Code - ❍

ANSWERS & HINT
for
WBJEE - 2018
SUB : PHYSICS & CHEMISTRY

PHYSICS

CATEGORY - I (Q1 to Q30)

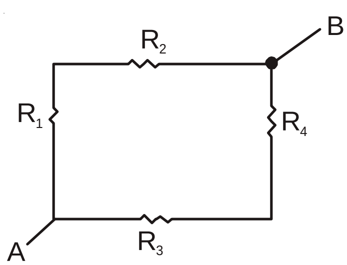
Carry 1 mark each and only one option is correct. In case of incorrect answer or any combination of more than one answer, ¼ marks will be deducted.

1. Four resistors 100 Ω, 200 Ω, 300 Ω and 400 Ω are connected to form four sides of a square. The resistors can be connected in any order. What is the maximum possible equivalent resistance across the diagonal of the square ?

(A) 210 Ω (B) 240 Ω (C) 300 Ω (D) 250 Ω

Ans : (D)

Hint :

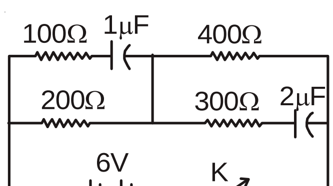


$R_{AB} = \frac{(R_1+R_2)(R_3+R_4)}{(R_1+R_2+R_3+R_4)}$. As $\sum R_i = \text{const.}$, for R_{AB} = maximum, $R_1 + R_2 = R_3 + R_4$

∴ The only possible combination is 100 + 400 = 200 + 300

∴ $(R_{AB})_{max} = 500/2 = 250\ \Omega$

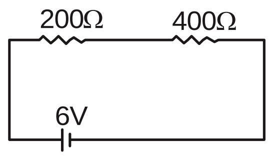
2. What will be current through the 200 Ω resistor in the given circuit a long time after the switch 'K' is made on ?



(A) Zero (B) 100 mA (C) 10 mA (D) 1 mA

Ans : (C)

Hint : Arms having capacitances will not conduct in steady state

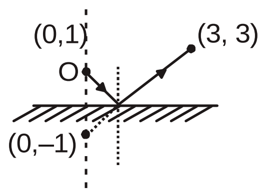
∴ The circuit reduces to 

$\therefore i = \frac{6}{600} = 10\text{mA}$

3. A point source is placed at co-ordinates (0, 1) in X-Y plane. A ray of light from the source is reflected on a plane mirror placed along the X-axis and perpendicular to the X-Y plane. The reflected ray passes through the point (3, 3). What is the path length of the ray from (0,1) to (3, 3) ?

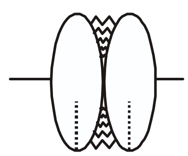
(A) 5 (B) $\sqrt{13}$ (C) $2\sqrt{3}$ (D) $1+2\sqrt{3}$

Ans : (A)

Hint : 

Path length = $\sqrt{(3-0)+(3-(-1))^2} = \sqrt{9+16} = \sqrt{25} = 5$

4. Two identical equiconvex lenses, each of focal length 'f' are placed side by side in contact with each other with a layer of water in between them as shown in the figure. If refractive index of the material of the lenses is greater than that of water, how the combined focal length 'F' is related to 'f' ?



(A) F > f (B) $\frac{f}{2} < F < f$ (C) $F < \frac{f}{2}$ (D) F = f

Ans : (B)

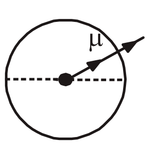
Hint : $\frac{1}{f_{eq}} = \frac{1}{f} - \frac{1}{f'} + \frac{1}{f}$, $F = \frac{ff'}{-f+2f'}$

$\Rightarrow F = \frac{f}{2 - f/f'} \Rightarrow F > \frac{f}{2}$ and $F < f$

5. There is a small air bubble at the centre of a solid glass sphere of radius 'r' and refractive index 'μ'. What will be the apparent distance of the bubble from the centre of the sphere, when viewed from outside ?

(A) r (B) $\frac{r}{\mu}$ (C) $r\left(r - \frac{1}{\mu}\right)$ (D) Zero

Ans : (D)

Hint : 

As the object is at centre, all rays will fall normally on surface, hence will not deviate.

∴ Apparent depth = Real depth

6. If Young's double slit experiment is done with white light, which of the following statements will be true ?
   (A) All the bright fringes wil be coloured.
   (B) All the bright fringes will be white
   (C) The central fringe will be white
   (D) No stable interference pattern will be visible

   Ans : (C)

   Hint : The central fringe will be white as $\Delta x = 0$ at central bright fringe which is independent of λ.

7. How the linear velocity 'v' of an electron in the Bohr orbit is related to its quantum number 'n' ?

   (A) $v \propto \frac{1}{n}$ (B) $v \propto \frac{1}{n^2}$ (C) $v \propto \frac{1}{\sqrt{n}}$ (D) $v \propto n$

   Ans : (A)

   Hint : $mvr = \frac{nh}{2\pi}$, $mv.r_0n^2 = \frac{nh}{2\pi}$, $v \propto \frac{1}{n}$

8. If the half life of a radioactive nucleus is 3 days, nearly what fraction of the initial number of nuclei will decay on the 3rd day ? (Given that $\sqrt[3]{0.25} \approx 0.63$)

   (A) 0.63 (B) 0.5 (C) 0.37 (D) 0.13

   Ans : (D)

   Hint : $N = \frac{N_0}{2^{t/t_{1/2}}}$ $\therefore t_{1/2} = 3$ days

   At t = 2 days; $N_1 = \frac{N_0}{2^{2/3}} = \frac{N_0}{4^{1/3}} = 0.63N$

   At t = 3 day, $N_2 = \frac{N_0}{2}$, Fraction disintegrated = $\frac{N_1 - N_2}{N_0} = \frac{(0.63 - 0.5)N_0}{N_0} = 0.13$

9. An electron accelerated through a potential of 10,000 V from rest has a de-Broglie wave length 'λ'. What should be the accelerating potential so that the wave length is doubled ?

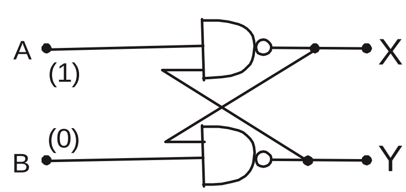
   (A) 20,000 V (B) 40,000 V (C) 5,000 V (D) 2,500 V

   Ans : (D)

   Hint : As $\lambda \propto \frac{1}{\sqrt{V}}$

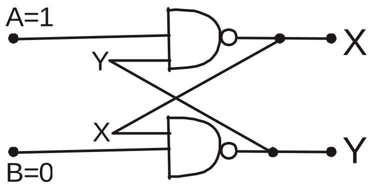
   $\frac{V'}{V} = \frac{1}{4}$, or $V' = \frac{10000}{4} = 2500\,V$

10. In the circuit shown, inputs A and B are in states '1' and '0' respectively. What is the possible stable state of the outputs 'X' and 'Y' ?



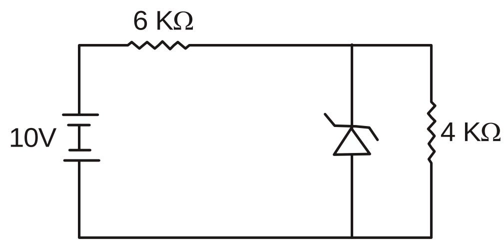
   (A) X = '1', 'Y' = '1' (B) X = '1', 'Y' = '0' (C) X = '0', 'Y' = 1 (D) X = '0', 'Y' = '0'

   Ans : (C)

Hint : 

$X = \overline{AY} = \overline{Y}$, $Y = \overline{BX} = 1$, $\therefore X = 0$

11. What will be the current flowing through the 6 KΩ resistor in the circuit shown, where the breakdown voltage of the zener is 6 V ?



(A) $\frac{2}{3}$mA (B) 1 mA (C) 10 mA (D) $\frac{3}{2}$mA

Ans : (B)

Hint : Since potential difference cross zener diode is 4Ω which is less than its breakdown voltage, therefore it does not conduct.

$$\therefore i = \frac{10}{(6+4)\times 10^3} = 1\,\text{mA}$$

12. In case of a simple harmonic motion, if the velocity is plotted along the X-axis and the displacement (from the equilibrium position) is plotted along the Y-axis, the resultant curve happens to be an ellipse with the ratio :

$$\frac{\text{major axis (along X)}}{\text{minor axis (along Y)}} = 20\pi$$

What is the frequency of the simple harmonic motion ?

