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81937
[Q. Booklet Number]

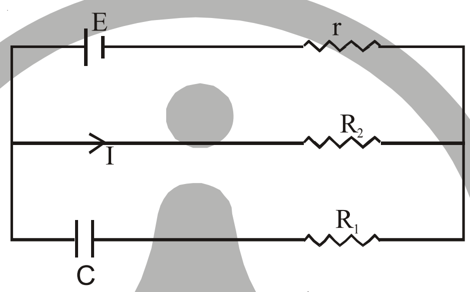
ANSWERS & HINTS
for
WBJEE - 2011

by Aakash Institute & Aakash IIT-JEE

MULTIPLE CHOICE QUESTIONS

SUB : PHYSICS & CHEMISTRY

1. The charge on the capacitor of capacitance C shown in the figure below will be



(A) CE (B) $\frac{CE R_1}{R_1 + r}$ (C) $\frac{CE R_2}{R_2 + r}$ (D) $\frac{CE R_1}{R_2 + r}$

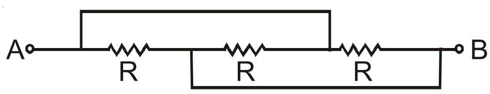
Ans : (C)

Hints : $I = \frac{E}{R_2 + r}$ (Since finally no current flows through capacitor)

$\therefore$ Potential difference across R_2, $V = IR_2 = \frac{ER_2}{R_2 + r}$

$\therefore$ Charge on the capacitor $Q = CV = \frac{CER_2}{R_2 + r}$

2. The resistance across A and B in the figure below will be

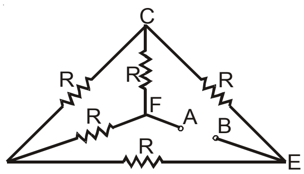


(A) $3R$ (B) R (C) $\frac{R}{3}$ (D) None of these

Ans : (C)

Hints : Resistance are in parallel $\therefore Req = \frac{R}{3}$

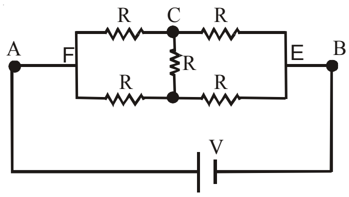
3. Five equal resistance, each of resistance R, are connected as shown in figure below. A battery of V volt is connected between A and B. The current flowing in FC will be



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

Ans : (C)

Hints :



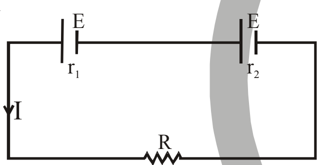
$I = \frac{V}{R} \therefore \text{Current in } FC = \frac{I}{2} = \frac{V}{2R}$

4. Two cells with the same e.m.f. E and different internal resistances r_1 and r_2 are connected in series to an external resistance R. The value of R so that the potential difference across the first cell be zero is

(A) $\sqrt{r_1 r_2}$ (B) $r_1 + r_2$ (C) $r_1 - r_2$ (D) $\frac{r_1 + r_2}{2}$

Ans : (C)

Hints :



$$I = \frac{2E}{R + r_1 + r_2}$$

Potential difference across first cell $V = E - Ir_1 = 0$

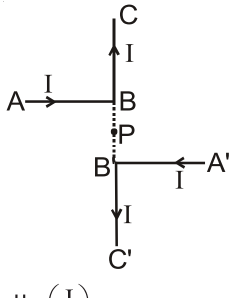
$$E - \frac{2Er_1}{R + r_1 + r_2} = 0$$

$$\left[\frac{R + r_1 + r_2 - 2r_1}{R + r_1 + r_2}\right] = 0$$

$$\Rightarrow R + r_2 - r_1 = 0$$

$$R = r_1 - r_2$$

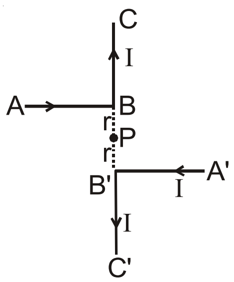
5. Current through ABC and A'B'C' is I. What is the magnetic field at P? BP = PB' = r (Here C'B' PBC are collinear)



(A) $B = \frac{1}{4\pi}\frac{2I}{r}$ (B) $B = \frac{\mu_o}{4\pi}\left(\frac{2I}{r}\right)$ (C) $B = \frac{\mu_o}{4\pi}\left(\frac{I}{r}\right)$ (D) Zero

Ans : (B)

Hints :



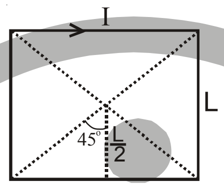
$$B = 2\left[\frac{\mu_o}{4\pi}\frac{I}{r}\right]$$

6. The magnetic field at the point of intersection of diagonals of a square wire loop of side L carrying a current I is

(A) $\frac{\mu_o I}{\pi L}$ (B) $\frac{2\mu_o I}{\pi L}$ (C) $\frac{\sqrt{2}\mu_o I}{\pi L}$ (D) $\frac{2\sqrt{2}\mu_o I}{\pi L}$

Ans : (D)

Hints : $B = 4\left[\frac{\mu_o}{4\pi}\frac{I}{\left(\frac{L}{2}\right)}\left(\sin 45^o + \sin 45^o\right)\right]$



$= \frac{\mu_o}{\pi}\frac{2I}{L}\cdot\frac{2}{\sqrt{2}}$ **;** $B = \frac{\mu_o}{\pi}\frac{2\sqrt{2}I}{L}$

7. In an inelastic collision an electron excites as hydrogen atom from its ground state to a M-shell state. A second electron collides instantaneously with the excited hydrogen atom in the M-State and ionizes it. At least how much energy the second electron transfers to the atom in the M-state?

(A) +3.4 eV (B) +1.51 eV (C) –3.4 eV (D) –1.51 eV

Ans : (B)

Hints : $E_m = -\frac{13.6}{(3)^2} = -1.51$

Minimum energy required by electron should be +1.51 eV

8. A radioactive nucleus of mass number A, initially at rest, emits an α-particle with a speed ν. The recoil speed of the daughter nucleus will be

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

Ans : (C)

Hints : From conservation of momentum $4.V = (A–4)V_1$; $V_1 = \frac{4V}{A-4}$

9. In the nuclear reaction

$^{14}_{7}N + X \rightarrow ^{14}_{6}C + ^{1}_{1}H$ the X will be

(A) $^{0}_{-1}e$ (B) $^{1}_{1}H$ (C) $^{2}_{1}H$ (D) $^{1}_{0}n$

Ans : (D)

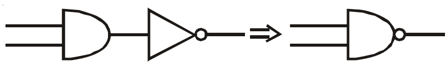
Hints : $X \rightarrow {}^{1}_{0}n$

10. Which type of Gate the following truth table represents?

Input		Output
A	B	Q
0	0	1
0	1	1
1	0	1
1	1	0

(A) NOT (B) AND (C) OR (D) NAND

Ans : (D)

Hints : 

11. Given $\vec{A} = 2\hat{i} + 3\hat{j}$ and $\vec{B} = \hat{i} + \hat{j}$. The component of vector $\vec{A}$ along vector $\vec{B}$ is

(A) $\frac{1}{\sqrt{2}}$ (B) $\frac{3}{\sqrt{2}}$ (C) $\frac{5}{\sqrt{2}}$ (D) $\frac{7}{\sqrt{2}}$

Ans : (C)

