3/2 \times 2 \times 10^{-4}$

$= 3 \times 10^{-4}\ mol\ L^{-1}\ s^{-1}$

Question 74.

Given:

(i) $Cu^{2+} + 2e^- \longrightarrow Cu$, $E° = 0.337$ V

(ii) $Cu^{2+} + e^- \longrightarrow Cu^+$, $E° = 0.153$ V

Electrode potential, E° for the reaction, $Cu^+ + e^- \longrightarrow Cu$, will be:

(A) 0.30 V

(B) 0.90 V

(C) 0.52 V

(D) 0.38 V

Explanation:

$Cu^{2+} + 2e^- \longrightarrow Cu$; $\Delta G° = -nE°F$

$= -2 \times F \times 0.337 = -0.674F$ ...(i)

$Cu^+ \longrightarrow Cu^{2+} + e^-$; $\Delta G° = -nE°F$

$= -1 \times F \times (-0.153) = 0.153F$ ...(ii)

On adding eqn (i) & (ii)

$Cu^+ + e^- \longrightarrow Cu$;

$\Delta G° = -0.521F = -nE°F$;

Here n = 1

$\therefore E° = +0.52$ V

Question 75.

Al_2O_3 is reduced by electrolysis at low potentials and high currents. If 4.0×10^4 amperes of current is passed through molten Al_2O_3 for 6 hours, what mass of a

(A) 9.0×10^3 g

(B) 2.4×10^5 g

(C) 1.3×10^4 g

(D) 8.1×10^4 g

Explanation:

As $Q = i \times t$

$\therefore Q = 4.0 \times 10^4 \times 6 \times 60 \times 60$ C

$= 8.64 \times 10^8$ C

Now since 96500 C liberates 9 g of Al

8.64×10^8 C liberates

$= (9/96500) \times 8.64 \times 10^8$ g Al

$= 8.1 \times 10^4$ g of Al

Question 76.

The equivalent conductance of M/32 solution of a weak monobasic acid is 8.0 mho cm^2 and at infinite dilution is 400 mho cm^2. The dissociation constant of this

(A) 1.25×10^{-5}

(B) 1.25×10^{-4}

(C) 6.25×10^{-4}

(D) 1.25×10^{-6}

Explanation:

Degree of dissociation,

$\alpha = \Lambda/\Lambda_\infty = 8.0/400 = 2 \times 10^{-2}$

$K_a = C\alpha^2/(1 - \alpha)$

$\approx C\alpha^2$

$= 1/32 \times (2 \times 10^{-2})^2$

$= 1.25 \times 10^{-5}$

Question 77.

A 0.0020 mol aqueous solution of an ionic compound $Co(NH_3)_5(NO_2)Cl$ freezes at −0.00732 °C. Number of moles of ions which 1 mol of compound produces

(A) 3

(B) 4

(C) 2

(D) 1

Explanation:

$\Delta T_f = 0 - (-0.00732) = 0.00732$

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

$i = \Delta T_f /(K_f \times m)$

$= 0.00732/(1.86 \times 0.002)$

$= 2$

Question 78.

Lithium metal crystallises in a body centred cubic crystal. If the length of the side of the unit cell of lithium is 351 pm, the atomic radius of the lithium will be:

(A) 151.8 pm

(B) 75.5 pm

(C) 240.8 pm

(D) 300.5 pm

Explanation:

Since lithium metal crystallises in a body centred cubic crystal

r = a√3/4

= (351 × 1.732)/4

= 151.98 pm

Question 79.

Copper crystallises in a face-centred cubic lattice with a unit cell length of 361 pm. What is the radius of copper atom in pm?

(A) 128

(B) 108

(C) 157

(D) 181

Explanation:

Since Cu metal crystallises in a face centred cubic lattice

∴ r = a/(2√2)

r = 361/(2√2) = 127.6 ≈ 128 pm

Question 80.

Which of the following compounds will exhibit cis-trans (geometrical) isomerism?

(A) 2-Butene

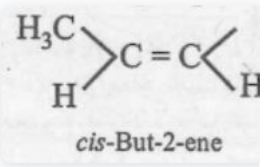
(B) 2-Butenol

(C) Butanol

(D) 2-Butyne

Explanation:

Alkenes with double bonds cannot undergo free rotation and can have different geometrical shapes with two different groups on each end of the double bond.



cis-But-2-ene

Question 81.

The IUPAC name of the compound having the formula CH ≡ C–CH=CH_2 is:

(A) 3-butene-1-yne

(B) 1-butyn-3-ene

(C) 1-butene-3-yne

(D) but-1-yne-3-ene

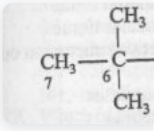
Explanation:

So the IUPAC name of the compound is 1-butene-3-yne.

Question 82.

The state of hybridization of C_2, C_3, C_5 and C_6 of the hydrocarbon,

in the following sequence:



(A) sp, sp^3, sp^2 and sp^3

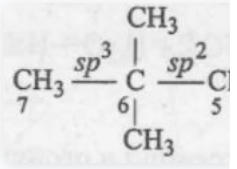
(B) sp, sp^2, sp^3 and sp^2

(C) sp, sp^2, sp^2 and sp^3

(D) sp^3, sp^2, sp^2 and sp

Explanation:

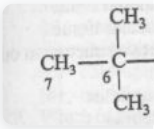
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Question 83.

The state of hybridization of C_2, C_3, C_5 and C_6 of the hydrocarbon,

is in the following sequence:



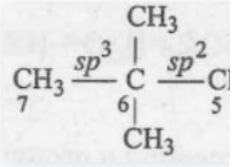
(A) sp^3, sp^2, sp^2 and sp

(B) sp, sp^2, sp^2 and sp^3

(C) sp, sp^2, sp^3 and sp^2

(D) sp, sp^3, sp^2 and sp^3

Answer:



Question 84.

The straight chain polymer is formed by

(A) hydrolysis of $(CH_3)_2SiCl_2$ followed by condensation polymerisation

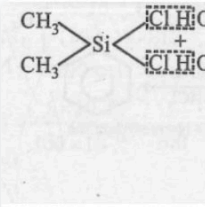
(B) hydrolysis of $(CH_3)_3SiCl$ followed by condensation polymerisation

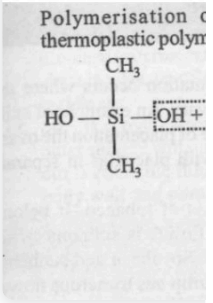
(C) hydrolysis of $(CH_3)_4Si$ by addition polymerisation

(D) hydrolysis of CH_3SiCl_3 followed by condensation polymerisation

Explanation:

Hydrolysis of substituted chlorosilanes yield corresponding silanols which undergo polymerisation.