(A) 100 Hz (B) 20 Hz (C) 10 Hz (D) $\frac{1}{10}$Hz

Ans : (C)

Hint : $\frac{\omega A}{A} = 20\pi$

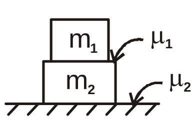
$\therefore \omega = 20\pi = f.2\pi \therefore f = 10$ Hz

13. A block of mass m_2 is placed on a horizontal table and another block of mass m_1 is placed on top of it. An increasing horizontal force $F = \alpha t$ is exerted on the upper block but the lower block never moves as a result. If the co-efficient of friction between the blocks is μ_1 and that between the lower block and the table is μ_2, then what is the maximum possible value of μ_1/μ_2 ?

(A) $\frac{m_2}{m_1}$ (B) $1+\frac{m_2}{m_1}$ (C) $\frac{m_1}{m_2}$ (D) $1+\frac{m_1}{m_2}$

Ans : (B)

Hint : $F = \alpha t$



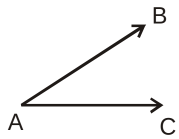
$$\mu_2 (m_1 + m_2)\, g \geq \mu_1 m_1 g, \therefore \frac{\mu_1}{\mu_2} \geq 1+\frac{m_2}{m_1}$$

14. In a triangle ABC, the sides AB and AC are represented by the vectors $3\hat{i}+\hat{j}+\hat{k}$ and $\hat{i}+2\hat{j}+\hat{k}$ respectively. Calculate the angle $\angle ABC$

(A) $\cos^{-1}\sqrt{\frac{5}{11}}$ (B) $\cos^{-1}\sqrt{\frac{6}{11}}$ (C) $\left(90^\circ-\cos^{-1}\sqrt{\frac{5}{11}}\right)$ (D) $\left(180^\circ-\cos^{-1}\sqrt{\frac{5}{11}}\right)$

Ans : (A)

Hint :



$\overrightarrow{AB}=3\hat{i}+\hat{j}+\hat{k}$, $\overrightarrow{AC}=\hat{i}+2\hat{j}+\hat{k}$, $\overrightarrow{AB}+\overrightarrow{BC}=\overrightarrow{AC}$ $\therefore$ $\overrightarrow{BC}=\overrightarrow{AC}-\overrightarrow{AB}$ = $-2\hat{i}+\hat{j}$ $\therefore$ $\angle ABC$ = Angle between $\overrightarrow{BA}$ and $\overrightarrow{BC}$

where $\overrightarrow{BA}$ = $-3\hat{i}-\hat{j}-\hat{k}\left(\overrightarrow{BA}=-\overrightarrow{AB}\right)$

$$\theta = \frac{\cos^{-1}\left[\overrightarrow{BA}\cdot\overrightarrow{BC}\right]}{\left[\left|\overrightarrow{BA}\right|\left|\overrightarrow{BC}\right|\right]} = \cos^{-1}\left[\frac{6-1}{\sqrt{3^2+1^2+1^2}\sqrt{2^2+1^2}}\right] = \cos^{-1}\left[\frac{5}{\sqrt{11}\sqrt{5}}\right] = \cos^{-1}\left[\sqrt{\frac{5}{11}}\right]$$

15. The velocity (v) of a particle (under a force F) depends on its distance (x) from the origin (with x > 0) $v \propto \frac{1}{\sqrt{x}}$. Find how the magnitude of the force (F) on the particle depends on x

(A) $F \propto \frac{1}{x^{\frac{3}{2}}}$ (B) $F \propto \frac{1}{x}$ (C) $F \propto \frac{1}{x^2}$ (D) $F \propto x$

Ans : (C)

Hint : $v \propto \frac{1}{\sqrt{x}}$ $\therefore v = \frac{K}{\sqrt{x}}$

$$F \propto \frac{vdv}{dx} = \frac{K}{\sqrt{x}} \times \frac{-K}{2} x^{-3/2} = \frac{-K^2}{2x^2}, \; F \propto \frac{1}{x^2}$$

16. The ratio of accelerations due to gravity $g_1 : g_2$ on the surfaces of two planets is 5:2 and the ratio of their respective average densities $\rho_1 : \rho_2$ is 2 : 1. What is the ratio of respective escape velocities $v_1 : v_2$ from the surface of the planets ?

(A) 5:2 (B) $\sqrt{5}:\sqrt{2}$ (C) $5:2\sqrt{2}$ (D) 25 : 4

Ans : (C)

Hint : $v_e = \sqrt{2gR}$, $v_e \propto \sqrt{g^2/\rho}$, $\frac{v_1}{v_2} = \sqrt{\frac{25}{8}} = \frac{5}{2\sqrt{2}}$

17. A spherical liquid drop is placed on a horizontal plane. A small disturbance causes the volume of the drop to oscillate. The time period of oscillation (T) of the liquid drop depends on radius (r) of the drop, density (ρ) and surface tension (s) of the liquid. Which among the following will be a possible expression for T (where k is a dimensionless constant) ?

(A) $k\sqrt{\frac{\rho r}{s}}$ (B) $k\sqrt{\frac{\rho^2 r}{s}}$ (C) $k\sqrt{\frac{\rho r^3}{s}}$ (D) $k\sqrt{\frac{\rho r^3}{s^2}}$

Ans : (C)

Hint : $T = kr^a\rho^b s^c$, $T = K[L]^a [ML^{-3}]^b [MT^{-2}]^c$, $[M°L° T^1] = K[M]^{b+c} [L]^{a-3b} [T]^{-2c}$

$-2c = 1$ $\quad$ $b + c = O$ $\quad$ $a - 3b = 0$

$c = -\frac{1}{2}$ $\quad$ $b = -c$ $\quad$ $a = 3b$

$b = \frac{1}{2}$ $\quad$ $a = 3/2$

$T = Kr^{3/2}\rho^{1/2} s^{-1/2} = T = K\sqrt{\frac{r^3\rho}{s}}$

18. The stress along the length of a rod (with rectangular cross section) is 1% of the Young's modulus of its material. What is the approximate percentage of change of its volume ? (Poisson's ratio of the material of the rod is 0.3)

(A) 3% (B) 1% (C) 0.7% (D) 0.4%

Ans : (D)

Hint : $\frac{F}{A} = \frac{1}{100} \times Y$, $Y = \frac{F/A}{\Delta\ell/L}$ $\therefore$ $\frac{\Delta L}{L} = \frac{F/A}{Y} = \frac{1}{100}$,

$\frac{\Delta V}{V} = \frac{2\Delta r}{r} + \frac{\Delta L}{L}$ $\quad\Big|\quad$ $\sigma = -\frac{\Delta r/r}{\Delta L/L}$, $\quad 0.3 = \frac{-\Delta r/r}{1/100}$

$= 2 \times \left(\frac{-0.3}{100}\right) + \frac{1}{100}$ $\quad$ $\frac{0.3}{100} = -\Delta r/r$

$= +\frac{0.4}{100} = 0.4\%$

19. What will be the approximate terminal velocity of a rain drop of diameter 1.8×10^{-3} m, when density of rain water $\approx 10^3$ kgm^{-3} and the co-efficient of viscosity if air $\approx 1.8 \times 10^{-5}$ Nsm^{-2} ? (Neglect buoyancy of air)

(A) 49 ms^{-1} (B) 98 ms^{-1} (C) 392 ms^{-1} (D) 980 ms^{-1}

Ans : (B)

Hint : $\sigma\frac{4}{3}\pi r^3 g = 6\pi\eta rv$, $v = \frac{2}{9}\frac{\sigma r^2 g}{\eta}$, $v = \frac{2}{9} \times \frac{10^3 \times 0.9\times10^{-3} \times 0.9\times10^{-3} \times 9.8}{1.8\times10^{-5}}$, v = 98 m/s

20. The water equivalent of a calorimeter is 10 g and it contains 50 g of water at 15° C. Some amount of ice, initially at –10°C is dropped in it and half of the ice melts till equilibrium is reached. What was the initial amount of ice that was dropped (when specific heat of ice = 0.5 cal gm^{-1} °C^{-1}, specific heat of water = 1.0 cal gm^{-1} °C^{-1} and latent heat of melting of ice = 80 cal gm^{-1}) ?

(A) 10 g (B) 18 g (C) 20 g (D) 30 g

Ans : (C)

Hint : $60 \times 15 \times 1 = m \times 10 \times 0.5 + \frac{m}{2} \times 80$,

$60 \times 15 = m\,[5+40]$, $m = \frac{60\times15}{45} = 20g$

21. One mole of a mono-atomic ideal gas undergoes a quasi-static process, which is depicted by a straight line joining points (V_0, T_0) and $(2V_0, 3T_0)$ in a V-T diagram. What is the value of the heat capacity of the gas at the point (V_0, T_0) ?

