

## Questions and answer-2018

Inter Science (+2)

Chemistry 2018

Time: 3 Hours 15 minutes

Total

Marks:70

1. Candidates are required to give their answers in their own words as far as practicable.
2. Figures in the right margin indicate full marks.
3. 15 Minutes of extra time has been allotted for the candidates to read the questions carefully.
4. This question paper is divided into section- **Section-A and Section – B.**
5. In **Section –A**, there are **35 Objective type questions** which are compulsory, each carrying **1 mark**. Darken the circle with blue/black ball pen against the correct option OMR Answer Sheet provided to you. **Do you use Whitener/Liquid/Blade/Nail etc. on OMR Sheet; otherwise the result will be invalid.**
6. IN **Section – B**, there are **15 Short answer type questions** (each carrying **2 marks**), out of which any 10 questions are to be answered. Apart from this, there are **3 Long Answer Type question** (Each Carrying 5 marks), out of which any 3 questions are to be answered.
7. Use of any electronic appliances is strictly prohibited.

### Section I: (Objective Type)

In the following question Nos. 1 to 35 there is only one correct answer against each question. For each question, mark the correct option on the OMR sheet.

$$(35 \times 1 = 35)$$

1. A dilute aqueous solution of sodium fluoride is electrolyzed; the products at the anode and cathode are-  
(A)  $F_2$  and  $Na$   
(B)  $F_2$  and  $H_2$   
(C)  $O_2$  and  $Na$   
(D)  $O_2$  and  $H_2$

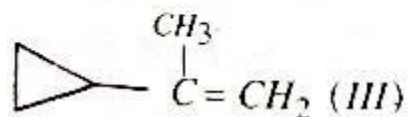
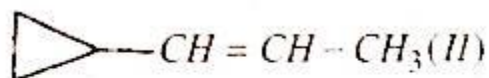
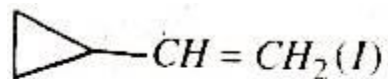
Answer: Option (B)

2. Number of  $\sigma$  and  $\pi$  bonds in  $C_2$  molecules are  
(A)  $1\sigma$  and  $1\pi$   
(B)  $1\sigma$  and  $2\pi$   
(C)  $1\pi$  only

(D)  $1\sigma$  and  $3\pi$

Answer: Option (C)

3.



(A)  $I < II < III$

(B)  $I > II > III$

(C)  $I < III < II$

(D)  $II < I < III$

Answer: Option (B)

4. The molecule which has zero dipole moment is-

(A)  $\text{NF}_3$

(B)  $\text{BF}_3$

(C)  $\text{ClO}_2$

(D)  $\text{CH}_2\text{Cl}_2$

Answer: Option (B)

5. The correct order of equivalent conductance at infinite dilution of  $\text{LiCl}$ ,  $\text{NaCl}$  and  $\text{KCl}$  is:

(A)  $\text{LiCl} > \text{NaCl} > \text{KCl}$

(B)  $\text{LiCl} < \text{NaCl} < \text{KCl}$

(C)  $\text{NaCl} > \text{KCl} > \text{LiCl}$

(D)  $\text{LiCl} > \text{KCl} > \text{NaCl}$

Answer: Option (C)

6.  $\text{R}-\text{OH} + \text{CH}_2\text{N}_2 \rightarrow$  leaving group in this reaction is-