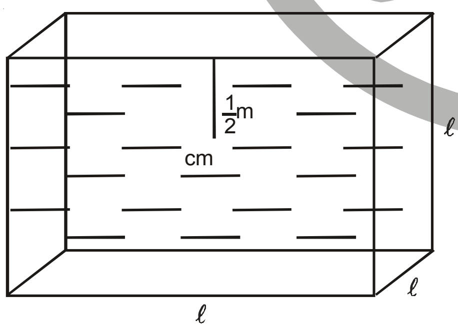
Hints : Component of $\vec{A}$ along $\vec{B}$ = $\vec{A}.\frac{\vec{B}}{|\vec{B}|}$

Component of $\vec{A}$ along $\vec{B} = \frac{5}{\sqrt{2}}$

12. A cubical vessel of height 1 m is full of water. What is the amount of work done in pumping water out of the vessel? (Take g = 10 m s^{-2})

(A) 1250 J (B) 5000 J (C) 1000 J (D) 2500 J

Ans : (B)

Hints : 

$V = \ell^3 = 1m^3$

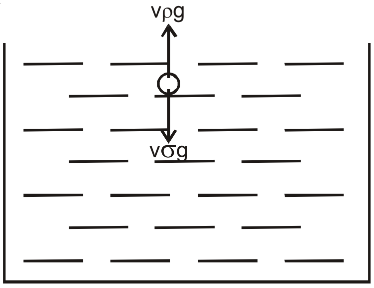
$m = 1 \times 1000 = 1000kg$; $W = mgh = 1000 \times 10 \times \frac{1}{2} = 5000J$

13. A stone of relative density K is released from rest on the surface of a lake. If viscous effects are ignored, the stone sinks in water with an acceleration of

(A) g(1–K) (B) g(1+K) (C) $g\left(1-\frac{1}{K}\right)$ (D) $g\left(1+\frac{1}{K}\right)$

Ans : (C)

Hints :



$$F = v\sigma g - v\rho g = v\sigma g\left(1-\frac{\rho}{\sigma}\right) = mg\left(1-\frac{1}{k}\right)$$

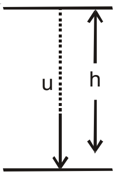
$$a = g\left(1-\frac{1}{k}\right)$$

14. If a person can throw a stone to maximum height of h metre vertically, then the maximum distance through which it can be thrown horizontally by the same person is

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

Ans : (C)

Hints :



$$h = \frac{u^2}{2g} \Rightarrow u^2 = 2gh$$

Maximum horizontal distance

$$R_{max} = \frac{u^2}{g}\left(\text{when } \theta = 45^o\right)$$

$$R_{max} = 2h$$

15. A body of mass 6 kg is acted upon by a force which causes a displacement in it given by $x = \frac{t^2}{4}$ metre where t is the time in second. The work done by the force in 2 seconds is

(A) 12 J (B) 9J (C) 6 J (D) 3 J

Ans : (D)

Hints : $m = 6kg \quad x = \frac{t^2}{4}$

$$\frac{dx}{dt} = v = \frac{t}{2} \quad v(0) = 0;\ v(2) = \frac{2}{2} = 1$$

$$K_i = \frac{1}{2}m(0)^2 = 0;\ K_f = \frac{1}{2}m(1)^2 = \frac{1}{2}\times 6\times 1 = 3;\ W = K_f - K_i = 3 - 0 = 3J$$

16. A box is moved along a straight line by a machine delivering constant power. The distance moved by the body in time t is proportional to

(A) $t^{\frac{1}{2}}$ (B) $t^{\frac{3}{4}}$ (C) $t^{\frac{3}{2}}$ (D) t^2

Ans : (C)

Hints : $P = Fv = m.\frac{dv}{dt}.v$

$\int vdv = \int P/m\,dt\ ;\ \frac{v^2}{2} = \frac{Pt}{m}$

$V = \sqrt{\frac{2p}{m}}\ t^{\frac{1}{2}}\ ;\ \frac{dx}{dt} = \sqrt{\frac{2p}{m}}\ t^{\frac{1}{2}}$

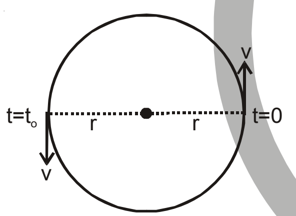
$\int dx = \sqrt{\frac{2p}{m}}\int t^{\frac{1}{2}}dt\ ;\ \ x = \sqrt{\frac{2p}{m}}\frac{t^{\frac{3}{2}}}{\frac{3}{2}} = \frac{2}{3}\sqrt{\frac{2p}{m}}\ t^{\frac{3}{2}}$

$x\ \alpha\ t^{\frac{3}{2}}$

17. A particle is moving with a constant speed ν in a circle. What is the magnitude of average velocity after half rotation?

(A) 2ν (B) $2\frac{\nu}{\pi}$ (C) $\frac{\nu}{2}$ (D) $\frac{\nu}{2\pi}$

Ans : (B)

Hints :


$T = \frac{2\pi r}{V}\ ;\ \ t_o = \frac{T}{2} = \frac{\pi r}{V};\ \ V_{av} = \frac{2r}{\frac{\pi r}{v}} = \frac{2v}{\pi}$

18. A cricket ball of mass 0.25 kg with speed 10 m/s collides with a bat and returns with same speed within 0.01 S. The force acted on bat is

(A) 25 N (B) 50 N (C) 250 N (D) 500 N

Ans : (D)

Hints : $\Delta P = 2mV = 2\times 0.25\times 10 = 5\frac{kgm}{s}$

$F = \frac{\Delta P}{\Delta t} = \frac{5}{0.01} = 500N$

19. If the Earth were to suddenly contract to $\frac{1}{n}$th of its present radius without any change in its mass, the duration of the new day will be nearly

(A) 24/n hr. (B) 24 n hr. (C) $24/n^2$ hr. (D) $24\ n^2$ hr.

Ans : (C)

Hints : $I_1\omega_1 = I_2\omega_2$

$$\frac{2}{5}MR^2\left(\frac{2\pi}{T_1}\right) = \frac{2}{5}M.\frac{R^2}{n^2}\left(\frac{2\pi}{T_2}\right)$$

$$T_2 = \frac{T_1}{n^2} = \frac{24}{n^2}$$

20. If g is the acceleration due to gravity on the surface of the earth, the gain in potential energy of an object of mass m raised from the earth's surface to a height equal to the radius R of the earth is

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

Ans : (B)

Hints : $\Delta U = \dfrac{mgh}{1+\dfrac{h}{R}} = \dfrac{mgR}{1+\dfrac{R}{R}} = \dfrac{mgR}{2}$

21. A material has Poisson's ratio 0.50. If a uniform rod of it suffers a longitudinal strain of 2×10^{-3}, then the percentage change in volume is

(A) 0.6 (B) 0.4 (C) 0.2 (D) zero

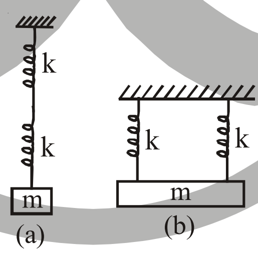
Ans : (D)

Hints : Poisson's ratio is 0.5 so there is no change in volume

22. Two identical springs are connected to mass m as shown (k = spring constant). If the period of the configuration in (a) is 2S, the period of the configuration (b) is

(A) $\sqrt{2}$ S (B) 1 S (C) $\frac{1}{\sqrt{2}}$ S (D) $2\sqrt{2}$ S

Ans : (B)