(A) R (B) $\frac{3}{2}R$ (C) 2R (D) 0

Ans : (C)

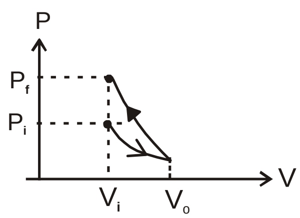
Hint : $C_{process} = C_v + \frac{P}{n}\frac{dV}{dT} = \frac{3R}{2} + \frac{P}{n}\left(\frac{V_o}{2T_o}\right) = \frac{3R}{2} + \frac{R}{2} = 2R$

22. For an ideal gas with initial pressure and volume P_i and V_i, respectively, a reversible isothermal expansion happens, when its volume becomes V_0. Then it is compressed to its original volume V_i by a reversible adiabatic process. If the final pressure is P_f, then which of the following statements is true ?

(A) $P_f = P_i$ (B) $P_f > P_i$ (C) $P_f < P_i$ (D) $\frac{P_f}{V_0} = \frac{P_i}{V_i}$

Ans : (B)

Hint :

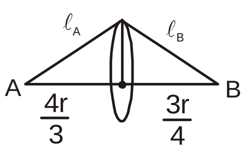


23. A point charge –q is carried from a point A to another point B on the axis of a charged ring of radius 'r' carrying a charge +q. If the point A is at a distance $\frac{4}{3}$r from the centre of the ring and the point B is $\frac{3}{4}$r from the centre but on the opposite side, what is the net work that need to be done for this ?

(A) $-\frac{7}{5}\frac{q^2}{4\pi\varepsilon_o r}$ (B) $-\frac{1}{5}\frac{q^2}{4\pi\varepsilon_o r}$ (C) $\frac{7}{5}\frac{q^2}{4\pi\varepsilon_o r}$ (D) $\frac{1}{5}\frac{q^2}{4\pi\varepsilon_o r}$

Ans : (B)

Hint :

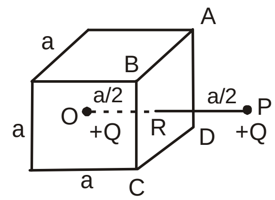


$\ell_A = \frac{5r}{3}$

$\ell_B = \frac{5r}{4}$

$$W = -q\,(V_B - V_A) = -q\left(\frac{Kq}{\ell_B} - \frac{Kq}{\ell_A}\right) = -qKq\left[\frac{4}{5r} - \frac{3}{5r}\right] = \frac{-Kq^2}{5r} = -\frac{1}{5}\left(\frac{q^2}{4\pi\varepsilon_o r}\right)$$

24. Consider a region in free space bounded by the surfaces of an imaginary cube having sides of length 'a' as shown in the diagram. A charge +Q is placed at the centre 'O' of the cube. P is such a point outside the cube that the line OP perpendicularly intersects the surface ABCD at R and also OR = RP = a/2. A charge +Q is placed at point P also. What is the total electric flux through the five faces of the cube other than ABCD ?



(A) $\frac{Q}{\varepsilon_0}$ (B) $\frac{5Q}{6\varepsilon_0}$ (C) $\frac{10Q}{6\varepsilon_0}$ (D) zero

Ans : (A)

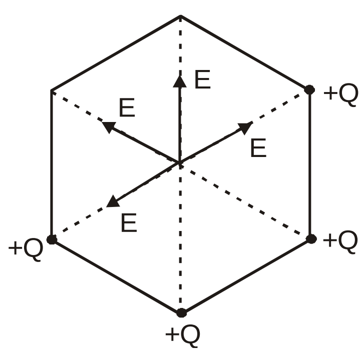
Hint : No net flux with ABCD and net flux through entire cube = $\frac{Q}{\varepsilon_o}$.

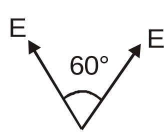
25. Four equal charges of value +Q are placed at any four vertices of a regular hexagon of side 'a'. By suitably choosing the vertices, what can be the maximum possible magnitude of electric field at the centre of the hexagon ?

(A) $\frac{Q}{4\pi\varepsilon_0 a^2}$ (B) $\frac{\sqrt{2}Q}{4\pi\varepsilon_0 a^2}$ (C) $\frac{\sqrt{3}Q}{4\pi\varepsilon_0 a^2}$ (D) $\frac{2Q}{4\pi\varepsilon_0 a^2}$

Ans : (C)

Hint :





$$E_{net} = \sqrt{3}\,E$$

$$= \frac{\sqrt{3}\,Kq}{a^2} = \frac{\sqrt{3}q}{4\pi\varepsilon_o a^2}$$

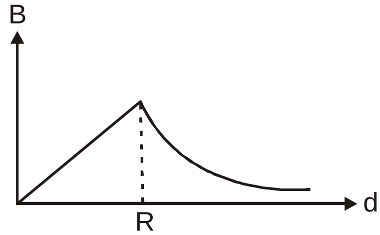
26. A proton of mass 'm' moving with a speed v (<< c, velocity of light in vacuum) completes a circular orbit in time 'T' in a uniform magnetic field. If the speed of the proton is increased to $\sqrt{2}$ v, what will be time needed to complete the circular orbit ?

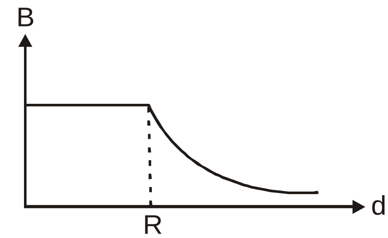
(A) $\sqrt{2}\,T$ (B) T (C) $\frac{T}{\sqrt{2}}$ (D) $\frac{T}{2}$

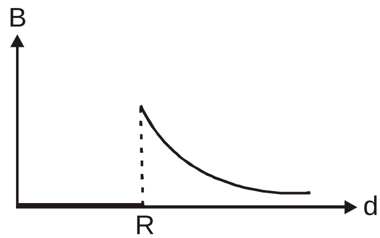
Ans : (B)

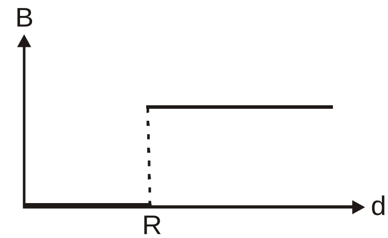
Hint : Time period is independent of velocity. So new time period = T

27. A uniform current is flowing along the length of an infinite, straight, thin, hollow cylinder of radius 'R'. The magnetic field 'B' produced at a perpendicular distance 'd' from the axis of the cylinder is plotted in a graph. Which of the following figures look like the plot ?

(A) 

(B) 

(C) 

(D) 

Ans : (C)

Hint : $B = 0$ $\quad d < R$

$B \; \alpha \; \frac{1}{d}$ $\quad d \geq R$

28. A circular loop of radius 'r' of conducting wire connected with a voltage source of zero internal resistance produces a magnetic field 'B' at its centre. If instead, a circular loop of radius '2r', made of same material, having the same cross section is connected to the same voltage source, what will be the magnetic field at its centre ?

(A) $\frac{B}{2}$ (B) $\frac{B}{4}$ (C) 2B (D) B

Ans : (B)

Hint : $B = \frac{\mu_0 I}{2r}$, $B' = \frac{\mu_0 I'}{2.2r}$, $I = \frac{V}{R}$, $I' = \frac{V}{2R} = \frac{I}{2}$

$B' = \frac{\mu_0 I'}{4x2r} = \frac{B}{4}$

29. An alternating currect is flowing through a series LCR circuit. It is found that the current reaches a value of 1 mA at both 200 Hz and 800 Hz frequency. What is the resonance frequency of the circuit ?

(A) 600 Hz (B) 300 Hz (C) 500 Hz (D) 400 Hz

Ans : (D)

Hint : $f_0 = \sqrt{f_1 f_2} = \sqrt{200 \times 800} = 400 HZ$

30. An electric bulb, a capacitor, a battery and a switch are all in series in a circuit. How does the intensity of light vary when the switch is turned on ?

(A) Continues to increase gradually.

(B) Gradually increases for some time and then becomes steady.

(C) Sharply rises initially and then gradually decreases.

(D) Gradually increases for some time and then gradually decreases.

Ans : (C)

Hint : Initially there will be no voltage drop across capacitor so intensity of bulb will rise sharply and gradually voltage drop across capacitor will increase as a result voltage drop across bulb decreases so intensity of bulb will decreases

Category II (Q31 to Q 35)

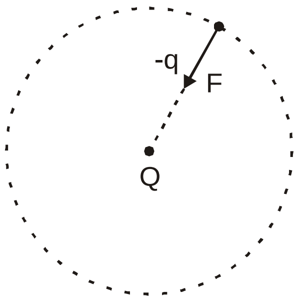
Carry 2 marks each and only one option is correct. In case of incorrect answer or any combination of more than one answer, ½ mark will be deducted.