Question 85.

Which of the following oxides is not expected to react with sodium hydroxide?

(A) SiO_2

(B) CaO

(C) B_2O_3

(D) BeO

Explanation:

NaOH is a strong alkali. It combines with acidic and amphoteric oxides to form salts. Since CaO is a basic oxide hence does not react with NaOH.

Question 86.

Oxidation numbers of P in PO_4^{3-}, of S in SO_4^{2-} and that of Cr in $Cr_2O_7^{2-}$ are respectively

(A) −3, +6 and +6

(B) +5, +6 and +6

(C) +3, +6 and +5

(D) +5, +3 and +6

Explanation:

$PO_4^{3-} = x + 4(-2) = -3; x - 8 = -3; x = +5$

$SO_4^{2-} = x + 4(-2) = -2; x - 8 = -2; x = +6$

$Cr_2O_7^{2-} = 2x + 7(-2) = -2; 2x - 14 = -2; 2x = 12; x = +6$

Question 87.

The ionization constant of ammonium hydroxide is 1.77×10^{-5} at 298 K. Hydrolysis constant of ammonium chloride is:

(A) 5.65×10^{-13}

(B) 6.50×10^{-12}

(C) 5.65×10^{-10}

(D) 5.65×10^{-12}

Explanation:

Ammonium chloride is a salt of weak base and strong acid. In this case, hydrolysis constant, K_h can be calculated as

$K_h = K_w / K_b$

$= (1 \times 10^{-14})/(1.77 \times 10^{-5})$

$= 5.65 \times 10^{-10}$

Question 88.

Which of the following molecules acts as a Lewis acid?

(A) $(CH_3)_2O$

(B) $(CH_3)_3P$

(C) $(CH_3)_3N$

(D) $(CH_3)_3B$

Explanation:

$(CH_3)_3B$ is electron deficient, thus behave as a Lewis acid.

Question 89.

The dissociation constants for acetic acid and HCN at 25°C are 1.5×10^{-5} and 4.5×10^{-10} respectively. The equilibrium constant for the equilibrium $CN^- + CH$

(A) 3.0×10^4

(B) 3.0×10^{-4}

(C) 3.0×10^5

(D) 3.0×10^{-5}

Explanation:

Given,

$CH_3COOH \rightleftharpoons CH_3COO^- + H^+$;

$K_{a1} = 1.5 \times 10^{-5}$ ...(i)

$HCN \rightleftharpoons H^+ + CN^-$;

$K_{a2} = 4.5 \times 10^{-10}$

or

$H^+ + CN^- \rightleftharpoons HCN$;

$K'_{a2} = 1/K_{a2}$

$= 1/(4.5 \times 10^{-10})$ ...(ii)

∴ From (i) and (ii), we find that the equilibrium constant (K_a) for the reaction,

$CN^- + CH_3COOH \rightleftharpoons CH_3COO^- + HCN$,

$K_a = K_{a1} \times K'_{a2}$

$= (1.5 \times 10^{-5})/(4.5 \times 10^{-10})$

$= (1/3) \times 10^5$

= 3.33×10^4

Question 90.

The values of ΔH and ΔS for the reaction, C(graphite) + $CO_2(g) \longrightarrow 2CO(g)$ are 170 kJ and 170 JK^{-1}, respectively. This reaction will be spontaneous at

(A) 710 K

(B) 1110 K

(C) 510 K

(D) 910 K

Explanation:

$\Delta G = \Delta H - T\Delta S$

At equilibrium, $\Delta G = 0$

$\Rightarrow 0 = (170 \times 10^3\ J) - T(170\ JK^{-1})$

$\Rightarrow T = 1000\ K$

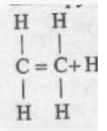
For spontaneity, ΔG is −ve, which is possible only if T > 1000 K.

Question 91.

From the following bond energies:
H–H bond energy: 431.37 kJ mol^{-1}
C=C bond energy: 606.10 kJ mol^{-1}
C–C bond energy: 336.49 kJ mol^{-1}
C–H bond energy: 410.50 kJ mol^{-1}

Enthalpy for the reaction,

will be:



(A) −120.0 kJ mol^{-1}

(B) −243.6 kJ mol^{-1}

(C) 553.0 kJ mol^{-1}

(D) 1523.6 kJ mol^{-1}

Explanation:

Enthalpy of reaction

= ΣB.E. Subscript (Reactant) − ΣB.E. Subscript (Product)

= [B.E. Subscript (C=C) + 4B.E. Subscript (C−H) + B.E. Subscript (H−H)]

− [B.E. Subscript (C−C) + 6B.E. Subscript (C−H)]

= [606.1 + (4 × 410.5) + 431.37] − [336.49 + (6 × 410.5)]

= −120.0 kJ mol^{-1}

Question 92.

According to MO theory which of the following lists ranks the nitrogen species in terms of increasing bond order?

(A) $N_2 < N_2^{2-} < N_2^-$

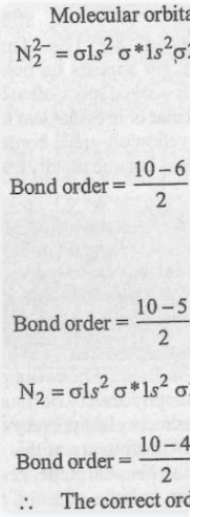
(B) $N_2^{2-} < N_2^- < N_2$

(C) $N_2^{2-} < N_2 < N_2^-$

(D) $N_2^- < N_2 < N_2^{2-}$

Explanation:

.



Question 93.

In which of the following molecules / ions BF_3, NO_2^-, NH_2^- and H_2O, is the central atom sp^2 hybridized?

(A) NO_2^- and NH_2^-

(B) BF_3 and NO_2^-

(C) NO_2^- and H_2O

(D) NH_2^- and H_2O

Explanation:

We find that in the given molecules hybridisation is

$BF_3 \rightarrow sp^2$

$NO_2^- \rightarrow sp^2$

$NH_2^- \rightarrow sp^3$

$H_2O \rightarrow sp^3$

Question 94.

What is the dominant intermolecular force or bond that must be overcome in converting liquid CH_3OH to a gas?

(A) Hydrogen bonding

(B) Covalent bonds

(C) Dipole-dipole interaction

(D) London dispersion force

Explanation:

Due to intermolecular hydrogen bonding in methanol, it exist as associated molecule.

Question 95.

The stability of +1 oxidation state increases in the sequence:

(A) In < Tl < Ga < Al

(B) Al < Ga < In < Tl

(C) Tl < In < Ga < Al

(D) Ga < In < Al < Tl

Explanation:

The stability of +1 oxidation state increases from aluminium to thallium i.e.

