



Code Number:

**A****Aakash****Medical | IIT-JEE | Foundations**

**Corp. Office:** Aakash Educational Services Limited, 3rd Floor, Incuspaze Campus- 2, Plot No. 13,  
Sector- 18, Udyog Vihar, Gurugram, Haryana - 122015

Time: 3 hrs.

**Mock Test Paper for Class-XII**

Max. Marks: 60

**CHEMISTRY****Answers & Solutions**

- 1 Molar mass of  $C_2H_4O_2 = 12 \times 2 + 1 \times 4 + 16 \times 2 = 60 \text{ gm/mol}$  01 M
- Moles of  $C_2H_4O_2 = \frac{2.5}{60 \text{ g/mol}} = 0.0417 \text{ mol}$
- Mass of benzene in kg =  $75 \text{ g} / 1000 \text{ g/kg} = 75 \times 10^{-3} \text{ kg}$
- Molality of  $C_2H_4O_2 = \frac{\text{moles of } C_2H_4O_2}{\text{mass of benzene in kg}}$  01 M
- $= \frac{0.0417 \text{ mol} \times 1000 \text{ g}}{75 \text{ g}} = 0.556 \text{ mol/kg}$
- 2 A primary battery is an electro chemical battery which act as a source of electrical energy, without being previously charged up by an external source of electric current. 01M
- Ex : Dry cell, Mercury cell 01M
- 3 Brass: 60 – 80% copper ; 20 – 40% Zinc. 01M
- Bronze : 75 – 90% copper ; 10 – 25% Tin 01M
- 4 1) Chlorine oxidizes acidified ferrous sulphate to ferric sulphate 01M
- $2FeSO_4 + H_2SO_4 + Cl_2 \longrightarrow Fe(SO_4)_3 + 2 HCl$
- 2) Oxidizes sodium sulphite to sodium sulphate 01M
- $Cl_2 + Na_2SO_3 + H_2O \longrightarrow Na_2SO_4 + 2HCl$
- 5 It is a mixture of triethyl aluminium  $[Al(C_2H_5)_3]$  and titanium tetra chloride  $(TiCl_4)$  02 M
- Used in preparation of high density polyethene.
- 6 The electronic configuration of  $Fe^{+2}$  ion is  $[Ar] 4s^0 3d^6$
- $\uparrow \downarrow \uparrow \uparrow \uparrow \uparrow$
- The no. of unpaired electrons (n) is 4. 01 M
- $\therefore$  The spin only magnetic moment of given

- by  $\mu = \sqrt{n(n+2)}$  BM 01 M  
 $= \sqrt{4(4+2)} = 4.90 \text{ B.M.}$
- 7 Monomer of Nylon 2 is glycine 01M  
 Nylon 6 is aminocaproic acid 01M
- 8 In modern diving apparatus, a mixture of He & O<sub>2</sub> is used because He is very low soluble in blood even at high pressure. 02M
- 9 Enantiomers are stereoisomers which are related to each other as non superimposable mirror images optically active but differ in rotation of plane polarized light. 01 M  
 Ex : Lactic acid 01 M
- 10 As the basic strength increases, the pK<sub>b</sub> value decreases 02 M  
 $\text{C}_6\text{H}_5\text{NH}_2 > \text{C}_6\text{H}_5\text{NHCH}_3 > \text{C}_2\text{H}_5\text{NH}_2 > (\text{C}_2\text{H}_5)_2\text{NH}$   
 pK<sub>b</sub> = 9.38      9.30      3.29      3.00
- 11 Ge (a group 14 element) is doped with 2M  
 In (a group 13 element) 2M  
 We know that Ge is tetra valent by nature which means each Ge atom is surrounded by four other Ge atoms. 2M  
 When an indium atom is added, which is trivalent a hole is created due to absence of an electron in lattice and the semiconductor generated is called p-type semiconductor  
 (ii) Si (a group 14 element) is doped with B (a group 13 element), we know that Si is tetravalent by nature which means each Si atom is surrounded by four other Si atoms when a boron atom is added, which is trivalent, a hole is created due to absence of an electron in lattice and the semiconductor generated is called p-type semiconductor.
- 12 Raoult's law for non-volatile solute: 01 M  
 Raoult's law states that the relative lowering of vapour pressure of a dilute solution of non-volatile solute is equal to mole fraction of the solute.  