31. A light charged particle is revolving in a circle of radius ‘r’ in electrostatic attraction of a static heavy particle with opposite charge. How does the magnetic field ‘B’ at the centre of the circle due to the moving charge depend on ‘r’ ?

(A) $B \alpha \frac{1}{r}$ (B) $B \alpha \frac{1}{r^2}$ (C) $B \alpha \frac{1}{r^{\frac{3}{2}}}$ (D) $B \alpha \frac{1}{r^{\frac{5}{2}}}$

Ans : (D)

Hint :

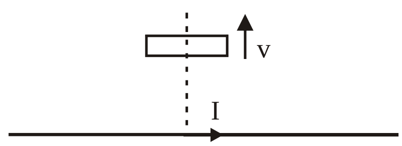


$$F = \frac{mv^2}{r} \Rightarrow \frac{KqQ}{r^2} = \frac{mv^2}{r} = m\omega^2 r$$

$$\therefore \omega \ \alpha \ \frac{1}{r^{3/2}}$$

$\therefore$ equivalent current, $i = \frac{q\omega}{2\pi} \ \alpha \ \omega \ \alpha \ \frac{1}{r^{3/2}}$, $B = \frac{\mu_0 i}{2r} \ \alpha \ \frac{1}{r^{5/2}}$

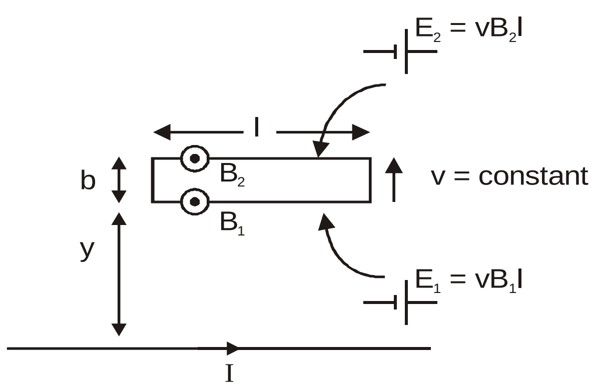
32. As shown in the figure, a rectangular loop of a conducting wire is moving away with a constant velocity ‘v’ in a perpendicular direction from a very long straight conductor carrying a steady current ‘I’. When the breadth of the rectangular loop is very small compared to its distance from the straight conductor, how does the e.m.f. ‘E’ induced in the loop vary with time ‘t’ ?



(A) $E \alpha \frac{1}{t^2}$ (B) $E \alpha \frac{1}{t}$ (C) $E \alpha -1n(t)$ (D) $E \alpha \frac{1}{t^3}$

Ans : (A)

Hint :



$E_{loop} = E_1 - E_2$

$= vl(B_1 - B_2)$

$= vl\left(\frac{\mu_0 I}{2\pi y} - \frac{\mu_0 I}{2\pi(y+b)}\right)$

$= vl\,\frac{\mu_0 I}{2\pi}\,\frac{b}{y(y+b)}$

$\therefore$ as $b << y$,

$E_{loop}\ \alpha\ \frac{1}{y^2}$

and as v = const , assuming the loop started from y = 0 at t = 0, y = vt at a time ‘t’

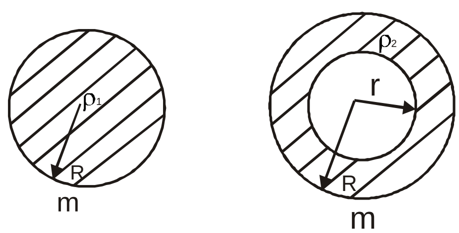
$E_{100p}\ \alpha\ \frac{1}{t^2}$

33. A solid spherical ball and a hollow spherical ball of two different materials of densities ρ_1 and ρ_2 respectively have same outer radii and same mass. What will be the ratio the moment of inertia (about an axis passing through the centre) of the hollow sphere to that of the solid sphere ?

(A) $\frac{\rho_2}{\rho_1}\left(1-\frac{\rho_2}{\rho_1}\right)^{\frac{5}{3}}$ (B) $\frac{\rho_2}{\rho_1}\left[1-\left(1-\frac{\rho_2}{\rho_1}\right)^{\frac{5}{3}}\right]$ (C) $\frac{\rho_2}{\rho_1}\left(1-\frac{\rho_1}{\rho_2}\right)^{\frac{5}{3}}$ (D) $\frac{\rho_2}{\rho_1}\left[1-\left(1-\frac{\rho_1}{\rho_2}\right)^{\frac{5}{3}}\right]$

Ans : (D)

Hint :



$\therefore\ m = \rho_1 \frac{4}{3}\pi R^3 = \rho_2 \frac{4}{3}\pi (R^3 - r^3)$

$\therefore\ \frac{\rho_1}{\rho_2} = 1 - \left(\frac{r}{R}\right)^3 \Rightarrow \frac{r}{R} = \left(1-\frac{\rho_1}{\rho_2}\right)^{1/3}$

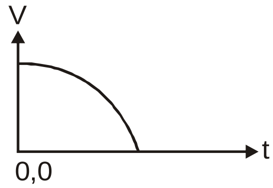
$\frac{I_{hollow}}{I_{solid}} = \frac{\frac{2}{5}\left(\rho_2 \frac{4}{3}\pi R^3\right)R^2 - \frac{2}{5}\left(\rho_2 \frac{4}{3}\pi r^3\right)r^2}{\frac{2}{5}mR^2}$

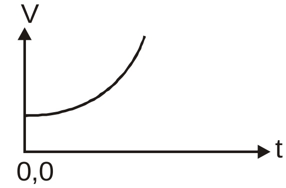
$= \frac{4}{3}\frac{\left(\pi R^3 \rho_2\right)R^2\left(1-\left(\frac{r}{R}\right)^5\right)}{mR^2}$

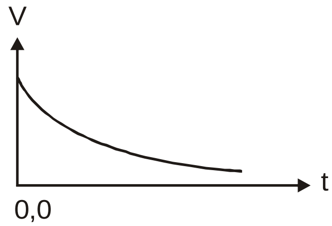
$= \frac{4}{3}\,\frac{\pi R^3 \rho_2}{\rho_1 \frac{4}{3}\pi R^3}\left(1-\left(\frac{r}{R}\right)^5\right)$

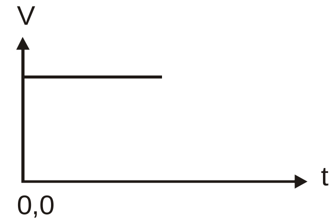
$= \frac{\rho_2}{\rho_1}\left(1-\left(1-\frac{\rho_1}{\rho_2}\right)^{5/3}\right)$

34. The insulated plates of a charged parallel plate capacitor (with small separation between the plates) are approaching each other due to electrostatic attraction. Assuming no other force to be operative and no radiation taking place, which of the following graphs approximately shows the variation with time (t) of the potential difference (V) between the plates ?

(A) 

(B) 

(C) 

(D) 

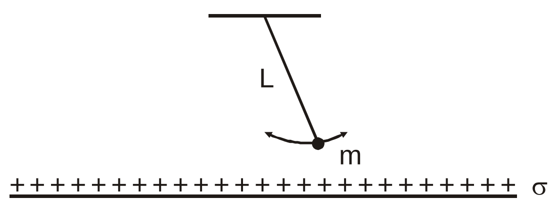
Ans : (A)

Hint :

$$a_{rel} = \frac{2F}{m}, \ V = Ed - E\left(d_o - \frac{1}{2}a_{rel}t^2\right)$$

$\therefore$ parabolic with downward concavity

35. The bob of a pendulum of mass 'm', suspended by a inextensible string of length 'L' as shown in the figure carries a small charge 'q'. An infinite horizontal plane conductor with uniform surface charge density 'σ' is placed below it. What will be the time period of the pendulum for small amplitude oscillations ?