Al < Ga < In < Tl

Question 96.

Amongst the elements with following electronic configurations, which of them may have the highest ionization energy?

(A) Ne [$3s^2 3p^1$]

(B) Ne [$3s^2 3p^3$]

(C) Ne [$3s^2 3p^2$]

(D) Ar [$3d^{10} 4s^2 4p^3$]

Explanation:

The smaller the atomic size, larger is the value of ionisation potential. Further the atoms having half filled or fully filled orbitals are comparatively more stable, h

Question 97.

Maximum number of electrons in a sub shell of an atom is determined by the following:

(A) $2n^2$

(B) 4l + 2

(C) 4l − 2

(D) 2l + 1

Explanation:

The number of subshell is (2l + 1). The maximum number of electrons in the subshell is

2(2l + 1) = (4l + 2)

Question 98.

Which of the following is not permissible arrangement of electrons in an atom?

(A) n = 3, l = 2, m = −2, s = −1/2

(B) n = 3, l = 2, m = −3, s = −1/2

(C) n = 4, l = 0, m = 0, s = −1/2

(D) n = 5, l = 3, m = 0, s = +1/2

Explanation:

m = 2l + 1, thus for l = 2, m = 5, hence values of m will be −2, −1, 0, +1, +2.

Therefore for l = 2, m cannot have the value −3.

Question 99.

The energy absorbed by each molecule (A_2) of a substance is 4.4×10^{-19} J and bond energy per molecule is 4.0×10^{-19} J. The kinetic energy of molecule per

(A) 2.0×10^{-20} J

(B) 4.0×10^{-20} J

(C) 2.0×10^{-19} J

(D) 2.2×10^{-19} J

Explanation:

K.E per atom

$= [(4.4 \times 10^{-19}) - (4.0 \times 10^{-19})] / 2$

$= (0.4 \times 10^{-19}) / 2$

$= 2.0 \times 10^{-20}$ J

Question 100.

Which one is the wrong pairing for the disease and its causal organism?

(A) Late blight of potato – Alternaria solani

(B) Root-knot of vegetables – Meloidogyne sp

(C) Black rust of wheat – Puccinia graminis

(D) Loose smut of wheat – Ustilago nuda

Explanation:

Late blight is caused by the fungus Phytophthora infestans. Late blight appears on potato or tomato leaves as pale green, water-soaked spots, often beginning and turn dark brown to purplish-black.

Question 101.

Mannitol is the stored food in:

(A) Fucus

(B) Chara

(C) Porphyra

(D) Gracillaria

Explanation:

Mannitol is a food stored in *Fucus*. *Fucus* is a genus of brown alga in the clas Phaeophyceae to be found in the intertidal zones of rocky seashores almost eve many other minerals.

Question 102.

Which one of the following plants is monoecious?

(A) Pinus

(B) Cycas

(C) Papaya

(D) Marchantia

Explanation:

Pinus plant is monoecious i.e. both male and female cone are present in same plant but on different branches. *Pinus*, with over 100 species, is the largest gen

Question 103.

Which one of the following is a vascular cryptogam?

(A) Marchantia

(B) Ginkgo

(C) Equisetum

(D) Cedrus

Explanation:

Equisetum is a vascular cryptogam. *Equisetum* is the only living genus in the Equisetaceae, a family of vascular plants that reproduce by spores rather than se

Question 104.

Which one of the following has haplontic life cycle?

(A) Funaria

(B) Wheat

(C) Ustilago

(D) Polytrichum

Explanation:

Ustilago has a haplontic life cycle. This is a simplest and most primitive type of life cycle. The other pattern of life-cycle have originated from this type. This typ
germination the zygote (2n) divides meiotically producing haploid (n) zoospores, which develop into individual plant. Here, the unicellular or filamentous gamet

Question 105.

Which one of the following groups of animals is bilaterally symmetrical and triploblastic?

(A) Aschelminthes (round worms)

(B) Ctenophores

(C) Sponges

(D) Coelenterates (Cnidarians)

Explanation:

Aschelminthes is bilaterally symmetrical and triploblastic. These are mostly aquatic, free living or parasitic. Their body is three layered which is ectoderm, mes

Question 106.

Which one of the following pairs of animals comprises jawless fishes?

(A) Mackerals and Rohu

(B) Lampreys and hag fishes

(C) Lampreys and eels

(D) Guppies and hag fishes

Explanation:

Lampreys and hagfishes are unusual, jawless fish that comprise the order Cyclostomata, so named because of the circular shape of the mouth. The brains of

Question 107.

An example of axile placentation is:

(A) Dianthus

(B) Marigold

(C) Lemon

(D) Argemone

Explanation:

In flowering plants, placentation occurs where the ovules are attached inside the ovary. An example of axile placentation is citrus. In this type of placentation th

Question 108.

The floral formula

is that of:



(A) Tulip

(B) Sunhemp

(C) Tobacco

(D) Soyabean

Explanation:

The given floral formula is of tobacco. It belong to the family Solanaceae. The flower is actinomorphic, bisexual and has superior ovary. Soyabean and sunhem

Question 109.

Reduction in vascular tissue, mechanical tissue and cuticle is characteristic of:

(A) mesophytes

(B) epiphytes

(C) xerophytes

(D) hydrophytes

Explanation:

Reduction in vascular tissue, mechanical tissue and cuticle is characteristic of hydrophytes.

Question 110.

Palisade parenchyma is absent in leaves of:

(A) sorghum

(B) soybean

(C) gram

(D) mustard

Explanation:

Palisade parenchyma is absent in leaves of sorghum. It is a leaf tissue composed of columnar cells containing numerous chloroplasts in which the long axis of

Question 111.

Anatomically fairly old dicotyledonous root is distinguished from the dicotyledonous stem by

(A) absence of secondary phloem

(B) presence of cortex

(C) position of protoxylem

(D) absence of secondary xylem

Explanation:

Anatomically fairly old dicotyledonous root is distinguished from the dicotyledonous stem by position of protoxylem. In dicot root the protoxylem is located near

Question 112.

The annular and spirally thickened conducting elements generally develop in the protoxylem when the root or stem is:

(A) elongating

(B) widening

(C) differentiating

(D) maturing

Explanation:

The annular and spirally thickened conducting elements generally develop in the protoxylem when the root or stem is maturing.

Question 113.

In barley stem vascular bundles are:

(A) open and in a ring

(B) closed and radial

(C) open and scattered

(D) closed and scattered

Explanation:

In barley stem, vascular bundles are closed and scattered. They are open only for a hours in the day time and never open at night. e.g. Cereals.

Question 114.