$$\frac{P^0 - P^S}{P^0} = X_2 = \frac{n_2}{n_1 + n_2}$$
 Where P<sup>0</sup> = Vapour pressure of pure solvent.  
 P<sup>S</sup> = Vapour pressure of solution.  
 n<sub>2</sub> = no. of mole  
 n<sub>1</sub> = no. of moles of solvent  
 Here P<sup>0</sup> = 17.535 03 M  
 W<sub>2</sub> = 25g  
 W<sub>1</sub> = 450 g  
 Molar mass of the solution (C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>)  
 M<sub>2</sub> = 180 g mol<sup>-1</sup>  
 Molar mass of the solvent (H<sub>2</sub>O)  
 M<sub>1</sub> = 18g.mol<sup>-1</sup>

Applying Raoult's law

$$\frac{P^{\circ} - P^s}{P^{\circ}} = \frac{W_2}{M_2} = \frac{M_1}{W_1}$$

$$\frac{17.535 - P_s}{17.535} = \frac{25}{180} \times \frac{18}{450}$$

$$\Rightarrow 17.535 - P_s = 17.535 \times \frac{25}{4500} = 0.097$$

(or)  $P_s = 17.535 - 0.097 = 17.438$  mm of Hg

$\therefore$  Vapour pressure of solution = 17.438 mm of Hg

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S. No.	Dispersed phase	Dispersion medium	Type of colloidal	Exchanged
1	Liquid	Gas	Aerosol	Fog
2	Solid	Gas	Aerosol	Smoke
3	Liquid	Liquid	Emulsion	Milk
4	Liquid	Gas	Aerosol	Cloud

01M

01M

01M

01M

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(1) The process of heating the ore below its M.P. in presence of air is called roasting. 02M

(2) It is applied to sulphide ores.

(3) During roasting the minerals get oxidised.

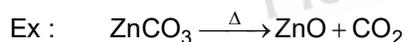


Calcination:

(1) The process of heating the ore below its fusion temperature in the absence of air is called calcination. 02M

(2) During calcination volatile impurities are removed

(3) It is applied to carbonates and hydrated oxides.



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(i) Ligand : The molecules (or) ion that bounds to the central atom by donating electron pairs is called a ligand. 01 M

Ex :  $\text{Cl}^-$ ,  $\text{NH}_3$  etc.

(ii) Co-ordination number : The number of coordination bonds with which the ligands are bound to the central ion of a coordination entity is called co-ordination number 01 M

Ex : In  $[\text{Ag}(\text{CN})_2]^-$ , coordination number of Ag is 2.

(iii) Co-ordination entity : A molecule in which a central atom (or) ion is bounded by a fixed number of ions (or) molecule ion with one (or) more ligands. 01 M

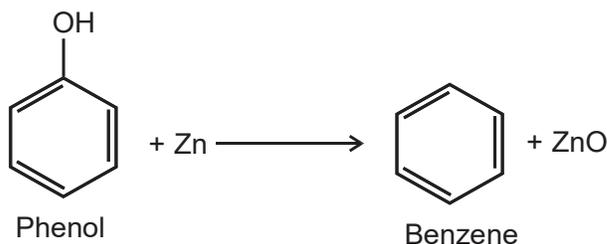
Ex : In the complex  $\text{K}_4[\text{Fe}(\text{CN})_6]$ , the co-ordination entity is  $[\text{Fe}(\text{CN})_6]^-$

(iv) Central atom (or) ion; In a co-ordination entity the atom (or) ion to which a fixed no. of ions (or) groups are bound in a definite geometrical. 01 M

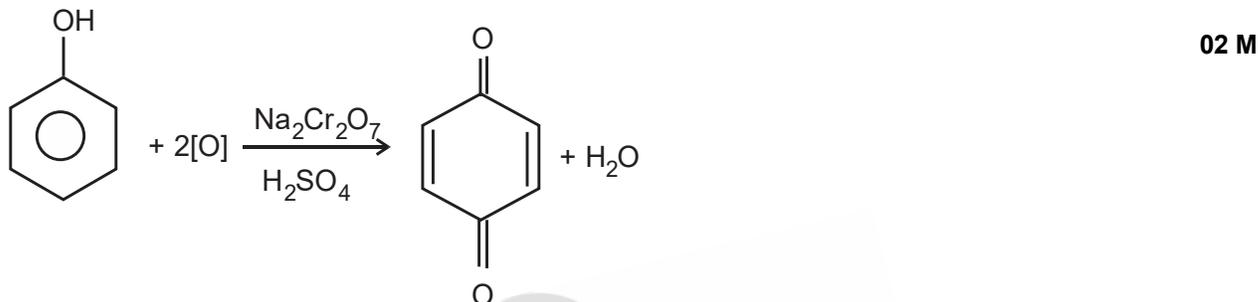
Arrangement around it; is called the central atoms (or) ion. Central ions also known as Lewis acids.