(A) $2\pi\sqrt{\frac{L}{\left(g - \frac{mq}{\varepsilon_0 \sigma}\right)}}$ (B) $\sqrt{\frac{L}{\left(g - \frac{mq\sigma}{\varepsilon_0}\right)}}$ (C) $\frac{1}{2\pi}\sqrt{\frac{L}{\left(g - \frac{q\sigma}{\varepsilon_0 m}\right)}}$ (D) $2\pi\sqrt{\frac{L}{\left(g - \frac{q\sigma}{\varepsilon_0 m}\right)}}$

Ans : (B,C,D)

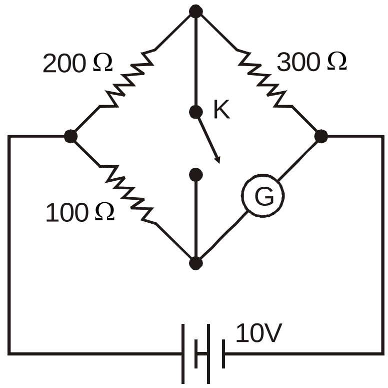
Hint : apparent weight mg = mg – q E

$$mg' = mg - \frac{\sigma q}{\epsilon_0}, \ g' = g - \frac{\sigma q}{\epsilon_0 m}, \ T = 2\pi\sqrt{\frac{L}{g - \frac{q\sigma}{\epsilon_0 m}}}$$

Category III (Q36 to Q40)

Carry 2 marks each and one or more option(s) is/are correct. If all correct answers are not marked and also no incorrect answer is marked then score = 2 × number of correct answers marked ÷ actual number of correct answers. If any wrong option is marked or if any combination including a wrong option is marked, the answer will considered wrong, but there is no negative marking for the same and zero marks will be awarded.

36. A non-zero current passes through the galvanometer G shown in the circuit when the key 'K' is closed and its value does not change when the key is opened. Then which of the following statement(s) is/are true ?



(A) The galvanometer resistance is infinite.

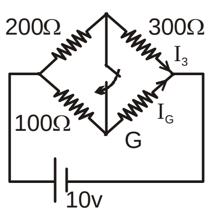
(B) The current through the galvanometer is 40 mA.

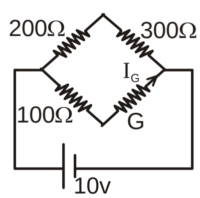
(C) After the key is closed, the current through the 200 Ω resistor is same as the current through the 300 Ω resistor.

(D) The galvanometer resistance is 150 Ω .

Ans : (B,C,D)

Hint :





$$I_G = \frac{10}{100+G} \qquad \therefore I_3\ 300 = \frac{10}{100+G}\times G$$

$$I_3 = \frac{G}{30}\times\left(\frac{1}{100+G}\right)$$

$$I_3 + I_G = \left(\frac{1}{100+G}\right)\left(10+\frac{G}{30}\right) = \left(\frac{300+G}{100+G}\right)\times\frac{1}{30}$$

$$\therefore\ 10 = \left(\frac{200}{3}+\frac{300G}{300+G}\right)\left(\frac{300+G}{100+G}\right)\times\frac{1}{30}$$

$$10 = \frac{6000+1100G}{3}\times\frac{1}{100+G}\times\frac{1}{30}$$

$\Rightarrow 900\ (100 + 6) = 60000 + 1100G$

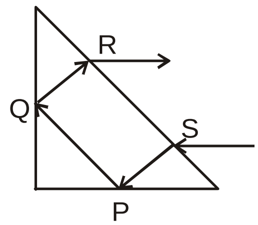
$\Rightarrow 30000 = 200G$

$G = 150\Omega$

$\therefore\ I_G = \dfrac{10}{100+150} = \dfrac{10}{250} = 40\,mA$

As $\dfrac{200}{100} = \dfrac{300}{150}$ $\quad\therefore\ I_{200} = I_{300}$

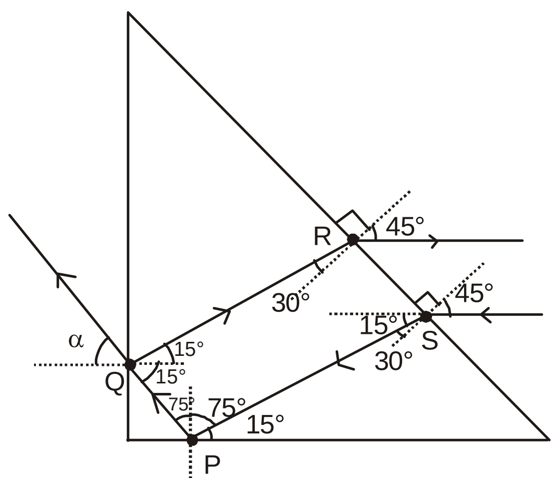
37. A ray of light is incident on a right angled isosceles prism parallel to its base as shown in the figure. Refractive index of the material of the prism is $\sqrt{2}$. Then which of the following statement (s) is/are true?



(A) The reflection at P is total internal
(B) The reflection at Q is total internal
(C) The ray emerging at R is parallel to the ray incident at S
(D) Total deviation of the ray is 150°

Ans : (A, C)

Hint : 1 sin 45° = $\sqrt{2}\sin\theta$ $\therefore\ \theta = 30°$



$\angle$incidence at P = 75° > θ_c $\therefore$ TIR at P

$\angle$incidence at Q = 15° < θ_c $\therefore$ Partial reflection and refraction at Q

As PS is parallel to QR, emergent ray at R is parallel to incident ray at S

$\therefore$ Net deviation = 180°

38. The intensity of a sound appears to an observer to be periodic. Which of the following can be cause of it?
(A) The intensity of the source is periodic
(B) The source is moving towards the observer
(C) The observer is moving away from the source
(D) The source is producing a sound composed of two nearby frequencies

Ans : (A,D)

Hint : Due to difference of frequencies phenomenon of beat occures

39. Which of the following statement(s) is/are true? "Internal energy of an ideal gas ___"

(A) Decreases in an isothermal process
(B) Remains constant in an isothermal process
(C) Increases in an isobaric process
(D) Decreases in an isobaric expansion

Ans : (B)

Hint : In isothermal process

T = constant

$\Delta U = n C_V \Delta T$

In isobaric expansion [$\therefore$ P = constant]

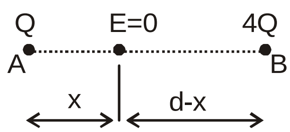
$\therefore V \propto T$ $\therefore$ T increases due to expansion $\Rightarrow$ increase in internal energy

40. Two positive charges Q and 4Q are placed at points A and B respectively, where B is at a distance 'd' units to the right of A. The total electric potential due to these charges is minimum at P on the line through A and B. What is (are) the distance (s) of P from A?

(A) $\frac{d}{3}$ units to the right of A
(B) $\frac{d}{3}$ units to the left of A
(C) $\frac{d}{5}$ units to the right of A
(D) d units to the left of A

Ans : (A)

Hint :



As V = min

$\therefore \frac{\partial V}{\partial r} = 0 \therefore E=0$

$\therefore \frac{kQ}{x^2} = \frac{k(4Q)}{(d-x)^2} \therefore x = \frac{d}{3}$

CATEGORY - I (Q41 to Q70)

Carry 1 mark each and only one option is correct. In case of incorrect answer or any combination of more than one answer, ¼ mark will be deducted

41. Cl_2O_7 is the anhydride of

(A) HOCl
(B) $HClO_2$
(C) $HClO_3$
(D) $HClO_4$

Ans : (D)

Hint : $Cl_2O_7 + H_2O \rightarrow 2HClO_4$

42. The main reason the $SiCl_4$ is easily hydrolysed as compared to CCl_4 is that

(A) Si – Cl bond is weaker than C – Cl bond
(B) $SiCl_4$ can form hydrogen bonds
(C) $SiCl_4$ is covalent
(D) Si can extend its coordination number beyond four

Ans : (D)

Hint : Si can extend coordination number as it has vacant 3d orbital

43. Silver chloride dissolves in excess of ammonium hydroxide solution. The cation present in the resulting solution is

(A) $[Ag(NH_3)_6]^+$
(B) $[Ag(NH_3)_4]^+$
(C) Ag^+
(D) $[Ag(NH_3)_2]^+$

Ans : (D)

Hint : $AgCl + 2NH_3(aq) \rightarrow [Ag(NH_3)_2]^+ + Cl^-$

44. The ease of hydrolysis in the compounds CH_3COCl (I), $CH_3 - CO - O - COCH_3$ (II), $CH_3COOC_2H_5$ (III) and CH_3CONH_2 (IV) is of the order

(A) I > II > III > IV (B) IV > III > II > I (C) I > II > IV > III (D) II > I > IV > III

Ans : (A)

Hint : Ease of hydrolysis is directly proportional to positive charge density on carbonyl carbon.

45. $CH_3 - C \equiv C\,MgBr$ can be prepared by the reaction of

(A) $CH_3 - C \equiv C - Br$ with $MgBr_2$ (B) $CH_3 - C \equiv CH$ with $MgBr_2$

(C) $CH_3 - C \equiv CH$ with KBr and Mg metal (D) $CH_3 - C \equiv CH$ with CH_3MgBr

Ans : (D)

Hint : $CH_3 - C \equiv C - H$ is a terminal alkyne, which has acidic hydrogen.