The epithelial tissue present on the inner surface of bronchioles and fallopian tube is:

(A) cuboidal

(B) squamous

(C) ciliated

(D) glandular

Explanation:

Ciliated epithelium has simple columnar epithelial cells, but in addition, they possess fine hair-like outgrowths, cilia, on their free surfaces. These cilia are capa move (flow or stream) in that direction.

Question 115.

The cell junctions called tight, adhering and gap junctions are found in

(A) muscular tissue

(B) neural tissue

(C) connective tissue

(D) epithelial tissue

Explanation:

The cell junctions known as tight, adhering and gap junctions are found in epithelial tissue. Epithelial tissue covers the whole surface of the body. It is made up

Question 116.

The kind of tissue that forms the supportive structure in our pinna (external ears) is also found in:

(A) nails

(B) ear ossicles

(C) tip of the nose

(D) vertebrae

Explanation:

The kind of tissue that forms the supportive structure in our pinna (external ears) is also found in tip of the nose. External pinna is made up of elastic cartilage.

Question 117.

If a live earthworm is pricked with a needle on its outer surface without damaging its gut, the fluid that comes out is:

(A) excretory fluid

(B) slimy mucus

(C) coelomic fluid

(D) haemolymph

Explanation:

If a live earthworm is pricked with a needle on its outer surface without damaging its gut, the fluid that comes out is coelomic fluid because coelomic fluid lies b

Question 118.

Which one of the following correctly describes the location of some body parts in the earthworm *Pheretima*?

(A) Four pairs of spermathecae in 4–7 segments.

(B) One pair of ovaries attached at intersegmental septum of 14th and 15th segments.

(C) Two pairs of accessory glands in 16–18 segments.

(D) Two pairs of testes in 10th and 11th segments.

Explanation:

In *Pheretima* two pairs of testes sacs are situated in the 10th and 11th segments. Each testes sac of the 10th segment encloses a testes and a seminal funnel

Question 119.

Plasmodesmata are:

(A) lignified cemented layers between cells

(B) membranes connecting the nucleus with plasmalemma

(C) connections between adjacent cells

(D) locomotary structures

Explanation:

Plasmodesmata are connections between adjacent cells. Plasmodesmata are narrow channels that act as intercellular cytoplasmic bridges to facilitate commu

Question 120.

Cytoskeleton is made up of:

(A) callose deposits

(B) cellulosic microfibrils

(C) proteinaceous filaments

(D) calcium carbonate granules

Explanation:

The cytoskeleton is made up of three kinds of protein filaments: actin filaments (also called microfilaments), intermediate filaments and microtubules whose ma

Question 121.

Stroma in the chloroplasts of higher plant contains:

(A) light-dependent reaction enzymes

(B) ribosomes

(C) chlorophyll

(D) light-independent reaction enzymes

Explanation:

Stroma in the chloroplasts of higher plant contains light independent reaction enzymes. Within the stroma are stacks of thylakoids, the sub-organelles which ar

Question 122.

Middle lamella is composed mainly of:

(A) muramic acid

(B) calcium pectate

(C) hemicellulose

(D) phosphoglycerides

Explanation:

Middle lamella is mainly composed of calcium pectate. Calcium is deposited in plant cell walls during their formation—it is required for the stability and function

Question 123.

Given below is a schematic break-up of the phases / stages of cell cycle:

Which one of the following is the correct indication of the stage/phase in the cell cycle?



(A) C – Karyokinesis

(B) D – Synthetic phase

(C) B – Metaphase

(D) A – Cytokinesis

Explanation:

In schematic break-up of the phases/ stages of cell cycle, D synthetic phase is the correct indication of the stage/phase in the cell cycle.

Question 124.

Synapsis occurs between:

(A) mRNA and ribosomes

(B) two homologous chromosomes

(C) a male and a female gamete

(D) spindle fibres and centromere

Explanation:

Synapsis is the pairing of two homologous chromosomes that occurs during prophase I (zygotene stage) of meiosis. The two chromosomes move together an

Question 125.

Guard cells help in:

(A) protection against grazing

(B) fighting against infection

(C) transpiration

(D) guttation

Explanation:

Guard cells help in transpiration. Transpiration is the evaporation of water from the aerial parts of plants, especially leaves but also stems, flowers and roots. S

Question 126.

Manganese is required in:

(A) photolysis of water during photosynthesis

(B) plant cell wall formation

(C) chlorophyll synthesis

(D) nucleic acid synthesis

Explanation:

Manganese is essential for many plant functions.

Some of them are:

• The assimilation of carbon dioxide in photosynthesis.

• It is involved in the Hill Reaction where water is split during photosynthesis.

• It aids in the synthesis of chlorophyll and in nitrate assimilation.

• Manganese activates fat forming enzymes.

• It functions in the formation of riboflavin, ascorbic acid, and carotene.

• It functions in electron transport during photosynthesis.

Question 127.

Which of the following is a symbiotic nitrogen fixer?

(A) Azotobacter

(B) Frankia

(C) Azolla

(D) Glomus

Explanation:

Frankia is a symbiotic nitrogen fixer in root nodules of several non-legume plants like Casuarina and Alnus.

Question 128.

Oxygenic photosynthesis occurs in:

(A) Chromatium

(B) Chlorobium

(C) Rhodospirillum

(D) Oscillatoria

Explanation:

Oxygenic photosynthesis occurs in Oscillatoria. It is a genus of filamentous cyanobacteria which is named for the oscillation in its movement.

Question 129.

Cyclic photophosphorylation results in the formation of

(A) ATP

(B) ATP, NADPH and O_2

(C) ATP and NADPH

(D) NADPH

Explanation:

Cyclic photophosphorylation results in the formation of ATP. This process is called photophosphorylation, which occurs in two different ways. Adenosine triphos

Question 130.

Aerobic respiratory pathway is appropriately termed:

(A) amphibolic

(B) parabolic

(C) catabolic

(D) anabolic

Explanation:

All energy-releasing pathways whether aerobic (requiring oxygen) or anaerobic (not requiring oxygen) begin with a pathway called glycolysis, which occurs in t

Question 131.

One of the synthetic auxin is:

(A) NAA

(B) IBA

(C) GA

(D) IAA

Explanation:

NAA is a synthetic auxin. Some of the most widely used weed killers are synthetic auxins. Synthetic auxin analogs include 1–naphthaleneacetic acid (NAA), 2,

Question 132.

Which one of the following acids is a derivative of carotenoids?

(A) Abscisic acid

(B) Indole butyric acid

(C) Gibberellic acid

(D) Indole-3-acetic acid

Explanation:

Abscisic acid (ABA), also known as abscisin II and dormin, is a plant hormone. It functions in many plant developmental processes, including bud dormancy. A another group was calling it “dormin” because they thought it had a major role in bud dormancy. The name abscisic acid (ABA) was coined as a compromise b

Question 133.