Ex : In  $[\text{Fe}(\text{CN})_6]^{4-}$  the central ion is  $\text{Fe}^{+2}$

- 16 Phenol reduced with Zinc dust to form benzene 02 M



Phenol is oxidized with chromic acid ( $\text{Na}_2\text{Cr}_2\text{O}_7 + \text{H}_2\text{SO}_4$ ) to form benzoquinone



- 17 Hormones : The organic compounds that transfer biological information from one part to another part in plant (or) animal body are called as hormones. It helps in maintaining balanced biological activities in the body. 01 M

Examples : Thyroxine, Para thyroxine, estrogen etc.

Types of Hormones:

- (i) Steroid Hormone: These hormones are produced by the adrenal cortex and gonads Ex : Testosterone. 01 M

- (ii) Polypeptide Derivatives : It is produced by pancreas, parathyroid, pituitary and gastrointestinal mucosa. 01 M

Ex : Insulin, vasopressin

- (iii) Amino acid Hormone : It is produced by thyroid and adrenal medulla 01 M

Ex : Thyroxine, Adrenaline

- 18 (a) Antacids : Chemical compounds which neutralize the excess acid in stomach and maintain pH to normal level are called antacids. 02 M

Ex: Sodium hydrogen carbonate.

Mixture of  $\text{Al}(\text{OH})_3$  and  $\text{Mg}(\text{OH})_2$ , omeprazole, cimetidine.

- (b) The chemical substances which prevent the spoilage of food due to microbial growth are called food preservatives. 02 M

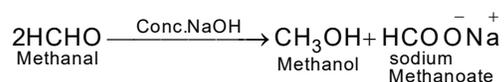
Ex : Sodium benzoate, salts of propanoic acid.

- 19 (i) Cannizzaro reaction: 02 M

When aldehydes which are not having  $\alpha$ -hydrogen atom are heated in the presence of concentrated alkali, they undergo self oxidation and reduction (disproportionation) reaction. Such a reaction is known as cannizzaro reaction. Thus one molecule of aldehyde is reduced to alcohol while another

is oxidized to carboxylic acid salt.

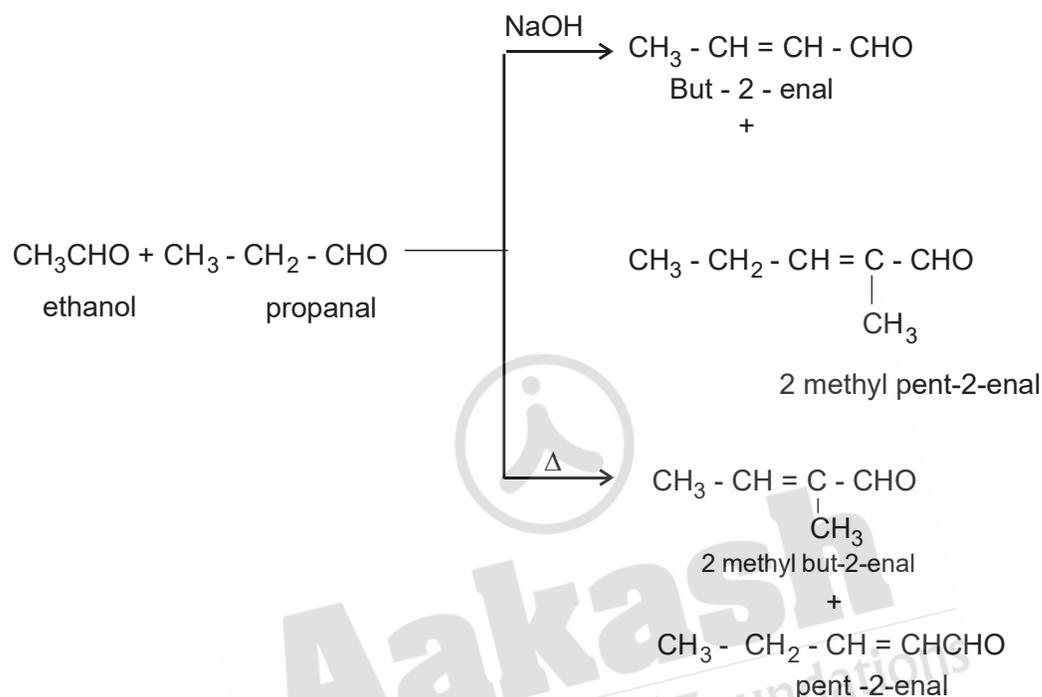
Example:



(ii) Cross aldol condensation : When aldol condensation takes place between two different aldehydes (or) ketones where both the reactants consist of  $\alpha$ -hydrogen atom to produce a mixture of four products, it is known as across aldol condensation.

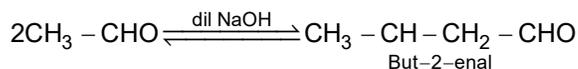
02 M

Example : Aldol reaction of a mixture of ethanal and propanal.

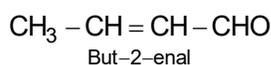
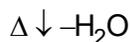
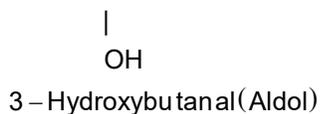


02 M

(iii) Aldol condensation: When aldehyde and ketones having at least one  $\alpha$ -hydrogen undergo a reaction in the presence of dilute alkali as catalyst, it gives (aldol)  $\beta$ -hydroxy aldehyde (or)  $\beta$ -hydroxy ketone (ketol) respectively. This reaction is known as aldol condensation.



Ex :

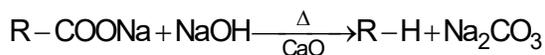


(Aldol condensation product)

02 M

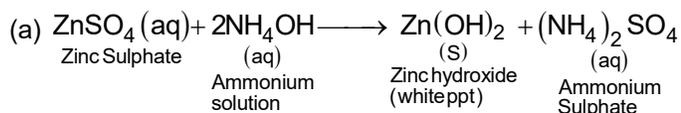
(iv) Decarboxylation :

Decarboxylation is the removal of  $\text{CO}_2$  from carboxylic acid. When sodium salts of carboxylic acids are heated with soda lime ( $\text{NaOH}$  &  $\text{CaO}$ ) in the ratio of 3 : 1) the carboxylic acids lose carbondioxide to form corresponding hydrocarbons. This reaction is known as decarboxylation.

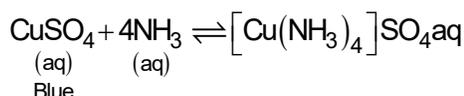


- 20 (a)  $ZnSO_4$  (aq) : Zinc sulphate reacts with ammonium solution and forms a white precipitate of Zinc hydroxide and ammonium sulphate.

04 M

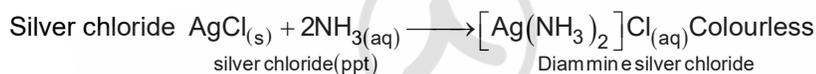


- (b)  $CuSO_4$ (aq) : Copper sulphate reacts with ammonia and forms a deep blue tetra amino copper sulphate (cuprammonium sulphates)



Tetraamine copper (II) sulphate Deep blue ppt.

- (c)  $AgCl$ (s) : Silver chloride reacts with ammonium solution and forms a colourless diammine.



04 M

- (b) The manufacture of  $H_2SO_4$  by contact process involves three steps.

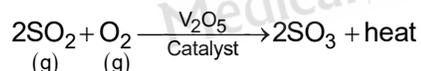
Step-1 : production of  $SO_2$ .

Burning of sulphur ores in the presence of oxygen gives –  $SO_2$



Step-2: Oxidation of  $SO_2$  to  $SO_3$

$SO_2$  on reacting with oxygen in the presence of  $V_2O_5$  gives  $SO_3$



$$\Delta H = -196.6 \text{ kJ / mol}$$

This is the main step in the formation of sulphuric acid.

Optimum conditions for  $SO_3$  Formation of sulphuric acid.