(A)  $\text{CH}_3$

(B) R

(C)  $\text{N}_2$

(D)  $\text{CH}_2$

**Answer:** Option (D)

7. The product obtained when silica reacts with hydrogen fluoride is-

- (A)  $SiF_4$
- (B)  $H_2SiF_6$
- (C)  $H_2SiF_4$
- (D)  $H_2SiF_3$

**Answer:** Option (B)

8. The van't Hoff's factor of  $0.1M Ba(NO_3)_2$  solution is 2.74. the degree of dissociation is-

- (A) 91.3%
- (B) 87%
- (C) 100%
- (D) 74%

**Answer:** Option (C)

9. Which of the following has the most stable +2 oxidation state?

- (A)  $Sn$
- (B)  $Ag$
- (C)  $Fe$
- (D)  $Pb$

**Answer:** Option (A)

10. The compound having tetrahedral geometry is-

- (A)  $[NiCl_4]^{2-}$
- (B)  $[Ni(CN)_4]^{2-}$
- (C)  $[PbCl_4]^{2-}$
- (D)  $[NiCl_4]^{2-}$   $[PdCl_4]^{2-}$  both

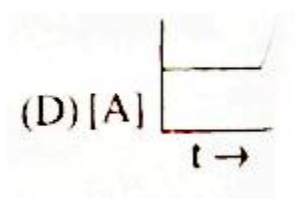
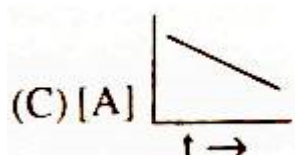
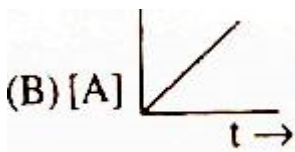
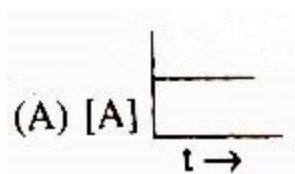
**Answer:** Option (A)

11. The canizzaro's reaction is not given by-

- (A) Formaldehyde
- (B) Acetaldehyde
- (C) Benz aldehyde
- (D) Furfural

**Answer:** Option (B)

12. Which represent a zero order reaction



**Answer:** Option (C)

13. Which gas is absorbed strongly by charcoal?

- (A)  $CO$
- (B)  $NH_3$
- (C)  $NCl_3$
- (D)  $H_2$

**Answer:** Option (A)

14. If  $\frac{dx}{dt} = k[H^+]^n$  and rate becomes 100 times when pH changes from 2 to 1, the order of reaction is-

- (A) 1
- (B) 2
- (C) 3
- (D) 0

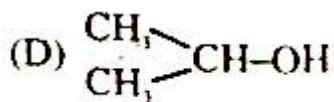
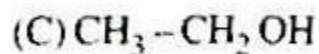
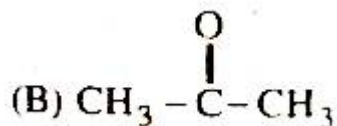
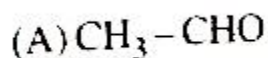
**Answer:** Option (A)

15. Equivalent conductance of saturated  $BaSO_4$  is  $400 \text{ ohm}^{-1}\text{cm}^2\text{eqvt}^2$  and specific conductance is  $8 \times 10^{-5} \text{ ohm}^{-1}\text{cm}^{-1}$ . The  $K_{SP}$  of  $BaSO_4$  is-

(A)  $4 \times 10^{-8} M^2$  (B)  $10^{-8} M^2$  (C)  $2 \times 10^{-4} M^2$  (D)  $10^{-4} M^2$

Answer: Option (A)

16. An organic compound gives iodoform test and also gives positive test with Tollens reagent. The compound is-



Answer: Option (A)

17. IUPAC name of  $H_2(ptCl_6)$  is-

- (A) Hydrogen hexachloro platinate(IV)
- (B) Hydrogen hexachloro platinate (II)
- (C) Hydrogen hexa chloride PT(IV)
- (D) Hydrogen hexa chloride Pt(II)

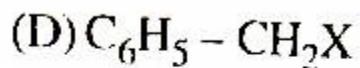
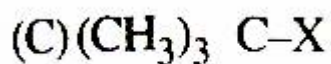
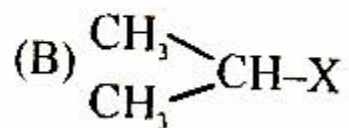
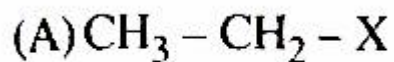
Answer: Option (A)