Hints : $\dfrac{T_1}{T_2} = \sqrt{\dfrac{k_2}{k_1}} \Rightarrow \dfrac{2}{T} = \sqrt{\dfrac{2k}{\dfrac{k}{2}}} = 2$

$\therefore T = 1$ S

23. An object weighs m_1 in a liquid of density d_1 and that in liquid of density d_2 is m_2. The density d of the object is

(A) $d = \dfrac{m_2d_2 - m_1d_1}{m_2 - m_1}$ (B) $d = \dfrac{m_1d_1 - m_2d_2}{m_2 - m_1}$ (C) $d = \dfrac{m_2d_1 - m_1d_2}{m_1 - m_2}$ (D) $d = \dfrac{m_1d_2 - m_2d_1}{m_1 - m_2}$

Ans : (D)

Hints : $V(d - d_1)g = m_1g$

$V(d - d_2)g = m_2g$

$$\frac{d-d_1}{d-d_2} = \frac{m_1}{m_2} \quad \therefore d = \frac{m_1d_2 - m_2d_1}{m_1 - m_2}$$

24. A body floats in water with 40% of its volume outside water. When the same body floats in an oil, 60% of its volume remains outside oil. The relative density of oil is

(A) 0.9 (B) 1.0 (C) 1.2 (D) 1.5

Ans : (D)

Hints : $V\sigma g = 0.6\, V\sigma_1 g$ ...... (1)

$V\sigma g = 0.4\, V\sigma_2 g$ .... (2)

Dividing (1) and (2) $1 = \frac{6}{4}\frac{\sigma_1}{\sigma_2} \therefore \frac{\sigma_2}{\sigma_1} = \frac{3}{2}$

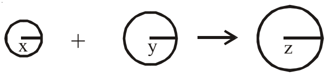
25. Two soap bubbles of radii x and y coalesee to constitute a bubble of radius z. Then z is requal to

(A) $\sqrt{x^2 + y^2}$ (B) $\sqrt{x + y}$ (C) $x + y$ (D) $\frac{x + y}{2}$

Ans : (A)

Hints : $n = n_1 + n_2$

$pv = p_1v_1 + p_2v_2$



$p_1 = p_0 + \frac{4T}{x}$, $p_2 = p_0 + \frac{4T}{y}$, $p = p_0 + \frac{4T}{z}$

If the process takes place is vaccume then $p_0 = 0$

$p_1 = \frac{4T}{x}$, $p_2 = \frac{4T}{y}$, $p = \frac{4T}{z}$

If process is isothermal

$\therefore\ p_1v_1 + p_2v_2 = pv$

$\therefore\ z = \sqrt{x^2 + y^2}$

26. A particle of mass m is located in a one dimensional potential field where potential energy is given by : $V(x) = A(1 - \cos px)$, where A and p are constants. The period of small oscillations of the particle is

(A) $2\pi\sqrt{\frac{m}{(Ap)}}$ (B) $2\pi\sqrt{\frac{m}{(Ap^2)}}$ (C) $2\pi\sqrt{\frac{m}{A}}$ (D) $\frac{1}{2\pi}\sqrt{\frac{Ap}{m}}$

Ans : (B)

Hints : $v_x = A(1 - \cos px)$

$F = -\frac{du}{dx} = -Ap\ \sin px$

For small (x)

$F = -AP^2x$

$a = -\frac{Ap^2}{m}x \quad a = -\omega^2 x$

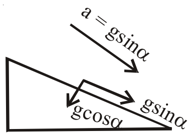
$\omega = \sqrt{\frac{AP^2}{m}} \quad \therefore T = 2\pi\sqrt{\frac{m}{Ap^2}}$

27. The period of oscillation of a simple pendulum of length *l* suspended from the roof of a vehicle, which moves without friction down an inclined plane of inclination α, is given by

(A) $2\pi\sqrt{\frac{1}{g\cos\alpha}}$ (B) $2\pi\sqrt{\frac{1}{g\sin\alpha}}$ (C) $2\pi\sqrt{\frac{1}{g}}$ (D) $2\pi\sqrt{\frac{1}{g\tan\alpha}}$

Ans : (A)

Hints :



$g_{eff} = g\cos\alpha$

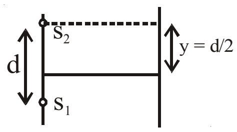
$$T = 2\pi\sqrt{\frac{\ell}{g_{eff}}}$$

28. In Young's double slit experiment the two slits are d distance apart. Interference pattern is observed on a screen at a distance D from the slits. A dark fringe is observed on the screen directly opposite to one of the slits. The wavelength of light is

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

Ans : (D)

Hints :



n^{th} Dark fringe

$$(2n-1)\frac{D\lambda}{2d} = \frac{d}{2}$$

$$\lambda = \frac{d^2}{(2n-1)D} = \frac{d^2}{D} \quad [\text{ for } n = 1]$$

29. A plane progressive wave is given by y = 2 cos 6.284 (330 t – x). What is period of the wave ?

(A) $\frac{1}{330}$S (B) $2\pi \times 330$ S (C) $(2\pi \times 330)^{-1}$S (D) $\frac{6.284}{330}$S

Ans : (A)

Hints : $y = 2\cos 2\pi(330t - x)$

$\omega = 2\pi \times 330$

$$\therefore T = \frac{1}{330}\text{ s}$$

30. The displacement of a particle in S.H.M. varies according to the relation $x = 4(\cos \pi t + \sin \pi t)$. The amplitude of the particle is

(A) – 4 (B) 4 (C) $4\sqrt{2}$ (D) 8

Ans : (C)

Hints : $R\sin\delta = 4$

$R\cos\delta = 4$

$R = 4\sqrt{2}$

31. Two temperature scales A and B are related by $\frac{A-42}{110} = \frac{B-72}{220}$. At which temperature two scales have the same reading ?

(A) -42^0 (B) -72^0 (C) $+12^0$ (D) -40^0

Ans : (C)

Hints : $\frac{A-42}{110} = \frac{B-72}{220}$, A = B

$$\frac{A-42}{110} = \frac{A-72}{220}$$

$2A - 84 = A - 72$

$A = 12$

32. An ideal gas is compressed isothermally until its pressure is doubled and then allowed to expand adiabatically to regain its original volume ($\gamma = 1.4$ and $2^{-1.4} = 0.38$). The ratio of the final to initial pressure is

(A) 0.76 : 1 (B) 1 : 1 (C) 0.66 : 1 (D) 0.86 : 1

Ans : (B)

Hints :
$$\begin{array}{ccc} P_i & V & T \\ \downarrow & \downarrow & \downarrow \\ 2P_i & \frac{V}{2} & T \end{array}$$

$$P_f V^{\gamma} = (2P_i)\left(\frac{V}{2}\right)^{\gamma}$$

$$\frac{P_f}{P_i} = 2\left(\frac{\gamma}{2\gamma}\right)^{\gamma} = 2\,(2)^{-\gamma}$$

$$= 2 \times 0.38 = 0.76$$

33. Air inside a closed container is saturated with water vapour. The air pressure is p and the saturated vapour pressure of water is $\overline{p}$. If the mixture is compressed to one half of its volume by maintaining temperature constant, the pressure becomes

(A) $2(p + \overline{p})$ (B) $2p + \overline{p}$ (C) $(p + \overline{p})/2$ (D) $p + 2\overline{p}$

Ans : (B)

