Nishant Jindal

(3) To determine eqlb^m conc of each sub:

$$A + 2B \longrightarrow C$$

time = 0 a moles b 0

at eqlb^m $a-x$ $b-2x$ x

$$P_A = \frac{n_A RT}{V}$$

or $P_A = X_A P_T$

$$= \frac{(a-x)}{(a+b-2x)} P_T$$

$$K_c = \frac{[C]}{[A][B]^2} = \frac{\left(x/V\right)}{\left(\frac{a-x}{V}\right)\left(\frac{b-2x}{V}\right)^2} = \frac{x}{(a-x)(b-2x)^2}\left(\frac{1}{V}\right)^{1-1-2}$$

$$K_p = \frac{P_C}{P_A \times P_B^2} = \frac{\left(\frac{x}{a+b-2x}P_T\right)}{\left(\frac{a-x}{(a+b-2x)}P_T\right)\left(\frac{b-2x}{a+b-2x}P_T\right)^2} = \frac{x}{(a-x)(b-2x)^2}\left(\frac{P_T}{a+b-2x}\right)^{1-1-2}$$

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Q. 2 moles each of $H_2(g)$ & $I_2(g)$ are mixed in a 10 lit container find conc of each substance at eqlbm

$$H_2(g) + I_2(g) \longrightarrow 2HI(g) \qquad K_c = 100$$

$$\begin{array}{ccc} 2 & 2 & \\ 2-x & 2-x & 2x \end{array}$$

$$\boxed{100 = \frac{(2x)^2}{(2-x)(2-x)} \times \left(\frac{1}{10}\right)^{2-1-1} = \frac{(2x)^2}{(2-x)^2}}$$

$$10 = \frac{2x}{2-x}$$

$$x = \frac{20}{12} = \frac{5}{3}$$

$$2 - \frac{5}{3} = \frac{1}{3} \qquad \frac{1}{3} \qquad \frac{10}{3} \text{ moles}$$

Conc $= \frac{1}{30}$ $\quad \frac{1}{30}$ $\quad \frac{1}{3}$

$$H_2 + I_2 \longrightarrow 2HI \qquad K_c = 100$$

$$\begin{array}{ccc} 2/10 & 2/10 & \\ 0.2 & 0.2 & \\ 0.2-y & 0.2-y & 2y \end{array}$$

$$100 = \frac{(2y)^2}{(0.2-y)^2}$$

$$10 = \frac{2y}{0.2-y}$$

$$y = \frac{2}{12} = \frac{1}{6}$$

J-Main

J-Advanced

Redox

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JEE ADVANCED PAPER –I

1. Find the ratio of coefficient of $Co(MnO_4)_3$ to $Pb(N_3)_2$ in the balanced chemical reaction

$Pb(N_3)_2 + Co(MnO_4)_3 = CoO + MnO_2 + Pb_3O_4 + NO$

(A) 11:22 (B) 13:15 (C) 22:15 (D) 15:19

$$\overset{+2\ \ -1/3}{3Pb(N_3)_2} \longrightarrow \overset{8/3}{Pb_3O_4} + \overset{+2}{18NO}$$

$= +6 - 18 \times 1/3 = 0$; $= 8/3 \times 3 = 8$; $+18 \times 2 = 36$

44

$\times 5$

$$\overset{+3\ \ +7}{Co(MnO_4)_3} \rightarrow \overset{+2}{CoO} + \overset{+4}{3MnO_2}$$