18. Mercuric chloride reacts with ammonia gas and forms white precipitate. The molecular formula of white precipitate is-

- (A)  $HgCl_2 \cdot NH_3$
- (B)  $Hg(NH_3)_2 \cdot Cl_3$
- (C)  $Hg(NH_2) \cdot Cl_2$
- (D)  $Hg(NH_2)Cl$

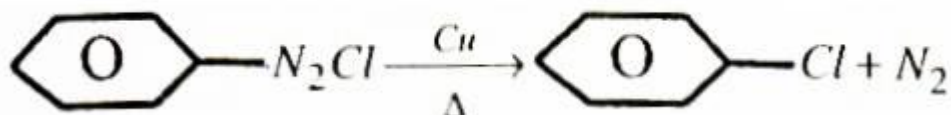
Answer: Option (D)

19. Which alkyl halide follows only  $SN^2$  hydrolysis mechanism?



**Answer:** Option (A)

20.



Half-life of this reaction is independent of concentration of reactant. After 10 minutes volume of  $\text{N}_2$  gas is 10 liter after complete reaction 100 liter. The rate of constant of the reaction is  $\text{min}^{-1}$  unit is-

- (A)  $\frac{2.303}{10}$   
 (B)  $\frac{2.303}{10} \log 5.0$   
 (C)  $\frac{2.303}{10} \log 2.0$   
 (D)  $\frac{2.303}{10} \log 4.0$

**Answer:** Option (A)

21. When  $\text{NaCl}$  solution is added to  $\text{Fe}(\text{OH})_3$  colloidal solution then-

- (A)  $[Fe(OH)_3]Fe^+$  is formed  
 (B)  $[Fe(OH)_3]Cl^-$  is formed  
 (C)  $[Fe(OH)_3]Na^+$  is formed  
 (D)  $[Fe(OH)_3]$  is coagulated

Answer: Option (C)

22. Which complex has maximum paramagnetic moment value amongst the following-

- (A)  $[Cr(H_2O)_6]^{3+}$   
 (B)  $[Fe(H_2O)_6]Cl_2$   
 (C)  $[Fe(CN)_4]^{4-}$   
 (D)  $[Ni(CO)_4]$

Answer: Option (B)

23. Which of the following gives yellow or brown precipitate with alkaline Nessler's reagent.

- (A)  $CO_2$   
 (B)  $NH_3$   
 (C)  $NaCl$   
 (D)  $KI$

Answer: Option (B)

24. A 5% solution of sugar cane (Mol. Wt=342) is isotonic with 1% solution of substance X. The molecular weight of X is-

- (A) 68.4  
 (B) 34.2  
 (C) 171.2  
 (D) 136.2

Answer: Option (A)

25.



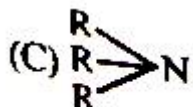
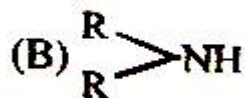
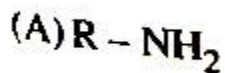
pH is equal to 2, electric potential is-

- (A) 1.36V

- (B) 1.30V
- (C) 1.42V
- (D) 1.20V

Answer: Option (B)

26. An organic compounds reacts with benzene sulfonyl chloride and product dissolves in aqueous NaOH. The compound is-



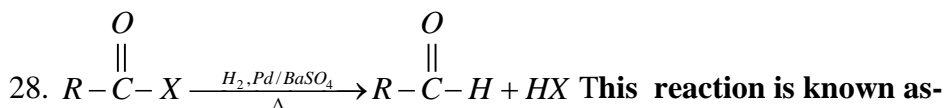
(D) All of these

Answer: Option (A)

27. A compound of hydrolysis gives  $1^\circ - amine$ . The compound is-

- (A) Anilide
- (B) Amide
- (C) Cyanide
- (D) None

Answer: Option (B)