Synapsis occurs between:

(A) mRNA and ribosomes

(B) two homologous chromosomes

(C) spindle fibres and centromere

(D) a male and a female gamete

Explanation:

Synapsis is the pairing of two homologous chromosomes that occurs during prophase I (zygotene stage) of meiosis. The two chromosomes move together an

Question 134.

A young infant may be feeding entirely on mothers milk which is white in colour but the stools which the infant passes out is quite yellowish. What is this yellow

(A) bile pigments passed through bile juice

(B) undigested milk protein casein

(C) pancreatic juice poured into duodenum

(D) intestinal juice

Explanation:

Young infant may be feeding entirely on mother's milk which is white in colour but the stools which the infant passes out is quite yellowish because of the bile p
Bile pigment is produced regularly when old red blood cells are broken down, mainly by the spleen. In some blood-disorders where the red cells are destroyed

Question 135.

Which one of the following statements is true regarding digestion and absorption of food in humans?

(A) Fructose and amino acids are absorbed through intestinal mucosa with the help of carrier ions like Na^+.

(B) Chylomicrons are small lipoprotein particles that are transported from intestine into blood capillaries.

(C) Oxyntic cells in our stomach secrete the proenzyme pepsinogen.

(D) About 60% of starch is hydrolysed by salivary amylase in our mouth.

Explanation:

Fructose and amino acids are absorbed through intestinal mucosa with the help of carrier ions like Na^+. Carbohydrates are absorbed as monosaccharides (sir
that can be hydrolyzed to two monosaccharides). These simpler molecules, however, must be obtained by the breaking down of polysaccharides, complex car

Question 136.

Which one of the following pairs of food components in humans reaches the stomach totally undigested?

(A) Starch and fat

(B) Fat and cellulose

(C) Starch and cellulose

(D) Protein and starch

Explanation:

Fat and cellulose is the pair of food components in human that reaches the stomach totally undigested.

Question 137.

When breast feeding is replaced by less nutritive food low in proteins and calories; the infants below the age of one year are likely to suffer from:

(A) Rickets

(B) Kwashiorkor

(C) Pellagra

(D) Marasmus

Explanation:

If breast feeding is replaced by less nutritive food low in proteins and calories; the infants below the age of one year are likely to suffer from Marasmus. It is a f natural calamities, or during political unrest. These conditions are responsible for a lack of food, which leads to malnutrition.

Question 138.

The most popularly known blood grouping is the ABO grouping. It is named ABO and not ABC, because “O” in it refers to having:

(A) overdominance of this type on the genes for A and B types.

(B) one antibody only - either anti-A or anti-B on the RBC.

(C) no antigens A and B on RBCs.

(D) other antigens besides A and B on RBCs.

Explanation:

The ABO blood group system is the most important blood type system (or blood group system) in human blood transfusion. It is named ABO and not ABC, bec anti-A antibodies and anti-B antibodies against the A and B blood group antigens. Therefore, a group O individual can receive blood only from a group O indivi

Question 139.

Compared to blood our lymph has:

(A) plasma without proteins

(B) more WBCs and no RBCs

(C) more RBCs and less WBCs

(D) no plasma

Explanation:

Lymph is a mobile connective tissue comprising lymph plasma and lymph corpuscles. Its composition is just like blood plasma except that it lacks RBCs and la

Question 140.

There is no DNA in:

(A) mature RBCs

(B) a mature spermatozoan

(C) hair root

(D) an enucleated ovum

Explanation:

Red blood cells are the most common type of blood cell and delivering oxygen to the body tissues via the blood. There is no DNA in mature RBC. The reticulo

Question 141.

Globulins contained in human blood plasma are primarily involved in:

(A) oxygen transport in the blood.

(B) osmotic balance of body fluids.

(C) clotting of blood.

(D) defence mechanisms of body.

Explanation:

Globulins contained in human blood plasma are primarily involved in defence mechanism of body. Globulin is one of the two types of serum proteins, the other

Question 142.

In a standard ECG which one of the following alphabets is the correct representation of the respective activity of the human heart?

(A) S - start of systole

(B) T - end of diastole

(C) R - repolarisation of ventricles

(D) P - depolarisation of the atria

Explanation:

In a standard ECG, the P-wave is a small upward wave that indicates the depolarisation of the atria. This is caused by the activation of SA node.

Question 143.

Uric acid is the chief nitrogenous component of the excretory products of:

(A) earthworm

(B) cockroach

(C) frog

(D) man

Explanation:

Uric acid is the chief nitrogenous component of the excretory product of cockroach. Animals which live in dry conditions have to conserve water in their bodies include insects, reptiles and birds.

Question 144.

What will happen if the stretch receptors of the urinary bladder wall are totally removed?

(A) Urine will continue to collect normally in the bladder

(B) Urine will not collect in the bladder

(C) Micturition will continue

(D) There will be no micturition

Explanation:

Sensory stretch receptors are responsible for the stretch reflex. If these are removed then autonomic nervous system control will not be there and micturition w

Question 145.

Which one of the following is the correct matching of three items and their grouping category?

Option	Items
(a)	ilium, ischium, pubis
(b)	actin, myosin, rhodopsin
(c)	cytosine, uracil, thiamine
(d)	malleus, incus, cochlea

(A) cytosine, uracil, thiamine – pyrimidines

(B) actin, myosin, rhodopsin – muscle proteins

(C) malleus, incus, cochlea – ear ossicles

(D) ilium, ischium, pubis – coxal bones of pelvic girdle

Explanation:

The pelvic girdle is formed by two innominate bones consists of three separate bones ilium, ischium and the pubis.

Question 146.

Elbow joint is an example of:

(A) hinge joint

(B) gliding joint

(C) ball and socket joint

(D) pivot joint

Explanation:

Elbow joint is an example of hinge joint. The elbow is a hinge joint; it can open and close like a door. Hinge joint is a form of diarthrosis (freely movable joint) th

Question 147.

Which part of human brain is concerned with the regulation of body temperature?

(A) Cerebrum

(B) Cerebellum

(C) Hypothalamus

(D) Medulla Oblongata

Explanation:

Hypothalamus part of human brain is concerned with the regulation of body temperature. The hypothalamus is a portion of the brain that contains a number of

Question 148.

Alzheimer disease in humans is associated with the deficiency of:

(A) acetylcholine

(B) glutamic acid

(C) dopamine

(D) gamma aminobutyric acid (GABA)

Explanation:

Alzheimer disease in humans is associated with the deficiency of acetylcholine. Acetylcholine is the neurotransmitter produced by neurons referred to as cholin choline and acetyl coenzyme-A through the action of the enzyme choline acetyltransferase and becomes packaged into membrane-bound vesicles.