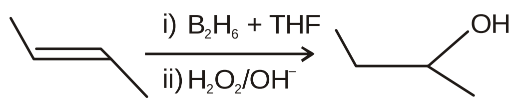
$$CH_3 - C \equiv C - H + CH_3MgBr \rightarrow CH_3C \equiv \overset{\ominus}{C}\overset{\oplus}{Mg}Br + CH_4$$

46. The number of alkene (s) which can produce 2-butanol by the successive treatment of (i) B_2H_6 in tetrahydrofuran solvent and (ii) alkaline H_2O_2 solution is

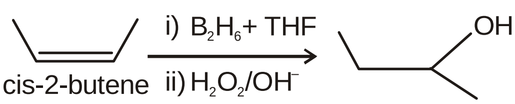
(A) 1 (B) 2 (C) 3 (D) 4

Ans : (B)

Hint :

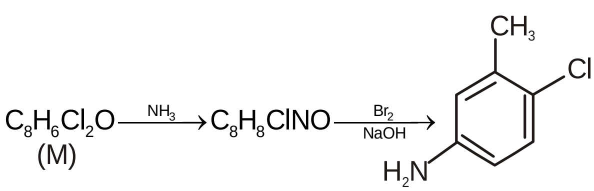


trans-2-butene Butan-2-ol

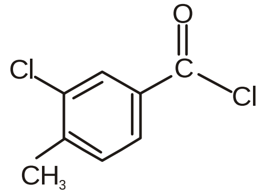


cis-2-butene Butan-2-ol

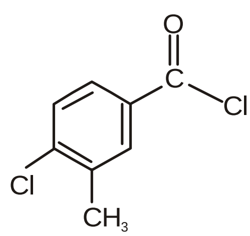
47. Identify 'M' in the following sequence of reaction



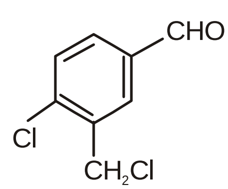
(A)



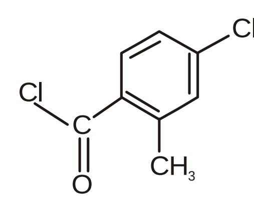
(B)



(C)

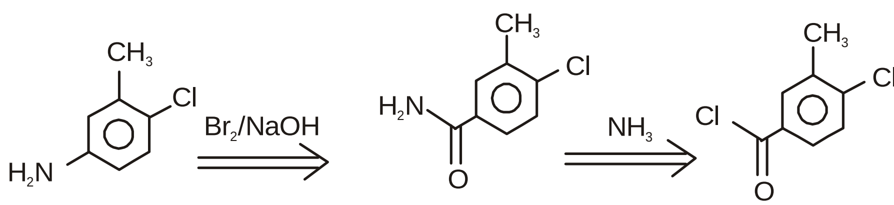


(D)



Ans : (B)

Hint :

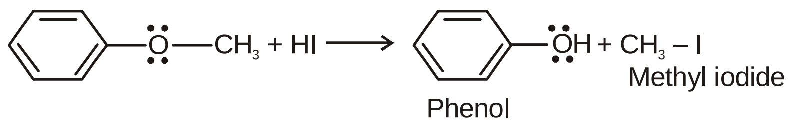


(⇒ is Retrosynthetic arrow)

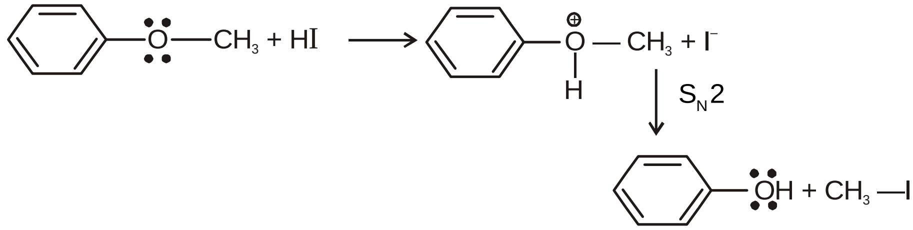
48. Methoxybenzene on treatment with HI produces

(A) Iodobenzene and methanol
(B) Phenol methyl iodide
(C) Iodobenzene and methyl iodide
(D) Phenol and methanol

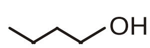
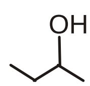
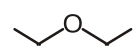
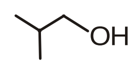
Ans : (B)

Hint : 

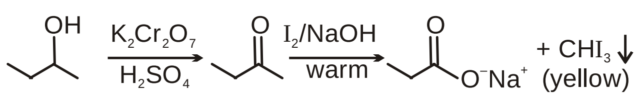
<u>Mechanism</u>



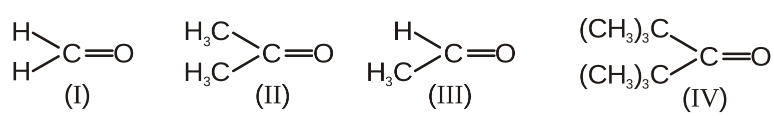
49. $C_4H_{10}O \xrightarrow[H_2SO_4]{K_2Cr_2O_7} C_4H_8O \xrightarrow[warm]{I_2/NaOH} CHI_3$ Here, N is
N

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

Ans : (B)

Hint : 

50. The correct order of reactivity for the addition reaction of the following carbonyl compounds with ethylmagnesium iodide is

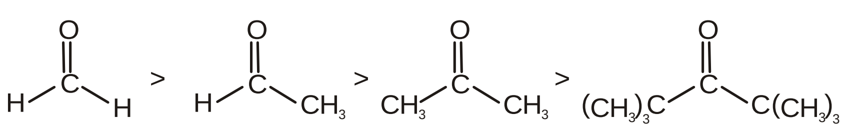


(A) I > III > II > IV
(B) IV > III > II > I
(C) I > II > IV > III
(D) III > II > I > IV

Ans : (A)

Hint : Reactivity of carbonyl compounds with nucleophile depends on both steric and electronic factors

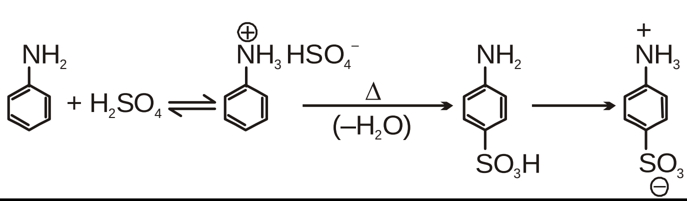
Reactivity order :



51. If aniline is treated with conc. H_2SO_4 and heated at 200°C, the product is

(A) Anilinium sulphate
(B) Benzenesulphonic acid
(C) m-Aminobenzenesulphonic acid
(D) Sulphanilic acid

Ans : (D)

Hint : 

52. Which of the following eletronic configuration is not possible ?

(A) n = 3, l = 0, m = 0 (B) n = 3, l = 1, m = –1 (C) n =2, l = 0, m = –1 (D) n = 2, l = 1, m = 0

Ans : (C)

Hint : n =2, l = 0, m =–1 is not possible

Here, l = 0 so, m should be equal to '0'

53. The number of unpaired electrons in Ni (atomic number = 28) are

(A) 0 (B) 2 (C) 4 (D) 8

Ans : (B)

Hint : Ni : [Ar] 3d: ⇅ ⇅ ⇅ ↑ ↑ 4s: ⇅

∴ No. of unpaired e^-s = 2

54. Which of the following has the strongest H-bond ?

(A) O – H···S (B) S – H···O (C) F – H···F (D) F – H···O

Ans : (D)

Hint : F–H·····O hydrogen-bond strength is more than that of F–H·····F due to effective Lewis acid base interaction

55. The half life of C^{14} is 5760 years. For a 200 mg sample of C^{14}, the time taken to change to 25 mg is

(A) 11520 years (B) 23040 years (C) 5760 years (D) 17280 years

Ans : (D)

Hint : $\left(\frac{M}{M_0}\right)=\left(\frac{1}{2}\right)^n \Rightarrow \left(\frac{\cancel{25}}{\cancel{200}_8}\right)=\left(\frac{1}{2}\right)^n \Rightarrow \left(\frac{1}{2}\right)^3=\left(\frac{1}{2}\right)^n \Rightarrow n = 3$

∴ Time taken = 3×5760 years = 17280 years

56. Ferric ion forms a Prussian blue precipitate due to the formation of

(A) $K_4[Fe(CN)_6]$ (B) $K_3[Fe(CN)_6]$ (C) $Fe(CNS)_3$ (D) $Fe_4[Fe(CN)_6]_3$

Ans : (D)

Hint : Formula of Prussian blue = $Fe_4[Fe(CN)_6]_3$

57. The nucleus $^{64}_{29}Cu$ accepts an orbital electron to yield,

(A) $^{65}_{28}Ni$ (B) $^{64}_{30}Zn$ (C) $^{64}_{28}Ni$ (D) $^{65}_{30}Zn$

Ans : (C)