$+3 + 21 = 24$; $+2 + 12 = 14$

10

$\times 22$

10. Select the correct option for 20% (w/v) aq. solution of MgO. [d = 2 gm/ml.].

(A) Molarity of solution = 10 M (B) Molality of solution = $\frac{100}{18}$ M

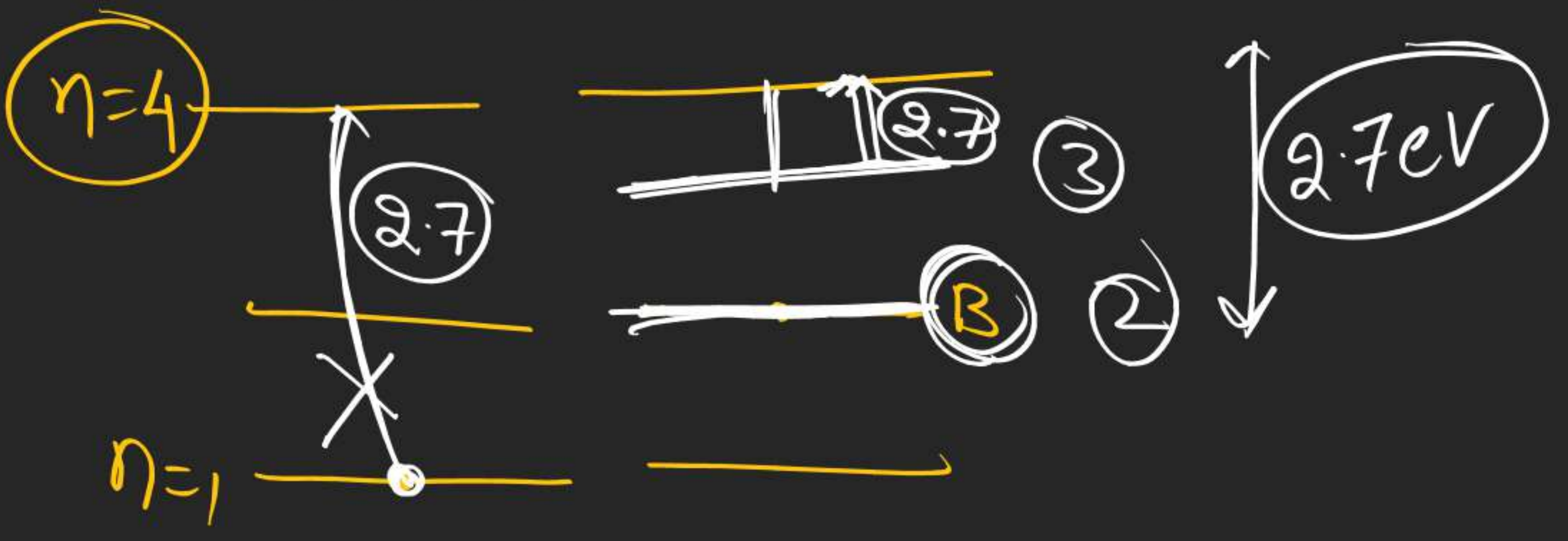
(C) $X_{MgO} = \frac{1}{21}$ (D) $\%\left(\frac{w}{w}\right) = 10$

100 ml solution —— 20 gm MgO

200 gm " ⟶ 20 gm MgO

$W_{H_2O} = 200 - 20 = 180$ gm

13. A gas of identical H-like atom has some atoms in the lowest (ground) energy level ‘A’ and some atoms in a particular upper (excited) energy level ‘B’ and there are no atoms in any other energy level. The atoms of the gas make transition to a higher energy level by absorbing monochromatic light of photon energy 2.7 eV. Subsequently, the atoms emit radiation of only six different photons energies. Some of the emitted photons have energy 2.7 eV. Some have more and some have less than 2.7 eV. Then principal quantum number of initially excited level ‘B’ is: $n = 2$



$$2.7 = 13.6\,\cancel{Z^2}\left[\frac{1}{4} - \frac{1}{16}\right]$$

$$E = 13.6\,Z^2\left[\frac{1}{9} - \frac{1}{16}\right]$$

16. A gas of identical H-like atom has some atoms in the lowest (ground) energy level ‘A’ and some atoms in a particular upper (excited) energy level ‘B’ and there are no atoms in any other energy level. The atoms of the gas make transition to a higher energy level by absorbing monochromatic light of photon energy 2.7 eV. Subsequently, the atoms emit radiation of only six different photons energies. Some of the emitted photons have energy 2.7 eV. Some have more and some have less than 2.7 eV. Then the minimum energy of emitted photon is

0.66
0.65

18. How many blood cells of 5ml each having $[K^+] = 0.1M$ should burst into 25 ml of blood plasma $[K^+] = 0.02$ M so as to give final $[K^+] = 0.06$ M

$$25 \times 0.02 + n \times 5\,ml \times 0.1 = (25 + n \times 5) \times 0.06$$

JEE ADVANCED PAPER –II

1. The number of species(s) which can react with acidified $KMnO_4$ out of the following specie(s) is/are –

$+2$ $\quad$ $+1$ $\;-2$ $\;-1$ $\quad$ $+4$

$FeSO_4$, $\cancel{Fe_2(SO_4)_3}$, $\cancel{O_3}$, FeC_2O_4, $\cancel{CuSO_4}$, Cu_2S, H_2O_2, NO_2^-, $\cancel{NO_3^-}$, SO_3^{2-}

OF_2

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4. 450 gm $\overset{+7}{Ba(MnO_4)_2}$ sample containing some inert impurity is treated with 100 ml, "33.6 V" H_2O_2 in acidic medium, then % purity of $Ba(MnO_4)_2$ in the sample.
11.2 (Atomic mass of Ba = 137, Mn = 55)

$$Ba(\overset{+7}{Mn}O_4)_2 + H_2O_2 \longrightarrow O_2 + Mn^{2+}$$

$n_f = 10$ $\quad$ $n_f = 2$

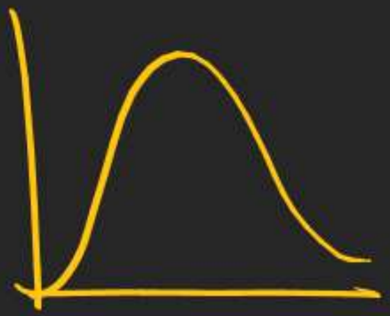
7. Which of the following information is true?

T (A) 3s orbital has two nodes. T

F (B) $d_{x^2-y^2}$ orbital has zero electron density in XY-plane

F (C) $3d_{z^2}$ has zero electron density in XY-plane.