- (A) Stephen's reaction
- (B) Cannizzaro's reaction
- (C) Rosenmund's reaction
- (D) Hinsberg's reaction

Answer: Option (C)

29. Percentage of free space in bcc. Unit cell is-

- (A) 32%

- (B) 34%  
(C) 28%  
(D) 30%

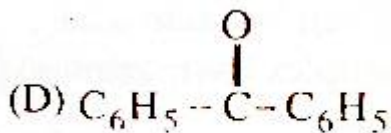
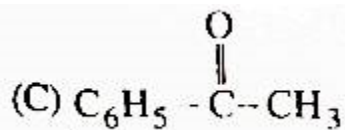
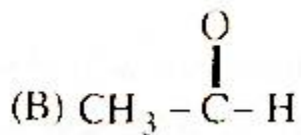
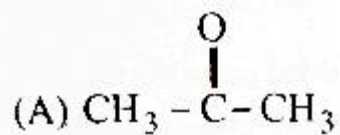
Answer: Option (A)

30. The coordination number of a metal crystallizing in hexagonal close packed (hcp) structure is-

- (A) 12  
(B) 8  
(C) 4  
(D) 6

Answer: Option (A)

31. Which of the following compound is most reactive towards nucleophilic addition?



Answer: Option (B)

32. Copper sulphate solution on treatment with excess of KI gives whitish precipitate. The precipitate is-

- (A)  $\text{CuI}_2$

- (B)  $Cu_2I_2$
- (C)  $Cu_2SO_4$
- (D)  $I_2$

**Answer:** Option (B)

33. Most stable oxidation state of Bismuth is-

- (A) +3
- (B) +5
- (C) +3 and +5 both
- (D) None

**Answer:** Option (A)

34. Which metal nitrate gives colorless gas on thermal decomposition?

- (A)  $NaNO_3$
- (B)  $Cu(NO_3)_2$
- (C)  $Ba(NO_3)_2$
- (D)  $Hg(NO_3)_2$

**Answer:** Option (D)

35. In which of the following pairs of structures are tetrahedral as well as octahedral voids respectively?

- (A) bcc and fcc
- (B) hcp and simple cubic
- (C) hcp and ccp
- (D) bcc and hcp

**Answer:** Option (C)

## SECTION – B (Non-Objective Type Questions)

### (Short Answer Type Question)

Answer any ten question:

**Q.1. Define electrode and electrode potential. (1+1=2)**

**Ans. Electrodes:** They are two metallic strips or rods suspended in an electrolyte and connected to the battery through conducting wires. These rods are called electrodes.

**Electrode potential :** when a metal rod is dipped in a solution of its own ions then a potential difference develops between the electrode and the electrolyte which is called electrode potential.

**Q.2. Nitrogen forms only  $NCl_3$  but phosphorous forms  $PCl_3$  and  $PCl_5$  both. Explain.**

(2)

**Ans.** Phosphorous has  $3d$  orbitals present in it whereas Nitrogen is an element of 2<sup>nd</sup> period. It has no d-orbitals. Thus P is able to expand its octet and can form  $PCl_5$ . In ground state it contains three unpaired electrons hence it forms  $NPCl_3$ .

In excited state it has five unpaired electrons hence it forms  $PCl_5$ . It is reason that Nitrogen forms only  $NCl_3$  but phosphorous forms  $PCl_3$  and  $PCl_5$  both.

**Q.3. Why does vapour pressure of a liquid decrease with addition of a non-volatile solute?**

(2)

**Ans.** when a non-volatile solute is dissolved in liquid, the number of molecules of the liquid in a unit volume of the liquid decrease. Since the number of molecules entering the vapour phase decrease. Decreases of liquid vapour pressure.