Hint : $^{64}_{29}Cu \xrightarrow{K-Capture} {}^{64}_{28}Ni$

58. How many moles of electrons will weigh one kilogram ?

(A) 6.023×10^{23} (B) $\frac{1}{9.108}\times10^{31}$ (C) $\frac{6.023}{9.108}\times10^{54}$ (D) $\frac{1}{9.108\times6.023}\times10^{8}$

Ans : (D)

Hint : Mass of one mole electron = $9.11\times10^{-31}\times6.023\times10^{23}$ kg

∴ No of moles = $\frac{1}{9.11\times6.023}\times10^{8}$

59. Equal weights of ethane and hydrogen are mixed in an empty container at 25°C. The The fraction of total pressure exerted by hydrogen is

(A) 1:2 (B) 1:1 (C) 1:16 (D) 15:16

Ans : (D)

Hint : $\dfrac{P_{H_2}}{P_T} = \dfrac{\frac{m}{2}}{\frac{m}{2}+\frac{m}{30}} = 15:16$

60. The heat of neutralization of a strong base and a strong acid is 13:7 kcal. The heat released when 0.6 mole HCl solution is added to 0.25 mole of NaOH is

(A) 3.425 kcal (B) 8.22 kcal (C) 11.645 kcal (D) 13.7 kcal

Ans : (A)

Hint :

	H^+	+	OH^-	$\longrightarrow$	H_2O
t = 0	0.6 mol		0.25 mol		
After reaction :	0.35 mol		0		0.25 mol

Heat released = 0.25 × 13.7 = 3.421 kcal

61. A compound formed by elements X and Y crystallizes in the cubic structure, where X atoms are at the corners of a cube and Y atoms are at the centres of the body. The formula of the compound is

(A) XY (B) XY_2 (C) X_2Y_3 (D) XY_3

Ans : (A)

Hint : X ↓ $8\times\frac{1}{8}$ = 1; Y ↓ 1

X : Y = 1 : 1 ∴ XY

62. What amount of electricity can deposit 1 mole of Al metal at cathode when passed through molten $AlCl_3$?

(A) 0.3 F (B) 1 F (C) 3 F (D) 1/3 F

Ans : (C)

Hint : $Al^{+3} + 3e^- \rightarrow Al$

3F 1 mol

63. Given the standard half-cell potentials (E^0) of the following as

$Zn = Zn^{2+} + 2e^-$ $E^0 = +0.76$ V

$Fe = Fe^{2+} + 2e^-$ $E^0 = 0.41$ V

Then the standard e.m.f. of the cell with the reaction $Fe^{2+} + Zn \rightarrow Zn^{2+} + Fe$ is

(A) –0.35 V (B) +0.35 V (C) +1.17 V (D) –1.17 V

Ans : (B)

Hint : $E^o_{cell} = E^o_{Fe^{2+}/Fe} - E^o_{Zn^{2+}/Zn} = -0.41 - (-0.76) = +0.35$ V

64. The following equilibrium constants are given :

$N_2 + 3N_2 \rightleftharpoons 2NH_3;\ K_1$

$N_2 + O_2 \rightleftharpoons 2NO;\ K_2$

$H_2 + \frac{1}{2}O_2 \rightleftharpoons H_2O;\ K_3$

The equilibrium constant for the oxidation of 2 mol of NH_3 to give NO is

(A) $K_1\cdot\dfrac{K_2}{K_3}$ (B) $K_2\cdot\dfrac{K_3^3}{K_1}$ (C) $K_2\cdot\dfrac{K_3^2}{K_1}$ (D) $K_2^2\cdot\dfrac{K_3}{K_1}$

Ans : (B)

Hint : $2NH_3 \rightleftharpoons N_2 + 3H_2 \; ; \; \frac{1}{K_1}$

$N_2 + O_2 \rightleftharpoons 2NO \; ; \; K_2$

$3H_2 + \frac{3}{2}O_2 \rightleftharpoons 3H_2O \; ; \; K_3^3$

$2NH_3 + \frac{5}{2}O_2 \longrightarrow 2NO + 3H_2O$

$\therefore K_c = \frac{K_2 K_3^3}{K_1}$

65. Which one of the following is a condensation polymer ?
(A) PVC (B) Teflon (C) Dacron (D) Polystyrene

Ans : (C)

Hint : Dacron

66. Which of the following is present in maximum amount in 'acid rain' ?
(A) HNO_3 (B) H_2SO_4 (C) HCl (D) H_2CO_3

Ans : (B)

Hint : Higher content of oxides of sulphur (60 - 70%) in polluted air is the major contributor towards acid rain.

67. Which of the set of oxides are arranged in the proper order of basic, amphoteric, acidic ?
(A) SO_2, P_2O_5, CO (B) BaO, Al_2O_3, SO_2
(C) CaO, SiO, Al_2O_3 (D) CO_2, Al_2O_3, CO

Ans : (B)

Hint : BaO (Basic)
Al_2O_3 (Amphoteric)
SO_2 (Acidic)

68. Out of the following outer electronic configurations of atoms, the highest oxidation state is achieved by which one ?
(A) $(n-1)d^8ns^2$ (B) $(n-1)d^5ns^2$ (C) $(n-1)d^3ns^2$ (D) $(n-1)d^5ns^1$

Ans : (B)

Hint : Maximum oxidation state $\rightarrow$ +7

69. At room temperature, the reaction between water and fluorine produces
(A) HF and H_2O_2 (B) HF, O_2 and F_2O_2 (C) F^-, O_2 and H^+ (D) HOF and HF

Ans : (C)

Hint : $H_2O(\ell) + F_2(g) \rightarrow HF(aq.) + O_2 \rightarrow H^+(aq.) + F^-(aq.) + O_2$

70. Which of the following is least thermally stable ?
(A) $MgCO_3$ (B) $CaCO_3$ (C) $SrCO_3$ (D) $BeCO_3$

Ans : (D)

Hint : Thermal stability order : $BeCO_3 < MgCO_3 < CaCO_3 < SrCO_3$

CATEGORY - II (Q71 to Q75)

Carry 2 marks each and only one option is correct. In case of incorrect answer or any combination of more than one answer, ½ mark will be deducted.

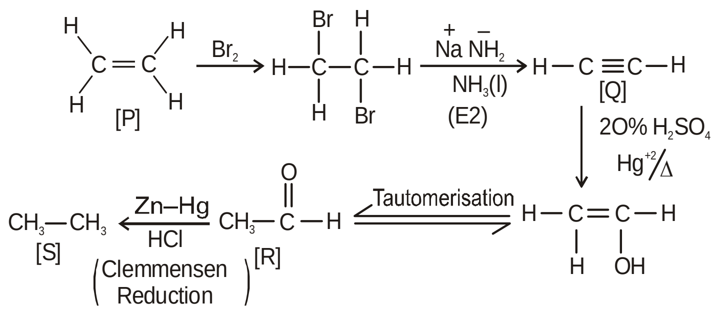
71. $[P] \xrightarrow{Br_2} C_2H_4Br_2 \xrightarrow[NH_3]{NaNH_2} [Q]$

$[Q] \xrightarrow[Hg^{2+}, \Delta]{20\% H_2SO_4} [R] \xrightarrow{Zn-Hg/HCl} [S]$

The species P, Q, R and S respectively are
(A) ethene, ethyne, ethanal, ethane (B) ethane, ethyne, ethanal, ethene
(C) ethene, ethyne, ethanal, ethanol (D) ethyne, ethane, ethene, ethanal

Ans : (A)

Hint :

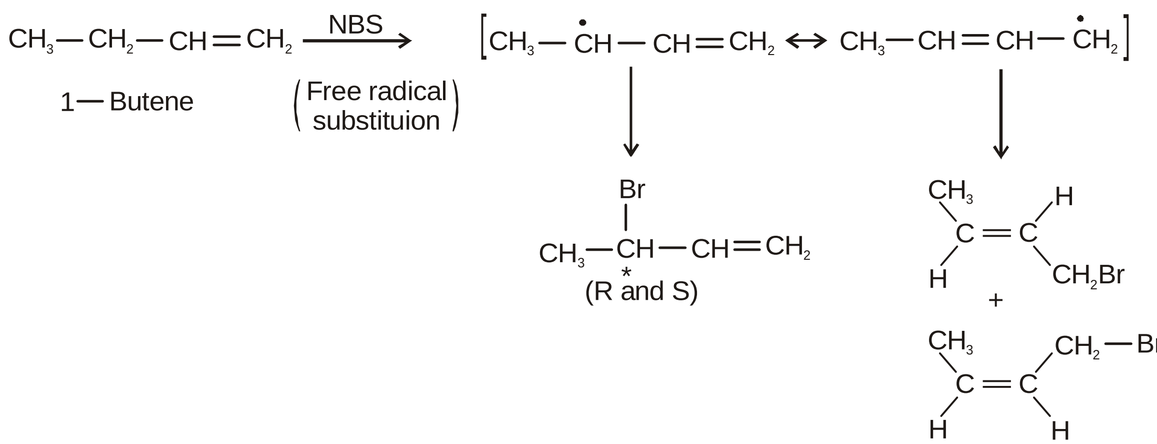


72. The number of possible organobromine compounds, which can be obtained in the allylic bromination of 1 – butene with N – bromosuccinimide is