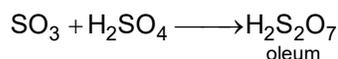
Optimum conditions for  $SO_3$  formation

Temperature  $\longrightarrow$  673 – 723 K

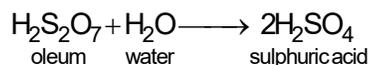
Pressure  $\longrightarrow$  1.5 – 2 atm

Catalyst  $\longrightarrow$   $V_2O_5$  (or) Pt asbestos

Step (3) :  $H_2SO_4$  formation  $SO_3$  is absorbed by conc.  $H_2SO_4$  are given oleum ( $H_2S_2O_7$ )



The oleum formed is diluted with water in obtain the required concentration of  $H_2SO_4$ .



Thus the obtained  $\text{H}_2\text{SO}_4$  is 96 – 98% pure.

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### Collision theory

Introduction : This theory was proposed by Arrhenius to explain rates of reactions. This is also called simple collision theory (or) bimolecular collision theory.

Postulates:

(1) Reacting molecules must have to collide with each other for any reaction to occur.

(2) All collisions do not leads to formation of products.

(3) The colliding molecules must possess a minimum energy to give products.

This minimum energy is called these hold energy ( $E_T$ )

(4) This energy ( $E_T$ ) is higher than that of energy of molecules is the normal state.

(5) The energy of the molecules at STP is very much less than this threshold energy ( $E_T$ )

(6) The difference between threshold energy & energy of the molecules in the normal state is called activation energy ( $E_a$ )

Threshold energy – Energy of normal molecules = Activation energy

$$E_T = E_R = E_a$$

(7) The molecules having threshold energy ( $E_T$ ) are called activated molecules.

(8) collisions occurring between activated molecules are called activated collisions, activated collisions will only give products.

(9) The fractions of activated collisions among total collisions is very much small the above facts are represented as followed.

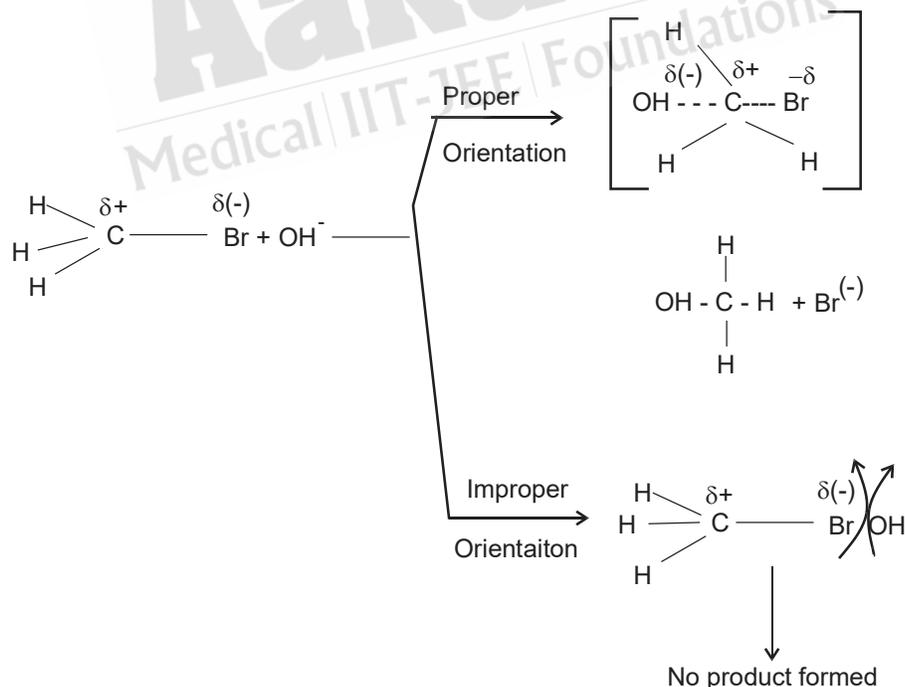


Where A = Normal molecule

$A^*$  = Activated molecule.

Example : Formation of methanol.

Bromo ethane reacts with hydroxide ions proper orientation of these reactants form methanol while improper orientation do not form any product.



If the molecule are oriented properly the bond formation takes place otherwise they simply bounce back and no product is formed thus in collision theory, the effective collision and the rate of a chemical reaction are determined by activation energy & proper orientation of reactant movement.