Question 149.

A health disorder that results from the deficiency of thyroxine in adults and characterised by (i) a low metabolic rate, (ii) increase in body weight and (iii) tenden

(A) simple goitre

(B) myxoedema

(C) cretinism

(D) hypothyroidism

Explanation:

Myxoedema is caused by deficiency of thyroid hormone or thyroxine in adults. It is characterised by increase in body weight, puffy appearance, low metabolic

Question 150.

Vegetative propagation in mint occurs by:

(A) offset

(B) rhizome

(C) sucker

(D) runner

Explanation:

Vegetative propagation in mint occurs through sucker. Vegetative reproduction is a type of asexual reproduction for plants, and is also called vegetative propag

Question 151.

A fruit developed from hypanthodium inflorescence is called

(A) Sorosis

(B) Syconus

(C) Caryopsis

(D) Hesperidium

Explanation:

The fig (*Syconus*) is an aggregate fruit, consisting of numerous seed-like pericarps enclosed within a hollow, fleshy receptacle where the flowers were attach

Question 152.

Cotyledons and testa respectively are edible parts in

(A) walnut and tamarind

(B) french bean and coconut

(C) cashew nut and litchi

(D) groundnut and pomegranate

Explanation:

Cotyledons and testa respectively are edible parts in groundnut and pomegranate. A cotyledon is a significant part of the embryo within the seed of a plant. Up

Question 153.

An example of a seed with endosperm, perisperm, and caruncle is

(A) coffee

(B) lily

(C) cotton

(D) castor

Explanation:

An example of a seed with endosperm, perisperm, and caruncle is castor. Castor seed is the source of castor oil, which has a wide variety of uses. The seeds

Question 154.

Seminal plasma in humans is rich in

(A) fructose and calcium but has no enzymes

(B) glucose and certain enzymes but has no calcium

(C) fructose and certain enzymes but poor in calcium

(D) fructose, calcium and certain enzymes

Explanation:

Human seminal plasma is a complex mixture of proteins, glycoproteins, peptides, glycolipids, and prostaglandins secreted by organs of the male reproductive implantation of the human embryo. Seminal plasma in humans is rich in fructose, calcium and certain enzymes.

Question 155.

Given below is a diagrammatic sketch of a portion of human male reproductive system. Select the correct set of the names of the parts labelled A, B, C, D.



(A) ureter (A); seminal vesicle (B); prostate (C); bulbourethral gland (D).

(B) ureter (A); prostate (B); seminal vesicle (C); bulbourethral gland (D).

(C) vas deferens (A); seminal vesicle (B); bulbourethral gland (C); prostate (D).

(D) vas deferens (A); seminal vesicle (B); prostate (C); bulbourethral gland (D).

Explanation:

The human male reproductive system consists of a number of sex organs that are a part of the human reproductive process. In diagram of human, the point in

Question 156.

Which one of the following is the correct matching of the events occurring during menstrual cycle?

(A) Ovulation: LH and FSH attain peak level and sharp fall in the secretion of progesterone.

(B) Menstruation: Breakdown of myometrium and ovum not fertilised.

(C) Development of corpus luteum : Secretory phase and increased secretion of progesterone.

(D) Proliferative phase: Rapid regeneration of myometrium and maturation of Graafian follicle.

Explanation:

The corpus luteum is essential for establishing and maintaining pregnancy in females. In the ovary, the corpus luteum secretes estrogens and progesterone, w

Question 157.

Which one of the following is the most likely root cause why menstruation is not taking place in regularly cycling human female?

(A) maintenance of the hypertrophical endometrial lining

(B) fertilisation of the ovum

(C) retention of well-developed corpus luteum

(D) maintenance of high concentration of sex hormones in the blood stream

Explanation:

Fertilization of ovum is the most likely root cause when menstruation is not taking place in regularly cycling human female. In order for fertilization to occur, one until it reaches the uterus. When it arrives, it attaches itself to the lining of the uterus and continues to grow. If the ovum is not fertilized it will die and the proge "period".

Question 158.

Foetal ejection reflex in human female is induced by

(A) release oxytocin from pituitary

(B) fully developed foetus and placenta

(C) differentiation of mammary glands

(D) pressure exerted by amniotic fluid

Explanation:

Foetal ejection reflex in human female is induced by fully developed foetus and placenta. When a woman is in a lithotomy or semi-sitting position, The Foetal E

Question 159.

A change in the amount of yolk and its distribution in the egg will affect

(A) pattern of cleavage

(B) number of blastomeres produced

(C) formation of zygote

(D) fertilization

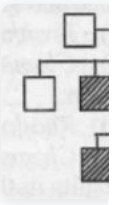
Explanation:

A change in the amount of yolk and its distribution in the egg will affect pattern of cleavage. The pattern of cleavage is influenced by the amount of yolk in the e unequal; the cells derived from the yolky region (the vegetal pole) are larger than those derived from the region without yolk (the animal pole).

Question 160.

Study the pedigree chart given below:

What does it show?



(A) The pedigree chart is wrong as this is not possible

(B) Inheritance of a condition like phenylketonuria as an autosomal recessive trait

(C) Inheritance of a recessive sex-linked disease like haemophilia

(D) Inheritance of a sex-linked inborn error of metabolism like phenylketonuria

Explanation:

The chart shows the inheritance of a condition like phenylketonuria as an autosomal recessive trait. Parents need to be heterozygous as two of their children a

Question 161.

The genetic defect - Adenosine deaminase (ADA) deficiency may be cured permanently by:

(A) introducing bone marrow cells producing ADA into cells at early embryonic stages.

(B) enzyme replacement therapy.

(C) periodic infusion of genetically engineered lymphocytes having functional ADA cDNA.

(D) administering adenosine deaminase activators.

Explanation:

By introducing bone marrow cells producing ADA into cells at early embryonic stages, the genetic defect adenosine deaminase (ADA) deficiency may be cured

Question 162.

Sickle cell anaemia is:

(A) caused by a change in a single base pair of DNA

(B) caused by substitution of valine by glutamic acid in the beta globin chain of haemoglobin

(C) characterized by elongated sickle like RBCs with a nucleus

(D) an autosomal linked dominant trait

Explanation:

Sickle cell anaemia is caused by a change in a single base pair of DNA. Sickle cell anaemia is controlled by a single pair of alleles, Hb^A and Hb^s and the genot assume an abnormal, rigid, sickle shape. Sickling decreases the cells flexibility and results in a risk of various complications.

Question 163.