**Q.4. Electrons affinity of Nitrogen is less than Carbon. Why? (2)**

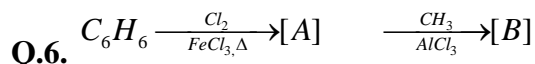
**Ans:** The electron affinity of group 14 elements more than that of group 15 elements in the corresponding periods because of the extra stable half-filled p-orbitals electronic configuration and smaller size. Hence carbon more than electrons affinity of nitrogen.

**Q.5 P-Nitrophenol is more acidic than P-methy phenol. Why? (2)**

**Ans:** P-methy 1 phenol less than acid P-Nitrophenol due to strong M and –I effect of  $NO_2$

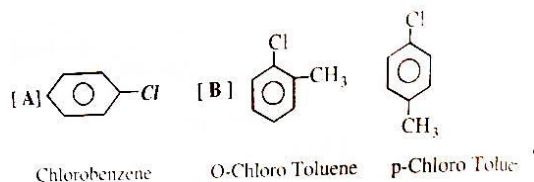
Group electron density in the  $O-H$  bond decrease and hence the loss of proton becomes easily.

On the other hand, due to +M effect of  $-CH_3$  group electron density on the  $O-H$  bond increase which makes the loss of proton difficult.



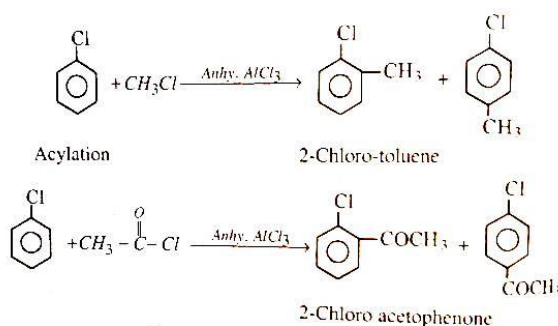
**Write the name and structure of [A] and [B]**

**Ans:**



**Q.7. Write Friedel-Crafts alkylation and acylation reaction. (1+1=2)**

**Ans. Friedal-Craft reaction :** When alkyl halide in presence of anhydrous  $AlCl_3$  alkylation takes place. It is Friedal-Craft reaction.



**Q.8. Define specific conductance & equivalent conductance. (1+1=2)**

**Ans. Specific conductance:** It may be defined as the reciprocal of specific resistance. It is denoted by  $K$ .

$$K = \frac{1}{R} \times \frac{1}{a}$$

**Equivalent conductance:** It is defined as the conductance of solution containing 1g equivalent such that the entire solution is placed between two electrodes one centimeter apart.

$$\Lambda_{eq} = \frac{K \times 1000}{C}$$

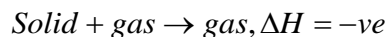
**Q.9. Half life period of first order reaction is 10 minutes. Calculate the rate constant of the reaction.**

**Ans:** From question,  $t_{\frac{1}{2}} = 10 \text{ min.}$

$$\text{We know that } K = \frac{0.693}{t_{\frac{1}{2}}} = \frac{0.693}{10} = 0.0693 \text{ min}^{-1} = 6.93 \times 10^{-2} \text{ min}^{-1}.$$

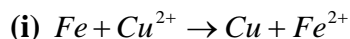
**Q.10. Describe thermodynamical change when a gas is adsorbed on a solid? (1+1=2)**

**Ans:** Adsorption of a gas on the surface of a solid is exothermic process. During adsorption the residual forces of the surfaces surface energy decrease which a heat.



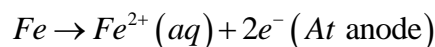
It is clear that thermodynamical changes when a gas is adsorbed on a solid.