Hints : $P_f = 2P + \overline{P}$

Saturated vapour pressure will not change if temperature remains constant

34. 1.56×10^5 J of heat is conducted through a 2 m^2 wall of 12 cm thick in one hour. Temperature difference between the two sides of the wall is 20^0C. The thermal conductivity of the material of the wall is (in W m^{-1} K^{-1})

(A) 0.11 (B) 0.13 (C) 0.15 (D) 1.2

Ans : (B)

Hints : $\frac{dQ}{dt} = \frac{KA\,\Delta T}{x}$

$$\frac{1.56 \times 10^5}{3600} = \frac{K \times 2 \times 20}{12 \times 10^{-2}}$$

$$K = \frac{1.56 \times 10^5 \times 12 \times 10^{-2}}{3600 \times 2 \times 20}$$

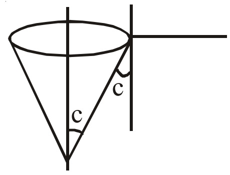
$$= \frac{1.56}{12} = 0.13$$

35. A diver at a depth of 12 m in water $\left(\mu = \frac{4}{3}\right)$ sees the sky in a cone of semivertical angle :

(A) $\sin^{-1}\left(\frac{4}{3}\right)$ (B) $\tan^{-1}\left(\frac{4}{3}\right)$ (C) $\sin^{-1}\left(\frac{3}{4}\right)$ (D) 90^0

Ans : (C)

Hints : $c = \sin^{-1}\left(\frac{1}{\mu}\right)$



$= \sin^{-1}\left(\frac{3}{4}\right)$

36. Two thin lenses of focal lengths 20 cm and 25 cm are placed in cotact. The effective power of the combination is
(A) 9D (B) 2D (C) 3D (D) 7D
Ans : (A)
Hints : $P = P_1 + P_2$

$= \frac{1}{f_1} + \frac{1}{f_2} = \frac{100}{20} + \frac{100}{25} = 5 + 4 = 9D$

37. A convex lens of focal length 30 cm produces 5 times magnified real image of an object. What is the object distance ?
(A) 36 cm (B) 25 cm (C) 30 cm (D) 150 cm
Ans : (A)

Hints : $\frac{1}{5u} - \left(\frac{1}{-u}\right) = \frac{1}{30}$

$\frac{1}{5u} + \frac{1}{u} = \frac{1}{30}, \quad \frac{5+1}{5u} = \frac{1}{30}$

$u = 36$ cm.

38. If the focal length of the eye piece of a telescope is doubled, its magnifying power (m) will be
(A) 2 m (B) 3 m (C) $\frac{m}{2}$ (D) 4m

Ans : (C)

Hints : $m = \frac{-f_0}{f_e}$

$m' = \frac{m}{2}$

39. A plano-concave lens is made of glass of refractive index 1.5 and the radius of curvature of its curved face is 100 cm. What is the power of the lens ?
(A) + 0.5 D (B) – 0.5 D (C) – 2 D (D) + 2 D
Ans : (B)

Hints : $P = \frac{1}{f} = (\mu - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$

$= (1.5 - 1)\left(\frac{1}{\infty} - \frac{1}{1m}\right)$

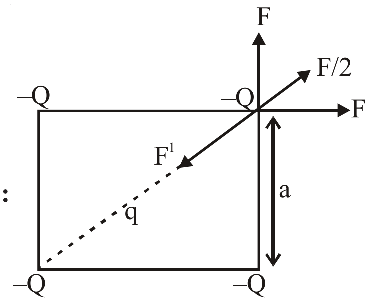
$= 0.5\,(-1)$
$P = -0.5$ D

40. Four charges equal to –Q are placed at the four corners of a square and a charge q is at its centre. If the system is in equilibrium, the value of q is

(A) $\frac{-Q}{4}(1+2\sqrt{2})$ (B) $\frac{Q}{4}(1+2\sqrt{2})$ (C) $\frac{-Q}{2}(1+2\sqrt{2})$ (D) $\frac{Q}{2}(1+2\sqrt{2})$

Ans : (B)

Hints :



$$F' = \sqrt{2}F + \frac{F}{2} = F\left(\sqrt{2} + \frac{1}{2}\right)$$

$$\frac{qQ}{\left(\frac{\sqrt{2}a}{2}\right)^2} = \frac{Q^2}{a^2}\left(\sqrt{2} + \frac{1}{2}\right), \quad q = \frac{Q}{2}\left(\frac{2\sqrt{2}+1}{2}\right)$$

$$q = \frac{Q}{4}\left(2\sqrt{2}+1\right)$$

41. Two aromatic compounds having formula C_7H_8O which are easily identifiable by $FeCl_3$ solution test (violet colouration) are

(A) o- cresol and benzyl alcohol
(B) m-cresol and p-cresol
(C) o-cresol and p-cresol
(D) methyl phenyl ether and benzyl alcohol

Ans : (A)

Hints : O – cresol contains phenolic group, thus it gives violet coloration with $FeCl_3$ where as benzylalchol donot contains phenolic group, hence no coloration with $FeCl_3$. Hence Identifiable

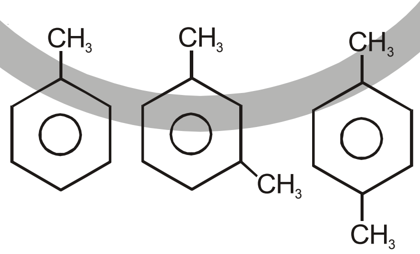
42. The ease of dehydrohalogenation of alkyl halide with alcoholic KOH is

(A) $3^o < 2^o < 1^o$
(B) $3^o > 2^o > 1^o$
(C) $3^o < 2^o > 1^o$
(D) $3^o > 2^o < 1^o$

Ans : (B)

Hints : Such dehydrohalogenation follows E_2 mechanism. The driving force of such reactions is the stability of alkene produced. Since tetriary alkyl halide can give more substituted alkene, it reacts fastest followed by secondary and primary i.e. $3^o > 2^o > 1^o$.

43. The ease of Nitration of the following three hydrocarbons follows the order



(A) II = III ≈ I
(B) II > III > I
(C) III > II > I
(D) I = III > II

Ans : (D)

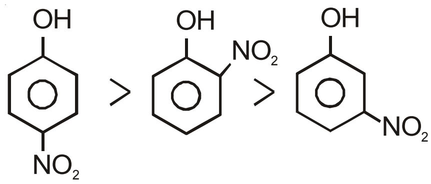
Hints : Stability order of Arenium ion

II > III > I

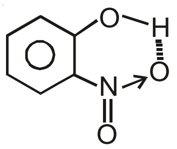
44. The correct order of decreasing acidity of nitrophenols will be

(A) m-Nitrophenol > p-Nitrophenol > o-Nitrophenol
(B) o-Nitrophenol > m- Nitrophenol > p-Nitrophenol
(C) p-Nitrophenol > m- Nitrophenol > o-Nitrophenol
(D) p-Nitrophenol > o-nitrophenol > m-Nitrophenol

Ans : (D)

Hints : 

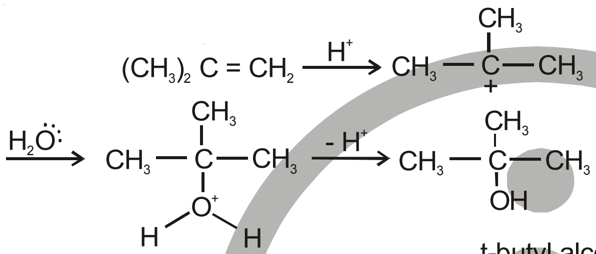
Due to – I and – R influence, NO_2 in ortho-postion should have raised the acidity to the maximum extent. But it is due to intramolecular H – bonding, ortho-nitrophenol is less acidic than para – nitrophenol.