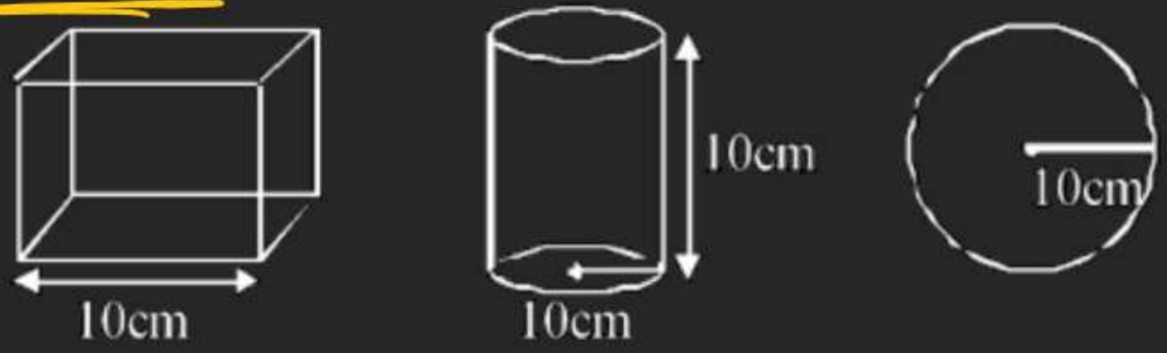
(D) The radial probability curve of 1s, 3p and 5d have one, two and three no of maxima



JEE ADVANCED PAPER –II

10. Three closed containers are filled with equal amount of same ideal gas. If pressure is same in all container then -

$PV = nRT$



1000

Container-I (Cube) Container-II (Cylinder) Container-III (Sphere)

$\pi \times 1000$

$\frac{4}{3} \times \pi \times 1000$

(A) $(U_{rms})_3 > (U_{rms})_2 > (U_{rms})_1$

(B) $(U_{rms})_3 = (U_{rms})_2 = (U_{rms})_1$

(C) $\lambda_1 < \lambda_2 < \lambda_3$ ($\lambda \rightarrow$ Mean free path)

(D) $(z_1)_1 < (z_1)_2 < (z_1)_3$

$Z_1 \propto \frac{P}{\sqrt{T}}$

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13. To a 10 ml 1 M aqueous solution of Br_2, excess of NaOH is added so that all Br_2 is disproportional to Br^- and BrO_3^-. The resulting solution is freed from Br^-, by extraction and excess of OH^- neutralised by acidifying the solution. The resulting solution is sufficient to react with 1.5 gm of impure CaC_2O_4(M = 128 gm/mol) sample. The % purity of Oxalate sample is

The relevant reactions are $Br_2 (aq.) + OH^- \rightarrow Br^- (aq.) + BrO_3^-$

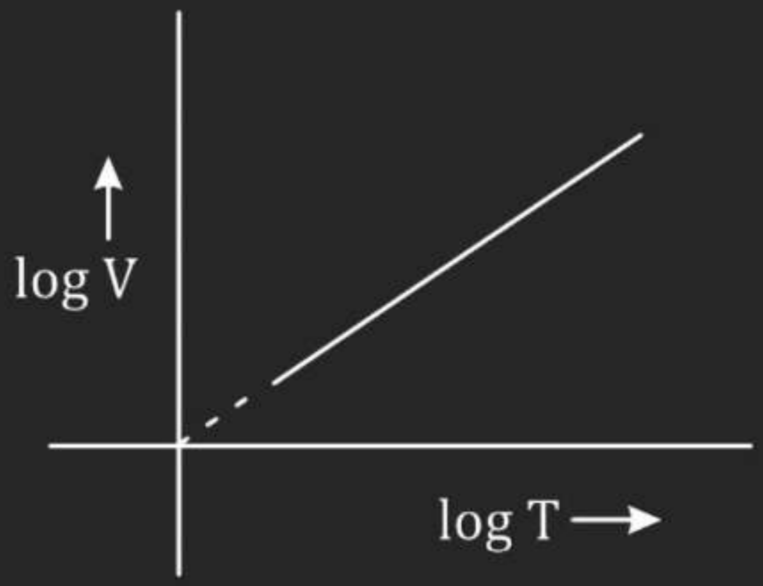
$n_f = 5/3$ $n_f = 5$

$BrO_3^- + C_2O_4^{2-} \rightarrow Br^- + CO_2$

$n_f = 6$ $n_f = 2$

17. At constant pressure of 0.1642 atm, $\log V$ vs $\log T$ graph is plotted for an ideal gas.

Calculate moles of gas. [Given $R = 0.0821\ L\ atmMol^{-1}\ K^{-1}$]



$$\log \frac{nR}{P} = 0$$

$$\frac{nR}{P} = 1$$

$$\frac{n \times 0.0821}{0.1642} = 1$$

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0 +3

18. In the reaction, $8Al + 3Fe_3O_4 \rightarrow 4Al_2O_3 + 9Fe$, the number of electrons transferred from reductant to oxidant is:

24 e^-