**Q.11. Construct electric cells for the following reactions – (1+1=2)**

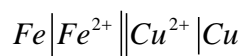


**Ans: (i)**  $Fe + Cu^{2+} \rightarrow Cu + Fe^{2+}$

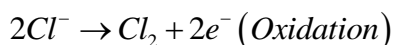
The half cell reactions are



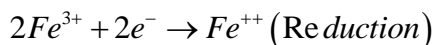
The cell may be represented as



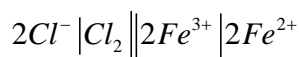
At anode,



At cathode,



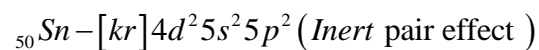
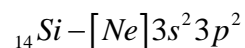
Cell reaction



**Q.12. Silicon shows only +4 oxidation state but it shows both +2 and +4 oxidation states both. Why?**

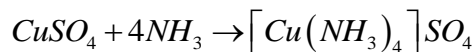
**(2)**

**Ans:** Silicon shows only +4 oxidation states but in (Sn) shows both +2 and +4 oxidation state both due to inert pair effect. The stability of +2 increase and +4 decrease in moving down a group. Hence +2 state is more stable only in Sn.



**Q.13 Write the chemical reaction of  $NH_3$  gas with aqueous  $CuSO_4$  and  $AgNO_3$  solutions respectively.**

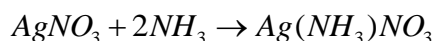
**Ans. (a)** Ammonia is passed through  $CuSO_4$  solution to give a deep blue solution.



Sol.

Tetra amine Copper II sulphate

**(b)** Ammonia is passed through  $AgNO_3$  solution to give diamine silver Nitrate solution.



Sol.

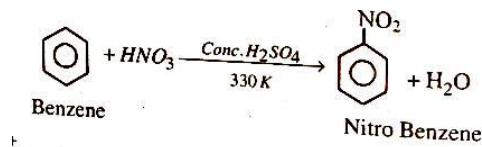
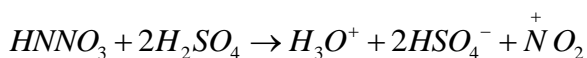
Diamine silver nitrate

**Q.14 HI is stronger acid than HF. Explain. (1+1=2)**

**Ans.** when we proceed from top to bottom in a group atomic radiation increase. As a result of this bond length increase and bond energy decrease HI decomposes first and give  $H^+$  ion before HF. Hence, HI is stronger acid than HF.

**Q.15. Describe method of nitration of benzene. (2)**

**Ans.** when benzene reacts with conc.  $HNO_3$  in presence of conc.  $H_2SO_4$  to give nitro benzene. This reaction is called nitration of benzene.



Here  $NO_2^+$  is electrophile.

### Long Answer Type Questions

**Answer all the three question:-**

**Q.16. Describe the kinetics of a first order reaction. Why a first order reaction is never completed?**

**(4+1=5)**

**Ans**

. Let us consider  $R \rightarrow \text{product}$

$$t = 0 \rightarrow a \rightarrow 0$$

$$t = t \rightarrow (a-x) \rightarrow x$$

$$\frac{dx}{dt} \propto (a-x) \Rightarrow \frac{dx}{dt} = k(a-x)$$

$$\text{integrating } \int \frac{dx}{(a-x)} = \int k dt$$

$$\Rightarrow -\lim(a-x) = kt + \frac{c}{v} \dots\dots(i)$$

$$\text{when } t=0, x=0 \Rightarrow c = -\lim a$$

$$-\lim(a-x) = kt - \lim 0$$

$$kt = \lim a - \lim(a-x) = \lim \frac{a}{(a-x)}$$

$$k = \frac{1}{t} \lim \frac{a}{(a-x)} \rightarrow k_s = \frac{2.303}{t} \log \frac{a}{(a-x)}$$

$$\text{unit} = \frac{\tan \alpha}{\sec \alpha \cot \alpha} = \tan^{-1} c = \sec^{-1}$$