(A) 1 (B) 2 (C) 3 (D) 4

Ans : (D)

Hint :



73. A metal M (specific heat 0.16) forms a metal chloride with = 65% chlorine present in it. The formula of the metal chloride will be

(A) MCl (B) MCl_2 (C) MCl_3 (D) MCl_4

Ans : (B)

Hint : <u>Using Dulong Petit's law</u>

At mass (approx) × sp. heat = 6.4

$$\therefore \text{At. mass(approx)} = \frac{6.4}{0.16} = 40$$

Let formula is MCl_x

$$\therefore \% \text{ by mass of Cl} = \frac{x \times 35.5}{40 + 35.5x} \times 100 = 65$$

$\therefore x = 2.09 \simeq 2$ Hence it is MCl_2

74. During a reversible adiabatic process, the pressure of a gas is found to be proportional to the cube of its absolute temperature. The ratio $\frac{C_p}{C_v}$ for the gas is

(A) $\frac{3}{2}$ (B) $\frac{7}{2}$ (C) $\frac{5}{3}$ (D) $\frac{9}{7}$

Ans : (A)

Hint : $P \propto T^3$

or, $P = KT^3$ or $PT^{-3} = K$ .... (i)

For reversible adiabatic process

$T^{\gamma}P^{1-\gamma} = K$

$PT^{\frac{\gamma}{1-\gamma}} = K$ .... (ii)

Comparing equation (i) and equation (ii)

$\frac{\gamma}{1-\gamma} = -3$

or $\gamma = -3 + 3\gamma$

or $\gamma = \frac{3}{2}$

75. $[X] + \text{dil. } H_2SO_4 \rightarrow [Y]$: Colourless, suffocating gas

$[Y] + K_2Cr_2O_7 + H_2SO_4 \rightarrow$ Green colouration of solution

Then, [X] and [Y] are

(A) SO_3^{2-}, SO_2 (B) Cl^-, HCl (C) S^{2-}, H_2S (D) CO_3^{2-}, CO_2

Ans : (A)

Hint : $SO_3^{2-} + \text{dil. } H_2SO_4 \longrightarrow SO_2 + H_2O + SO_4^{2-}$

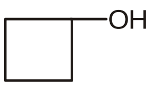
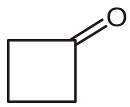
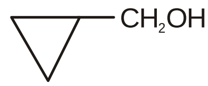
$3SO_2 + K_2Cr_2O_7 + H_2SO_4 \longrightarrow K_2SO_4 + \underset{\text{green}}{Cr_2(SO_4)_3} + 4H_2O$

SO_2 is a colourless gas with suffocating smell.

<u>CATEGORY - III (Q76 to Q80)</u>

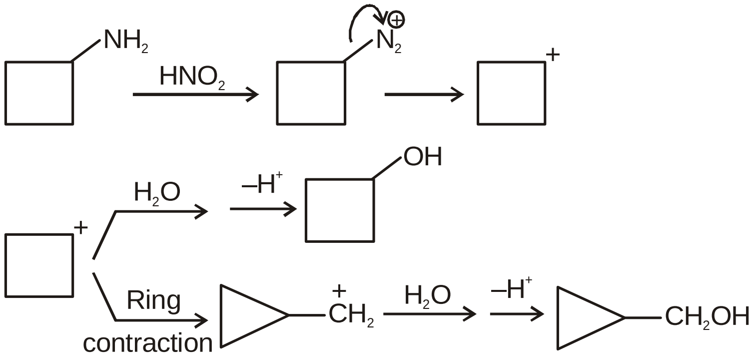
Carry 2 marks each and one or more option(s) is/are correct. If all correct answers are not marked and also no incorrect answer is marked then score = 2 × number of correct answers marked + actual number of correct answers. If any wrong option is marked or it any combination including a wrong option is marked, the answer will considered wrong, but there is no negative marking for the same and zero marks will be awarded.

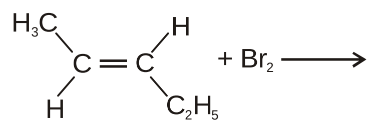
76. The possible product (s) to be obtained from the reaction of cyclobutyl amine with HNO_2 is/are

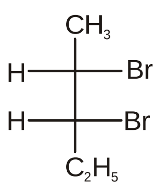
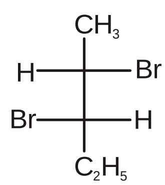
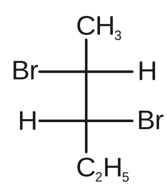
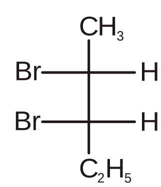
(A)  (B)  (C)  (D) $H_2C=CH_2$

Ans : (A, C)

Hint :

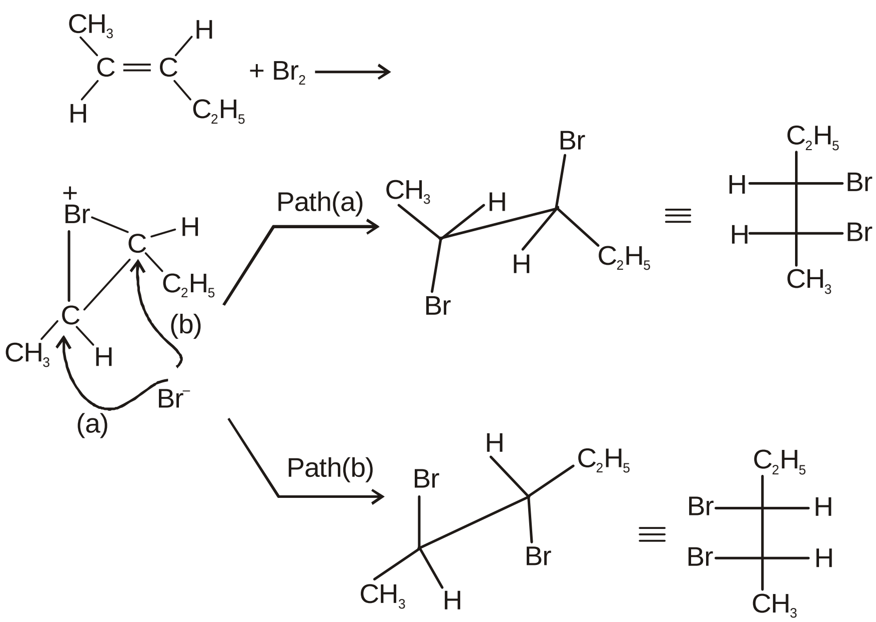


77. The major product(s) obtained in the following reaction is/are 

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

Ans : (A, D)

Hint :



78. Which statements are correct for the peroxide ion?
(A) It has five completely filled anti-bonding molecular orbitals.
(B) It is diamagnetic
(C) It has bond order one
(D) It is isoelectronic with neon

Ans : (B, C)

Hint : O_2^{2-} is the peroxide ion:

$$O_2^{2-} : (\sigma_{1s}^b)^2 (\sigma_{1s}^*)^2 (\sigma_{2s}^b)^2 (\sigma_{2s}^*)^2 \ (\sigma_z^b)^2 \ (\pi_x^b)^2 = (\pi_y^b)^2 (\pi_x^*)^2 = (\pi_y^*)^2$$

No unpaired electron implies it is diamagnetic in nature:

$$\text{Bond order} = \frac{10-8}{2} = 1$$

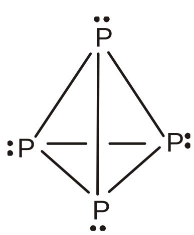
79. Among the following the extensive variables are
(A) H (Enthalpy) (B) P (Pressure) (C) E (Internal energy) (D) V (Volume)

Ans : (A, C, D)

Hint : 'P' is an intensive variable

80. White phosphorus P_4 has the following characteristics:
(A) 6 P – P single bonds (B) 4 P – P single bonds
(C) 4 lone pair of electrons (D) P – P – P angle of 60°

Ans : (A, C, D)

Hint : 

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