45. Among the alkenes which one produces tertiary bytyl alcohol on acid hydration

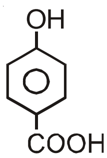
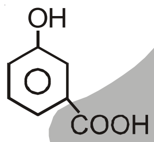
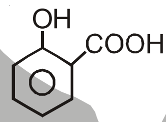
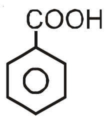
(A) $CH_3-CH_2-CH=CH_2$ (B) $CH_3-CH=CH-CH_3$ (C) $(CH_3)_2C=CH_2$ (D) $CH_3-CH=CH_2$

Ans : (C)

Hints : 

t-butyl alcohol

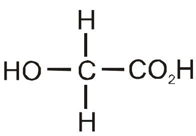
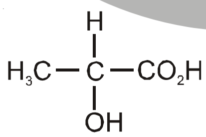
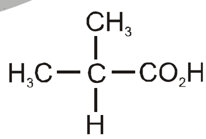
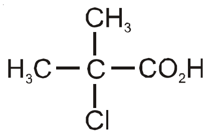
46. Which of the following compounds has maximum volatility?

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

Ans : (C)

Hints : Due to intramolecular H – bonding

47. Which one of the following will show optical isomerism?

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

Ans : (B)

Hints : The central carbon is attached to four different substituents, hence it is chiral carbon, therefore optically active.

48. The pH of an aqueous solution of CH_3COONa of concentrated C(M) is given by

(A) $7-\frac{1}{2}pK_a-\frac{1}{2}\log C$ (B) $\frac{1}{2}pK_w+\frac{1}{2}pK_b+\frac{1}{2}\log C$

(C) $\frac{1}{2}pK_w-\frac{1}{2}pK_b-\frac{1}{2}\log C$ (D) $\frac{1}{2}pK_w+\frac{1}{2}pK_a+\frac{1}{2}\log C$

Ans : (D)

Hints : In case of Hydrolysis of salt of weak acid and strong base, the pH is given by

$$\frac{1}{2}pK_w+\frac{1}{2}pK_a+\frac{1}{2}\log c$$

49. The standard reduction potential E^o for half reations are

$Zn = Zn^{+2} + Ze \quad E^o = +0.76\ V$

$Fe = Fe^{+2} + Ze \quad E^o = +0.41\ V$

The EMF of hte cell reaction

$Fe^{+2} + Zn = Zn^{+2} + Fe$ is

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

Ans : (B)

Hints : $E_{cell} = E^o_{Anode(o.p)} - E^o_{cathode(o.p)}$

$= 0.76 - 0.41$

$= +0.35\ V$

50. If the equilibrium constants of the following equilibria

$SO_2 + \frac{1}{2}O_2 \rightleftharpoons SO_3$ and $2SO_3 \rightleftharpoons 2SO_2 + O_2$

are given by K_1 and K_2 respectively, which of the following relations is correct

(A) $K_2 = \left(\frac{1}{K_1}\right)^2$ (B) $K_1 = \left(\frac{1}{K_2}\right)^3$ (C) $K_2 = \left(\frac{1}{K_1}\right)$ (D) $K_2 = (K_1)^2$

Ans : (A)

Hints : $K_1 = \frac{[SO_3]}{[SO_2][O_2]^{1/2}}$

$K_2 = \frac{[SO_2]^2[O_2]}{[SO_3]^2}$

Thus $K_2 = \left(\frac{1}{K_1}\right)^2$

51. The energy of an electron in first Bohr orbit of H – atom is – 13.6 eV. The possible energy value of electron in the excited state of Li^{2+} is

(A) – 122.4 eV (B) – 30.6 eV (C) – 30.6 eV (D) 13.6 eV

Ans : (C)

Hints : $E_n = \frac{E_1}{n^2} \times z^2$

$= \frac{-13.6}{4} \times 9 = -30.6\,eV$

For the excited state, n = 2 and for Li^{++} ion, z = 3

52. The amount of the heat released when 20 ml 0.5 M NaOH is mixed with 100 ml 0.1 M HCl is x kJ. The heat of neutralization is

(A) – 100 x kJ/mol (B) – 50 x kJ/mol (C) + 100 x kJ/mol (D) +50 x kJ/mol

Ans : (A)

Hints : $\underset{20\times0.5}{NaOH} + \underset{100\times0.1}{HCl} \rightarrow NaCl + \underset{10\,millimole\ produced}{H_2O}$

During formation of 10 millimole of H_2O the heat released is x KJ. Therefore heat of neutralisation is – 100 x KJ/mol (heat released hence negative)

53. Which one of the following has the lowest ionization energy?

(A) $1s^2\ 2s^22p^6$ (B) $1s^22s^22p^63s^1$ (C) $1s^2\ 2s^22p^5$ (D) $1s^22s^22p^3$

Ans : (B)

Hints : It's an alkalimetal; hence least I.P

54. The ozone layer forms naturally by

(A) the interaction of CFC with oxygen (B) the interaction of UV radiation with oxygen

(C) the interaction of IR radiation with oxygen (D) the interaction of oxygen and water vapour.

Ans : (B)

Hints : $O_2 \xrightarrow[\text{rays}]{h\upsilon} O + O \Rightarrow O_2 + O \rightarrow O_3$

55. 2 gm of metal carbonate is neutralized completely by 100 ml of 0.1 (N) HCl. The equivalent weight of metal carbonate is
(A) 50 (B) 100 (C) 150 (D) 200
Ans : (D)
Hints : Number of gram equivalents of HCl

$= \dfrac{100 \times 0.1}{1000} = 0.01$

Number of gram equivalents of metal carbonate required for neutralisation must also be 0.01. Thus, mass of 1 gram eqivalent of carbonate salt $\dfrac{2}{0.01} = 200\,\text{g}$

$\therefore$ Equivalent mass of carbonate salt = 200

56. Which one of the following is not true at room temperature and pressure
(A) P_4O_{10} is a white solid (B) SO_2 is a coloureless gas (C) SO_3 is a colourless gas (D) NO_2 is a brown gas
Ans : (C)
Hints : SO_3 is colorless, crystalline transparent solid at room temperature.

57. An electric current is passed through an aqueous solution of a mixture of alanine (isoelectric point 6.0) glutamic acid (3.2) and arginine (10.7) buffered at pH 6. What is the fate of the three acids?
(A) Glutamic acid migrates to anode at pH 6. Arginine is present as a cation and migrates to the cathode. Alanine in a dipolar ion remains uniformly distributed in solution.
(B) Glutamic acid migrates to cathode and others remain uniformly distributed in solution.
(C) All three remain uniformly distributed in solution.
(D) All three move to cathode
Ans : (A)
Hints : At pH = 6, glutamic acid exists as a dianionic species & migrates to anode while arginine exists as cationic species & moves to cathode. Alanine does not migrate to any electrode at its isoelectric point .

58. The representation of the ground state electronic configuration of He by box – diagram as $\boxed{\uparrow\uparrow}$ is wrong because it violates
(A) Hysenberg's Uncertainty Principle (B) Bohr's Quantization Theory of Angular Momenta
(C) Pauli Exclusion Principle (D) Hund's Rule
Ans : (A)
Hints : According to Pauli Exclusion Principle, In any orbital, maximum two electrons can exist, having opposite spin.