**Half life:**

$$x = \frac{a}{2} \quad \text{when } t=t_{1/2}$$

$$k = \frac{2.303}{t_{1/2}} \log \frac{a}{\left(a - \frac{a}{2}\right)} = \frac{2.303}{t_{1/2}} \log z$$

$$\Rightarrow t_{1/2} = \frac{2.303}{k_s} \log z = \frac{2.303}{k_l} \times 0.3010$$

$$\Rightarrow t_{1/2} = \frac{0.693}{k}$$

**OR**

**For a chemical reaction the energy of activation is  $80 \text{ kJ mol}^{-1}$ , if frequency factor is  $4.0 \times 10^{10} \text{ Lmol}^{-1}$ , what is rate constant at  $400 \text{ K}$ ?**

**Ans:**

**Or**

From question

$$A = 4 \times 10^{10} \text{ litre mol}^{-1}$$

$$E_a = 80 \text{ kJ mol}^{-1} = 80 \times 10^3 \text{ J mol}^{-1}$$

$$T = 400 \text{ K}, R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$$

We know that  $k = Ae^{-\frac{E_a}{RT}}$

$$\begin{aligned} \log K &= \log A - \frac{E_a}{2.303RT} \\ &= \log(4 \times 10^{10}) - \frac{80 \times 10^3}{2.303 \times 8.314 \times 400} \\ &= \log 4 + \log 10^{10} - 10.45 \\ &= 0.6020 + 10 - 10.45 \\ &= 10.6020 - 10.45 \\ &= 0.15 \\ k &= \text{Antilog } 0.15 \end{aligned}$$

**Q.17. Write the test by which following are distinguished:**

**(1+1+1+1+1=5)**

- (i) **Ethanol and Acetaldehyde**
- (iii) **Aldehyde and ketone**
- (iv) **Formic acid and acetic acid**
- (v) **Primary, secondary and tertiary alcohols**

**(ii) Phenol and carboxylic acid**

**OR**

**Write the following name reaction: (2 1/2+2 1/2=5)**

- (i) **Hoffmann Bromide reaction**
- (ii) **Clemmensen's reduction of aldehyde and Ketone**

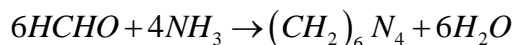
**Ans: (i) Ethanol and Acetaldehyde:** Ethanol reacts with  $I_2 + NaOH$ , Iodoform is obtained.



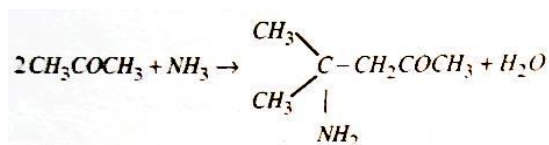
Acetaldehyde reacts with con.  $NaOH$ , Resine is obtained.

**(ii) Phenol and carboxylic acid:** Phenol reacts with  $FeCl_3$  to give violet colour while carboxylic acid no reaction.

(iii) **Aldehydes and Ketones** : Aldehydes reacts with  $NH_3$  to give Urotropine.



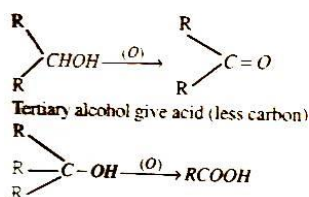
Ketones forms dimethyl acetone amine



(iii) **Formic acid and acetic acid**: Formic acid reacts with acidified  $KMnO_4$  to give solution decolourises white acetic acid no reaction.



Secondary alcohol give ketone

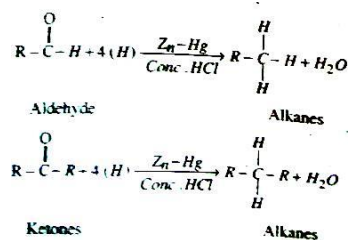


**OR**

(i) **Hoffmann Bromide reaction** : It is that reaction in which acid amide is heated with bromine and alkali, a primary amine is obtained.