Select the incorrect statement from the following:

(A) Small population size results in random genetic drift in a population

(B) Galactosemia is an inborn error of metabolism

(C) Baldness is a sex-limited trait

(D) Linkage is an exception to the principle of independent assortment in heredity

Explanation:

Baldness is a sex influenced trait. The dominance of alleles may differ in heterozygotes of the two sexes.

Question 164.

Point mutation involves:

(A) duplication

(B) change in single base pair

(C) insertion

(D) deletion

Explanation:

A point mutation is a simple change in one base of the gene sequence. This is equivalent to changing one letter in a sentence, such as in this example, where

Original: The fat cat ate the wee rat.

Point Mutation: The fat hat ate the wee rat.

Question 165.

T.O. Diener discovered a:

(A) bacteriophage

(B) infectious protein

(C) free infectious DNA

(D) free infectious RNA

Explanation:

Theodor O. Diener discovered the Potato Spindle Tuber Viroid (“PSTVd”), the first viroid ever identified, in 1971. PSTVd is a small, circular RNA molecule. Dr.

Question 166.

What is not true for genetic code?

(A) It is degenerate

(B) It is nearly universal

(C) It is unambiguous

(D) A codon in mRNA is read in a non contiguous fashion

Explanation:

The genetic code consists of 64 triplets of nucleotides. These triplets are called codons. With three exceptions, each codon encodes for one of the 20 amino a be expressed as either RNA codons or DNA codons.

Question 167.

Removal of introns and joining the exons in a defined order in a transcription unit is called:

(A) tailing

(B) transformation

(C) capping

(D) splicing

Explanation:

Splicing is the removal of introns and joining the exons in a defined order in a transcription unit. In molecular biology, splicing is a modification of RNA after tran

Question 168.

Whose experiments cracked the DNA and discovered unequivocally that a genetic code is a ‘triplet’.

(A) Hershey and Chase

(B) Morgan and Sturtevant

(C) Nirenberg and Matthaei

(D) Beadle and Tatum

Explanation:

Nirenberg and Matthaei (1961) experimentally proved that a single amino acid is determined by a sequence of three nitrogen bases. The sequence of three nit code is a triplet.

Question 169.

Semi-conservative replication of DNA was first demonstrated in:

(A) Escherichia coli

(B) Streptococcus pneumoniae

(C) Salmonella typhimurium

(D) Drosophila melanogaster

Explanation:

Semiconservative replication of DNA was first demonstrated in *Escherichia coli*. *E. coli* is a common type of bacteria that can get into food, like beef and vegeta and digest the food you eat.

Question 170.

Peripatus is a connecting link between:

(A) Mollusca and Echinodermata

(B) Annelida and Arthropoda

(C) Coelenterata and Porifera

(D) Ctenophora and Platyhelminthes

Explanation:

Peripatus is a genus of Onychophora (Velvet worms). It is said to be a living fossil because it has been unchanged for approximately 570 million years. *Peripat* ejects from two antennae near its head. The fluid hardens on contact with the air and then the prey becomes immobilized.

Question 171.

In the case of peppered moth (Biston betularia) the black-coloured form became dominant over the light-coloured form in England during industrial revolution.

(A) appearance of the darker coloured individuals due to very poor sunlight

(B) protective mimicry

(C) inheritance of darker colour character acquired due to the darker environment

(D) natural selection whereby the darker forms were selected

Explanation:

In the case of peppered moth (Biston betularia) the black coloured form became dominant over the light coloured form in England during industrial revolution. T

Question 172.

A person likely to develop tetanus is immunised by administering

(A) preformed antibodies

(B) wide spectrum antibiotics

(C) dead germs

(D) weakened germs

Explanation:

Tetanus toxoid is a vaccine consisting of growth products of *Clostridium tetani* treated with formaldehyde serving as an active immunising agent. Hence it is we
the mid-1940s, tetanus vaccine was combined with diphtheria toxoid and inactivated pertussis vaccine to make the combination DTP vaccine for routine childh

Question 173.

The letter T in T-lymphocyte refers to

(A) Thalamus

(B) Tonsil

(C) Thymus

(D) Thyroid

Explanation:

The letter T in T-lymphocyte refers to thymus. In human anatomy, the thymus is an organ located in the upper anterior portion of the chest cavity just behind th

Question 174.

Use of anti-histamines and steroids give a quick relief from

(A) nausea

(B) cough

(C) headache

(D) allergy

Explanation:

The use of anti-histamines and steroids gives a quick relief from headache. Antihistamines are drugs that block the action of histamine (a compound released

Question 175.

Which of the following is a pair of viral diseases?

(A) Dysentery, common cold

(B) Common cold, AIDS

(C) yphoid, tuberculosis

(D) Ringworm, AIDS

Explanation:

Common Cold, AIDS is a pair of viral diseases. Viruses are a very common type of infectious disease. Viruses are the smallest life-form existing, since they ar
host cells.

Question 176.

Which one of the following statements is correct?

(A) Heroin accelerates body functions.

(B) Benign tumours show the property of metastasis.

(C) Malignant tumours occurs may exhibit metastasis.

(D) Patients who have undergone surgery are given cannabinoids to relieve pain.

Explanation:

Malignant tumours may exhibit metastasis. Cancer (medical term: malignant neoplasm) is a class of diseases in which a group of cells display uncontrolled gro
lymph or blood.

Question 177.

Which of the following is not used as a biopesticide?

(A) Trichoderma harzianum

(B) Nuclear Polyhedrosis Virus (NPV)

(C) Xanthomonas campestris

(D) Bacillus thuringiensis

Explanation:

Xanthomonas campestris is not used as a biopesticide. *Xanthomonas campestris* is a plant pathogen that causes black rot in cotton plants.

Question 178.

Which of the following plant species you would select for the production of bioethanol?

(A) Brassica

(B) Jatropha

(C) Zea mays

(D) Pongamia

Explanation:

Jatropha is useful for production of bioethanol. *Jatropha* is a genus of approximately 175 succulent plants, shrubs and trees (some are deciduous, like *Jatroph*
Jatropha curcas seeds is used for making biodiesel fuel in Philippines and in Brazil, where it grows naturally and in plantations in the southeast, and the north/

Question 179.

Somaclones are obtained by

(A) plant breeding

(B) irradiation

(C) tissue culture

(D) genetic engineering

Explanation:

Genetic variation present among plant cells during tissue culture is called somaclonal variation. The term somaclonal variation is also used for the genetic varia yield, better quality etc.

Question 180.

Which one of the following pairs is wrongly matched?

(A) Alcohol – nitrogenase

(B) Fruit juice – pectinase

(C) Textile – amylase

(D) Detergents – lipase

Explanation:

Alcohol and nitrogenase pair is wrongly matched. Ethanol produces alcohol.

Question 181.