59. The electronic transitions from n = 2 to n = 1 will produce shortest wavelength in (where n = principal quantum state)
(A) Li^{+2} (B) He^{+} (C) H (D) H^{+}
Ans : (A)

Hints : $\dfrac{1}{\lambda} = z^2 . R_H \left[\dfrac{1}{n_1^2} - \dfrac{1}{n_2^2} \right]$

$\Rightarrow \dfrac{1}{\lambda} = (z)^2 . R_H \left\{ \dfrac{1}{1} - \dfrac{1}{4} \right\} = \dfrac{3}{4} R_H z^2$

$\therefore \lambda \propto \dfrac{1}{z^2}$

Hence, for shortest λ, z must be maximum, which is for Li^{+2}.

60. In the following electron – dot structure, calculate the formal charge from left to right nitrogen atom;

$\ddot{\underset{\cdot\cdot}{N}} = N = \ddot{\underset{\cdot\cdot}{N}}$

(A) – 1, –1, + 1 (B) – 1, +1, – 1 (C) + 1, –1, – 1 (D) + 1, – 1, + 1
Ans : (B)
Hints : Formal chargl = Number of electrons in

Valence shell – ($\dfrac{1}{2}$ × numbers of electrons as bond pair + numbers of electrons as lone pair)

$$\overset{1}{:\ddot{N}} = \overset{2}{N} = \overset{3}{\ddot{N}:}$$

For N_1 & N_3

Formal charge $= 5 - \left(\frac{4}{2} + 4\right) = 5 - (6) = -1$

For $N_2 = 5 - \frac{1}{2} \times 8 - 0 = 5 - 4 = +1$

61. If the molecular wt. of $Na_2S_2O_3$ and I_2 are M_1 and M_2 respectively, then what will be the equivalent wt. of $Na_2S_2O_3$ and I_2 in the following reaction?

$2S_2O_3^{2-} + I_2 \longrightarrow S_4O_6^{2-} + 2I^-$

(A) M_1, M_2 (B) $M_1, M_2/2$ (C) $2M_1, M_2$ (D) $M_1, 2M_2$

Ans : (B)

Hints : $\overbrace{2\overset{(+2)}{S_2}O_3^{2-} + \underbrace{\overset{(0)}{I_2} \longrightarrow \overset{(+2.5)}{S_4}O_6^{2-}}_{\text{Change in O.N per mole = 1×2=2}}}^{\text{Change in O.N per mole = 0.5×2=1}} + 2\overset{(-1)}{I^-}$

$\text{n.f.}\left(S_2O_3^{2-}\right) = 1$, Equivalent mass $= \frac{M_1}{1} = M_1$

n.f. $(I_2) = 2$, Equivalent mass $= \frac{M_2}{2}$

62. A radioactive atom ${}^{X}_{Y}M$ emits two α particles and one β particle successively. The number of neutrons in the nucleus of the product will be

(A) $X - 4 - Y$ (B) $X - Y - 5$ (C) $X - Y - 3$ (D) $X - Y - 6$

Ans : (B)

Hints : $M^{X}_{Y} \xrightarrow{-\alpha} N^{X-4}_{Y-2} \xrightarrow{-\alpha} O^{X-8}_{Y-4} \xrightarrow{-\beta} P^{X-8}_{Y-3}$

Number of neutrons $=$ Mass no. $-$ Atomic no.

$= X - 8 - Y + 3$

$= X - Y - 5$

63. An element belongs to Group 15 and third period of the periodic table. Its electonic configuration will be

(A) $1s^22s^22p^3$ (B) $1s^22s^22p^4$ (C) $1s^22s^22p^63s^23p^3$ (D) $1s^22s^22p^63s^23p^2$

Ans : (C)

Hints : General valence shell electronic configuration of 15 group elements is ns^2np^3. where n = period number.

64. Which one of the following is paramagnetic?

(A) N_2 (B) NO (C) CO (D) O_3

Ans : (B)

Hints : $\overset{\times}{\underset{\times}{}}N \overset{\times\times}{\equiv} O:$, Valence electron = 11

65. Platinum, Palladium and Iridium are called noble metals because

(A) Alfred Nobel discovered them (B) They are shining lustrous and pleasing to look at

(C) They are found in native state (D) They are inert towards many common reagents.

Ans : (D)

Hints : Fact

66. Which one is not a constituent of nucleic acid?

(A) Uracil (B) Guanidine (C) Phosphoric acid (D) Ribose sugar

Ans : (B)

Hints : Guanine is the constituent of nucleic acid and not guanidine.

67. The sp^3d^2 hybridization of central atom of a molecule would lead to

(A) square planar geometry (B) Tetrahedral geometry

(C) Trigonal bipyramidal geometry (D) Octahedral geometry

Ans : (D)

Hints : Fact

68. In aqueous solution glucose remains as

(A) Only in open chain form (B) Only in pyranoze form

(C) Only in furanose forms (D) In all three forms in equilibrium

Ans : (D)

Hints : $\beta - D - \text{glucose} \rightleftharpoons D - \text{glucose} \rightleftharpoons \alpha - D - \text{glucose}$

$(\approx 64\%)$ (open chain $\approx 0.02\%$) $(\approx 34\%)$

69. Which of the following is used to prepare Cl_2 gas at room temperature from concentrated HCl?

(A) MnO_2 (B) H_2S (C) $KMnO_4$ (D) Cr_2O_3

Ans : (C)

Hints : $2MnO_4^- + 16H^+ + 10Cl^- \rightarrow 2Mn^{2+} + 5Cl_2 + 8H_2O$

70. NO_2 is not obtained on heating

(A) $AgNO_3$ (B) KNO_3 (C) $Cu(NO_3)_2$ (D) $Pb(NO_3)_2$

Ans : (B)

Hints : $KNO_3 \xrightarrow{\Delta} KNO_2 + \frac{1}{2}O_2$

71. The normality of 30 volume H_2O_2 is

(A) 2.678 N (B) 5.336 N (C) 8.034 N (D) 6.685 N

Ans : (B)

Hints : Volume strength = 5.6 × normality

$30 = 5.6 \times N$

$\Rightarrow N = \frac{30}{5.6} = 5.3$

72. Reaction of formaldehyde and ammonia gives

(A) Hexamethylene tetramine (B) Bakelite

(C) Urea (D) Triethylene Tetramine

Ans : (A)

Hints : $6HCHO + 4NH_3 \rightarrow (CH_2)_6N_4 + 6H_2O$

73. A plot of In k against $\frac{1}{T}$ (abscissa) is expected to be a straight line with intercept on ordinate axis equal to

(A) $\frac{\Delta S^\circ}{2.303R}$ (B) $\frac{\Delta S^\circ}{R}$ (C) $-\frac{\Delta S^\circ}{R}$ (D) $R \times \Delta S^\circ$

Ans : (B)

Hints : $\Delta G^\circ = -RT\ \text{InK}$

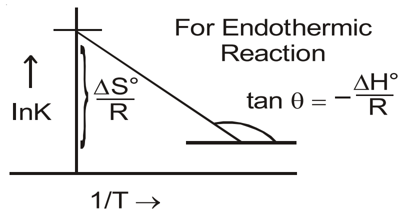
or, $\Delta H^\circ - T\Delta S^\circ = -RT\ \text{InK}$

or, $\text{InK} = \frac{-\Delta H^\circ}{RT} + \frac{\Delta S^\circ}{R}$

comparing with

$y = m.x + c$

$\therefore$ y intercept is $\frac{\Delta S^\circ}{R}$



74. Which of the following represents the composition of Carnallite mineral?

(A) $K_2O.Al_2O_3.6SiO_2$ (B) KNO_3

(C) $K_2SO_4.MgSO_4.MgCl_2.6H_2O$ (D) $KCl.MgCl_2.6H_2O$

Ans : (D)