(ii) **Clemmensen's reduction of aldehydes and Ketone**: Aldehydes and Ketones react with  $Zn-Hg$  (zinc amalgam) and conc.  $HCl$  is called Clemmensen reduction



**Q.18 what are the important ores of copper? How is copper extracted from copper pyrites?**

**(4+1=5)**

**OR**

**What happens when:**

- (i) Chlorine gas reacts with NaOH solution.**
- (ii) Nitric acid reacts with Zn or Cu in different concentrations.**

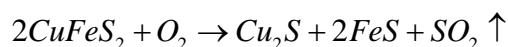
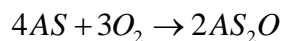
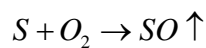
**Ans.** The sulphide ores of Cu are the following:

- (i) Copper pyrites or chalcocopyrite:  $CuFeS_2$**  (ii) Copper glance or chalcocite –  $Cu_2S$

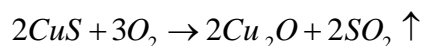
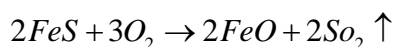
**Extraction of Cu :** The main source of copper is copper pyrites. The extraction of copper is followed in the following steps:

**Concentration :** The concentration of ore is done by froth floatation process.

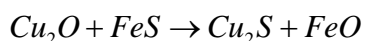
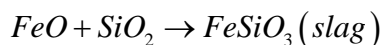
**Roasting:** The concentrated ore is roasted in a reverberatory furnace. The following reaction occurs:



In this process  $Cu_2S$  and  $FeS$  oxidise partially.

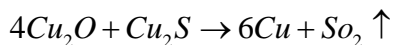
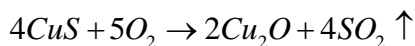


**Smelting:** The roasted ore contains  $FeO, Cu_2O, Cu_2S$  and  $FeS$  is mixed with silica and coke then heated in the absence of air in a blast furnace. Silica reacts with  $FeO$  to give iron silicate (slag).  $Cu_2S$  obtained after roasting reacts with  $FeS$  to give  $Cu_2S$  and  $FeO$ . The reactions are given below.



The mixture of  $Cu_2S$  and  $FeS$  is called matte.

**Ressemerisation:** The molten matte is introduced in a Bessemer converter and a certain amount of silica is also introduced. Now a blast of air is blown into it by means of pipes. The following reaction occurs in the Bessemer converter.



**OR**

**(1) When chlorine gas reacts with NaOH solution:**

**(a)** With cold and dilute NaOH



Sod.hypochloride

**(b)** With hot and conc. NaOH

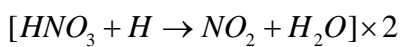
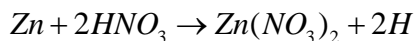


Sodium

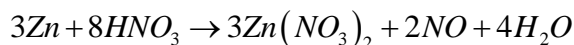
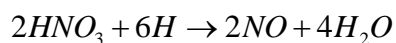
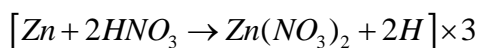
Chlorate

**(ii)** When nitric acid reacts with Zn or Cu to give

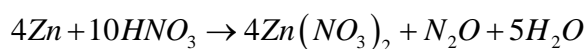
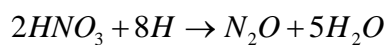
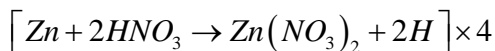
**(a)** Reaction with  $Zn + \text{Conc. } HNO_3$  to form nitrogen dioxide.



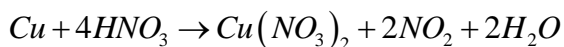
**(b)** Reaction with  $Zn + 50 \times \text{dil. } HNO_3$  to form NO.



**(c)** Reaction with  $Zn + 20\% \times \text{dil. } HNO_3$  to give  $N_2O$



**(a)** Copper + Conc.  $HNO_3$  to form No.



**(b)** Copper + dil.  $HNO_3$  to form No.