Polyethylene glycol method is used for

(A) biodiesel production

(B) seedless fruit production

(C) energy production from sewage

(D) gene transfer without a vector

Explanation:

gene transfer without a vector

Question 182.

Which one of the following is commonly used in transfer of foreign DNA into crop plants?

(A) Trichoderma harzianum

(B) Agrobacterium tumefaciens

(C) Penicillium expansum

(D) Meloidogyne incognita

Explanation:

Agrobacterium tumefaciens is the causal agent of crown gall disease (the formation of tumours) in over 140 species of dicot. This disease is caused by a DNA to form transgenic plant.

Question 183.

What is true about Bt toxin?

(A) Bt protein exists as active toxin in the Bacillus

(B) The activated toxin enters the ovaries of the pest to sterilise it and thus prevent its multiplication.

(C) The concerned Bacillus has antitoxins.

(D) The inactive protoxin gets converted into active form in the insect gut.

Explanation:

The inactive protoxin gets converted into active form in the insect gut.

Question 184.

The bacterium *Bacillus thuringiensis* is widely used in contemporary biotechnology as

(A) indicator of water pollution

(B) agent for production of dairy products

(C) source of industrial enzyme

(D) insecticide

Explanation:

The bacterium *Bacillus thuringiensis* is widely used in contemporary biology as insecticide. *Bacillus thuringiensis* (also known as Bt) is a Gram-positive, soil dw

Question 185.

Transgenic plants are the ones:

(A) generated by introducing foreign DNA into a cell and regenerating a plant from that cell.

(B) produced after protoplast fusion in artificial medium.

(C) produced by a somatic embryo in artificial medium.

(D) grown in artificial medium after hybridization in the field.

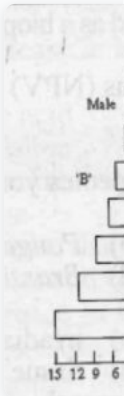
Explanation:

Transgenic plants are the ones generated by introducing foreign DNA into a cell and regenerating a plant from that cell.

Question 186.

A country with a high rate of population growth took measures to reduce it. The Figure below shows age-sex pyramids of populations A and B twenty years apa

Select the correct interpretation about them: Interpretations:



(A) “B” is earlier pyramid and shows stabilised growth rate.

(B) “B” is more recent showing that population is very young.

(C) “A” is the earlier pyramid and no change has occurred in the growth rate.

(D) “A” is more recent and shows slight reduction in the growth rate.

Explanation:

'A' is more recent and shows slight reduction in growth rate.

Question 187.

The correct sequence of plants in a hydrosere is:

(A) Volvox → Hydrilla → Pistia → Scirpus → Lantana → Oak

(B) Pistia → Volvox → Scirpus → Hydrilla → Oak → Lantana

(C) Oak → Lantana → Volvox → Hydrilla → Pistia → Scirpus

(D) Oak → Lantana → Scirpus → Pistia → Hydrilla → Volvox

Explanation:

Volvox → Hydrilla → Pistia → Scirpus → Lantana → Oak

Question 188.

Which one of the following types of organisms occupy more than one trophic level in a pond ecosystem?

(A) Zooplankton

(B) Fish

(C) Frog

(D) Phytoplankton

Explanation:

Fish

Question 189.

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

(A) Mango

(B) Wheat

(C) Tea

(D) Teak

Explanation:

Wheat

Question 190.

Steps taken by the Government of India to control air pollution include:

(A) compulsory PUC (Pollution Under Control) certification of petrol driven vehicles which tests for carbon monoxide and hydrocarbons.

(B) permission to use only pure diesel with a maximum of 500 ppm sulphur as fuel for vehicles.

(C) compulsory mixing of 20% ethyl alcohol with petrol and 20% biodiesel with diesel.

(D) use of non-polluting Compressed Natural Gas (CNG) only as fuel by all buses and trucks.

Explanation:

compulsory PUC (Pollution Under Control) certification of petrol driven vehicles which tests for carbon monoxide and hydrocarbons.

Question 191.

Biochemical Oxygen Demand (BOD) in a river water

(A) has no relationship with concentration of oxygen in the water.

(B) gives a measure of Salmonella in the water.

(C) remains unchanged when algal bloom occurs.

(D) increases when sewage gets mixed with river water.

Explanation:

Biochemical Oxygen Demand (BOD) in a river water increases when sewage gets mixed with river water. Bio - chemical oxygen demand or biological oxygen

It is used in water quality management and assessment, ecology and environmental science.

Question 192.

DDT residues are rapidly passed through food chain causing biomagnification because DDT is

(A) moderately toxic

(B) non-toxic to aquatic animals

(C) water soluble

(D) lipo soluble

Explanation:

lipo soluble

Question 193.

Global agreement in specific control strategies to reduce the release of ozone depleting substances, was adopted by

(A) The Montreal Protocol

(B) The Kyoto Protocol

(C) The Vienna Convention

(D) Rio de Janeiro Conference

Explanation:

The Montreal Protocol

Question 194.

Montreal protocol aims at

(A) Control of water pollution

(B) Biodiversity conservation

(C) Control of CO_2 emission

(D) Reduction of ozone depleting substances

Explanation:

The aim of Montreal protocol was to protect the ozone layer in the stratosphere by decreasing and eventually eliminating the use of ozone depleting substance

Question 195.

Chipko movement was launched for the protection of

(A) forests

(B) livestock

(C) wet lands

(D) grasslands

Explanation:

forests

Question 196.

Tiger is not a resident in which one of the following national park?

(A) Sunderbans

(B) Gir

(C) Jim Corbett

(D) Ranthambhor

Explanation:

Gir

Question 197.

The correct sequence of spermatogenetic stages leading to the formation of sperms in a mature human testis is:

(A) Spermatogonia → spermatid → spermatocyte → sperms

(B) Spermatocyte → spermatogonia → spermatid → sperms

(C) Spermatid → spermatocyte → spermatogonia → sperms

(D) Spermatogonia → spermatocyte → spermatid → sperms

Explanation:

Spermatogonia → spermatocyte → spermatid → sperms

Question 198.

Which one of the following is considered important in the development of seed habit?

(A) Free-living gametophyte

(B) Dependent sporophyte

(C) Heterospory

(D) Haplontic life cycle

Explanation:

Development of heterospory or formation of two types of spores is important for the development of seed habit. The two types of spores are smaller male ormi

Question 199.

Which of the following is a symbiotic nitrogen fixer?

(A) Azolla

(B) Azotobacter

(C) Glomus

(D) Frankia

Explanation:

Frankia

Question 200.

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

(A) Tea

(B) Teak

(C) Mango

(D) Wheat

Explanation:

Genetic diversity is the diversity in the number and types of genes as well as chromosomes present in different species and the variation in the genes and thei