Hints : Fact

75. The solubility of $Ca_3(PO_4)_2$ in water is y moles / litre. Its solubility product is

(A) $6y^4$ (B) $36y^4$ (C) $64y^5$ (D) $108y^5$

Ans : (D)

Hints : $Ca_3(PO_4)_2(s) \rightleftharpoons \underset{3s}{3Ca^{2+}(aq)} + \underset{2s}{2PO_4^{3-}(aq)}$

$^{K}sp = [Ca^{2+}]^3.[PO_4^{3-}]^2$

$= (3s)^3.(2s)^2$

$= 27s^3 \times 4s^2$

$= 108\ s^5$

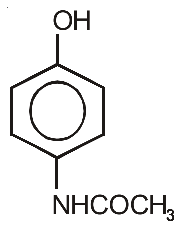
76. Paracetamol is

(A) Methyl salicylate (B) Phenyl salicylate

(C) N-acetyl p-amino phenol (D) Acetyl salicylic acid

Ans : (C)

Hints : Fact



77. Anhydrous ferric chloride is prepared by

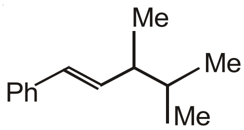
(A) Dissolving $Fe(OH)_3$ in concentrated HCl (B) Dissolving $Fe(OH)_3$ in dilute HCl

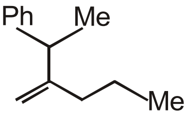
(C) Passing dry HCl over heated iron scrap (D) Passing dry Cl_2 gas over heated iron scrap

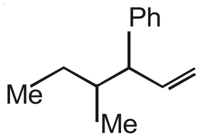
Ans : (D)

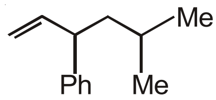
Hints : $2Fe + 3Cl_2 \xrightarrow{\Delta} 2FeCl_3$

78. Which one of the following is s-butyl phynylvinyl methane?

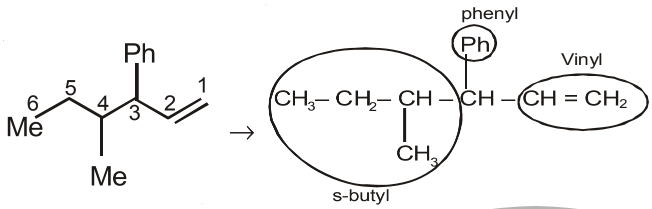
(A) 

(B) 

(C) 

(D) 

Ans : (C)

Hints : 

79. Hybridization of C_2 and C_3 of $H_3C-CH=C=CH-CH_3$ are

(A) Sp, Sp^3 (B) Sp^2, Sp (C) Sp^2, Sp^2 (D) Sp, Sp

Ans : (B)

Hints : $\overset{1}{C}H_3-\underset{\substack{\uparrow\\ sp^2}}{\overset{2}{C}}H=\underset{\substack{\uparrow\\ sp}}{\overset{3}{C}}=\overset{4}{C}H-\overset{5}{C}H_3$

80. Which of the following compounds is not formed in iodoform reaction of acetone

(A) CH_3COCH_2I (B) ICH_2COCH_2I (C) CH_3COCHI_2 (D) CH_3COCI_3

Ans : (B)

Hints :

$$CH_3-\overset{O}{\overset{\|}{C}}-CH_3 \xrightarrow{OI^-} CH_3-\overset{O}{\overset{\|}{C}}-CH_2I + O\bar{H}$$

$$CH_3-\overset{O}{\overset{\|}{C}}-CH_2I \xrightarrow{OI^-} CH_3-\overset{O}{\overset{\|}{C}}-CHI_2 + O\bar{H}$$

$$CH_3-\overset{O}{\overset{\|}{C}}-CHI_2 \xrightarrow{OI^-} CH_3-\overset{O}{\overset{\|}{C}}-CI_3 + O\bar{H}$$

$$CH_3-\overset{O}{\overset{\|}{C}}-CI_3 \xrightarrow{OH^-} CH_3-\overset{O}{\overset{\|}{C}}-O^- + CHI_3$$

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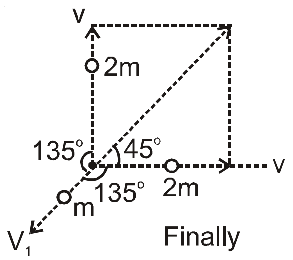
DESCRIPTIVE TYPE QUESTIONS

SUB : PHYSICS & CHEMISTRY

1. A shell of mass m is at rest initially. It explodes into three fragments having masses in the ratio 2 : 2 : 1. the fragments having equal masses fly off along mutually perpendicular direction with speed *V*. What will be the speed of the third (lighter) fragment?

A.



From conservation of momentum

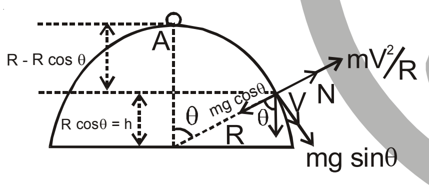
$$O = 2mv\sqrt{2} + mv_1$$

$$V_1 = -2\sqrt{2}\,v$$

Hence, velocity of third part is $2\sqrt{2}\,v$ at an angle of 135° with either part.

2. A small spherical ball of mass m slides without friction from the top of a hemisphere of radius R. AT what height will the ball lose contact with surface of the sphere ?

A. If the ball lose contact at B then, from conservation of energy.



$$\cancel{m}gR(1-\cos\theta) = \frac{1}{2}\cancel{m}v^2$$

$v^2 = 2gR\,(1 - \cos\theta)$ ......(i)

<u>At B</u>

$$N + \frac{mV^2}{R} = mg\cos\theta$$

When the ball will lose the contact

$N = O$

$$\cancel{m}g\cos\theta = \frac{\cancel{m}v^2}{R}$$

$V^2 = gR\cos\theta$ ....(ii)

$\therefore$ from (i) & (ii)

$2\cancel{R}\cancel{g}(1 - \cos\theta) = \cancel{g}\cancel{R}\cos\theta$

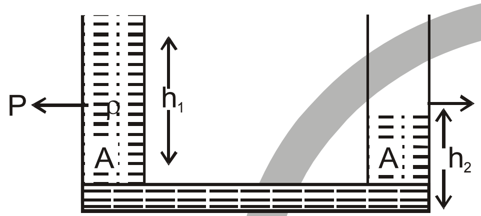
$2 - 2\cos\theta = \cos\theta.$

$2 = 3\cos\theta.$

$\therefore$ Height from the ground

$$h = R\cos\theta = \frac{2R}{3}$$

3. Two identical cylindrical vessels, with their bases at the same level, each cotain a liquid of density p. The height of liquid in one vessel in h_1 and that in the other is h_2. The area of either base is A. What is the work done by gravity in equalizing the levels when the vessles are interconnected ?

A. 

Let find height = h

$$\therefore h = \left(\frac{h_1 + h_2}{2}\right)$$

decerese in height

$$\Delta h = h_1 - \left(\frac{h_1 + h_2}{2}\right) = \left(\frac{h_1 - h_2}{2}\right)$$

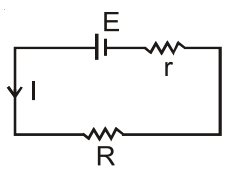
Mass of liquid

$$m = \frac{(h_1 - h_2)}{2}\rho A$$

$\therefore$ Work done

$$W = \left[\left(\frac{h_1 - h_2}{2}\right)\rho A\right]\left[\frac{h_1 - h_2}{2}\right] = \frac{(h_1 - h_2)^2}{4} g\rho A$$

4. A battery of emf E and internal resistance r is connected across a pure resistive device (such as an electric heater) of resistance R. Prove that the power output of the device will be maximum if R = r.

A. 

$$I = \frac{E}{R + r}$$

$$\text{Power } P = I^2R = \frac{E^2R}{(R+r)^2}$$

For maximum power

$$\frac{dp}{dR} = 0$$

$$E^2\left[\frac{(R+r)^2.1 - R.2(R+r)}{(R+r)4}\right] = 0$$

$$R + r - 2R = 0$$

$$r = R$$

5. A radioactive isotope X with half life 1.5×10^9 yrs. decays into a stable nucleus Y. A rock sample contains both elements X and Y in ratio 1 : 15. Find the age of the rock.

A.

	X	→ Y
t = 0,	16	0
t = 1,	1	15

$$T_{1/2} = 1.5 \times 10^9 \text{ yr}$$

$$N = N_o\left(\frac{1}{2}\right)^n$$

$$1 = 16\left(\frac{1}{2}\right)^n$$

$$\left(\frac{1}{2}\right)^n = \left(\frac{1}{2}\right)^4 \quad \therefore n = 4$$

$\therefore$ time $t = 4 \times 1.5 \times 10^9 = 6 \times 10^9$ yrs

6. The bacterial growth follows the rate l aw, $\frac{dN}{dt} = KN$ where 'K' is a constant and 'N' is the number of bacteria cell at any time. If the population of bacteria (no. of cell) is doubled in 5 minutes, find the time by which the population will be eight times of the initial one.

A. $\frac{dN}{dt} = KN$ (1st order kinetics)

$\Rightarrow N = N_0e^{kt}$ (integrating)

$\because$ in 5 min, $N = 2N_0$

$$K = \frac{2.303}{t}\log\frac{N}{N_0}$$

$$\Rightarrow K = \left(\frac{2.303}{5}\log\frac{2N_o}{N_0}\right)\min^{-1}$$

$$\Rightarrow K = \frac{2.303}{5}\log 2$$

for $8N_0$

$$t = \left(\frac{2.303}{\frac{2.303}{5}\log 2}\right)\log\frac{8N_o}{N_o}$$

$$\Rightarrow\ t = \frac{5\times 3\log 2}{\log 2} = 15\min$$

$\therefore$ time required is 15 min.

7. In ‘x’ ml 0.3 (N) HCl, addition of 200 ml distilled water or addition of 100 ml 0.1 (N) NaOH, gives same final acid strength. Determine ‘x’.

A. When 200 ml H_2O is added to x ml solution

$(x)(0.3) = (x+200)(Y) \rightarrow$ final conc.

$$Y = \frac{0.3x}{200+x}$$

in 2nd case

Number of equivalents of HCl after NaOH addition

$\frac{0.3x}{1000} - 0.01$ (no of eq. of NaOH added = 0.01)

$$\therefore \text{ conc. would be } \frac{\left\{\frac{0.3x}{1000} - 0.01\right\}}{100+x}\times 1000(N)$$

by condition,

$$\frac{\left\{\frac{0.3x}{1000} - 0.01\right\}1000}{100+x} = \frac{0.3x}{200+x} \Rightarrow \frac{0.3x-10}{100+x} = \frac{0.3x}{(200+x)} \Rightarrow (0.3x-10)\times(200+x) = (0.3x)(100+x)$$

$$\Rightarrow 60x - 2000 + 0.3x^2 - 10x = 30x + 0.3x^2$$

$$\Rightarrow 20x = 2000 \qquad \Rightarrow x = 100\text{ ml}$$

8. Compound A treated with $NaNH_2$ followed by CH_3CH_2Br gave compound B. Partial hydrogenation of compound B produced compound C, which on ozonolysis gave a carbonyl compound D, (C_3H_6O). Compound D did not respond to iodoform test with I_2/Kl and NaOH. Find out the structures of A, B, C and D

A. Assuming 1 eq. of $NaNH_2$ is used,

$$CH_3CH_2C \equiv CH \xrightarrow[-NH_3]{NaNH_2} CH_3CH_2C \equiv \overset{\ominus}{C}\ \overset{\oplus}{Na}$$

$$\overset{S+}{CH_3CH_2} - \overset{S-}{Br}$$

$$S_N2 \downarrow -NaBr$$

$$\underset{(C)}{CH_3CH_2CH = CH\,CH_2CH_3} \xleftarrow[\text{Hydrogenation}]{\text{Partial}} \underset{(B)}{CH_3CH_2C \equiv C{-}CH_2CH_3}$$

(i) O_3

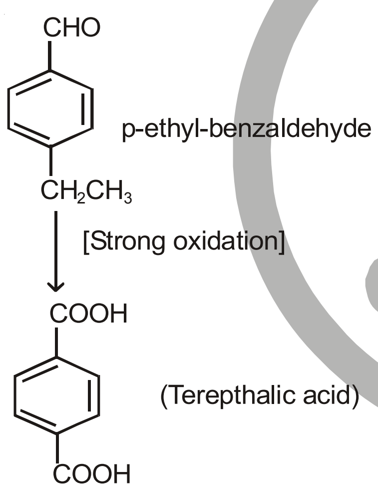
(ii) $Zn + H_2O$ $\downarrow$ Ozonolysis

$\underset{(D)}{2\,CH_3CH_2CHO}$ (No Keto Methyl group $\therefore$ –ve iodoform)

9. An organic compound with molecular formula $C_9H_{10}O$ forms, 2, 4-DNP derivative, reduces Tollen's reagent and undergoes Cannizzaro reaction. On vigorous oxidation it gives a dicarboxylic acid which is used in the preparation of terylene. Identify the organic compound.

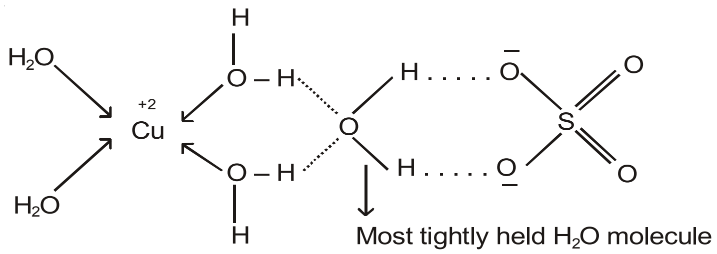
A. +ve Brady's test indicates carbonyl compound, Tollens & Cannizzaro reaction indicates aldehyde without $\alpha - H$

$\because$ end product is terepthalic acid, compound must be



10. Deep blue $CuSO_4.5H_4O$ is converted to a bluish white salt at 100°C. At 250°C and 750°C it is then transformed to a white powder and black material respectively. identify the salts.

A. One H_2O molecule in blue vitriol is Hydrogen bonded from 4 sides and is thus released with more difficulty than the rest four H_2O molecules.



$$CuSO_4.5H_2O \xrightarrow[\Delta]{-4H_2O} CuSO_4.H_2O \text{ bluish white salt (100°C)}$$

$$\downarrow [\Delta]$$

$$CuO + SO_3 \xleftarrow{\Delta} CuSO_4 \text{ (White powder)}$$

(black powder) 750°   250°C