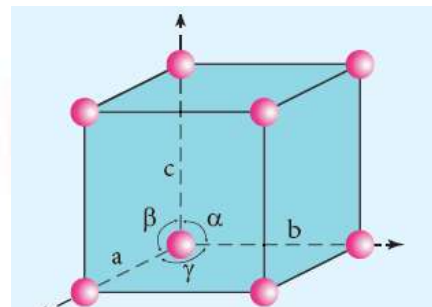
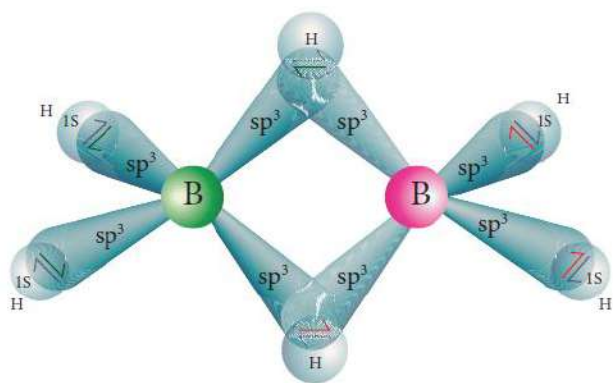


# XII - Chemistry

## Volume - I & II

(2021)

### UNITWISE EVALUATION AND ADDITIONAL QUESTIONS



Time + Effort = Success

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## 1. METALLURGY

### EVALUATION :

Answer the following questions briefly: ( 2 or 3 Marks)

1. What are the differences between minerals and ores? ( Volume I - Page No : 2 )
2. What are the various steps involved in extraction of pure metals from their ores? ( 2 )
3. What is the role of limestone in the extraction of iron from its oxide  $\text{Fe}_2\text{O}_3$ ? ( 8 )
4. Which type of ores can be concentrated by froth flotation method? Give two examples for such ores. ( 4 )
5. Describe a method for refining Nickel ( 16 )
6. Explain zone refining process with an example ( 16 )
7. Give the uses of zinc ( 17 )
8. Explain the following terms with example i) gangue ii) slag ( Creative )
9. Give the basic requirement for vapour phase refining ( 16 )
10. The selection of reducing agent depends on the thermodynamic factor. Explain with an example ( 10, 11 )
11. Give the limitations of Ellingham diagram ( 13 )

Answer the following questions in detail : ( 5 Marks)

1. Using the Ellingham diagram A) predict the conditions under which
  - i) Aluminium might be expected to reduce magnesia
  - ii) Magnesium could reduce AluminaB) it is possible to reduce  $\text{Fe}_2\text{O}_3$  by coke at the temperature around 1200 K ( Creative )
2. Explain the electrometallurgy of Aluminium ( 14 )
3. Describe the role of the following in the process mentioned ( Creative )
  - i) silica in the extraction of copper
  - ii) cryolite in the extraction of aluminium
  - iii) iodine in the refining of zirconium

iv) sodium cyanide in froth flotation

4. Explain the principle of electrolytic refining with an example ( 15, 16 )
5. Write a short note on electrochemical principles of metallurgy ( 14 )

### **ADDITIONAL QUESTIONS:**

**Answer the following questions briefly: ( 2 or 3 Marks)**

1. What are the difference between minerals and ores? ( 2 )
2. Explain i) Gravity separation ii) hydraulic wash ( 3 )
3. What is leaching? Give an example ( 4 )
4. Write note on magnetic separation method ( 6 )
5. How is crude metals extracted? ( 6 )
6. Write note on Roasting and calcination ( 6, 7 )
7. What is smelting? ( 8 )
8. What is Herold diagram? ( 12 )
9. What are the things can be observed from Ellingham diagram? ( 12 )
10. How is thermodynamic principle involved in metallurgical process? ( 10, 11 )
11. What is liquation? ( 15 )
12. Explain about Van-Arkel method for refining Zirconium/ Titanium ( 17 )
13. Mention the applications of Al, Zn ( 17 )
14. Mention the applications of Fe, Cu Au ( 18 )

**Answer the following questions in detail : ( 5 Marks)**

1. How is copper extracted from copper pyrites? ( 8 )
2. How is Ellingham diagram used to predict thermodynamic feasibility of reduction of oxides of one metal by another metal ? ( 13 )

## 2. P BLOCK ELEMENTS – I

### EVALUATION :

Answer the following questions briefly: ( 2 or 3 Marks)

1. Write a short note on anomalous properties of the first element of P block ( 29 )
2. Describe briefly allotropism in p block elements with specific reference to carbon ( 30 )
3. Give the uses of borax ( 34 )
4. What is catenation? Describe briefly the catenation property of carbon ( 41 )
5. Write a note on Fischer tropesch synthesis ( 44 )
6. Give the structure of CO and CO<sub>2</sub> ( 44, 45 )
7. Give the uses of silicones ( 48 )
8. Write a short note on hydroboration ( 37 )
9. Give one example for each of the following ( 28 )  
i) icosogens ii) tetragen iii) prictogen iv) chalcogen
10. Complete the following reactions ( Creative )
  - a.  $B(OH)_3 + NH_3 \rightarrow$
  - b.  $Na_2B_4O_7 + H_2SO_4 + H_2O \rightarrow$
  - c.  $B_2H_6 + 2NaOH + H_2O \rightarrow$
  - d.  $B_2H_6 + CH_3OH \rightarrow$
  - e.  $BF_3 + H_2O \rightarrow$
  - f.  $HCOOH + H_2SO_4 \rightarrow$
  - g.  $SiCl_4 + NH_3 \rightarrow$
  - h.  $SiCl_4 + C_2H_5OH \rightarrow$
  - i.  $B + NaOH \rightarrow$
  - j.  $H_2B_4O_7 \rightarrow$
11. How will you identify borate radical? ( 35 )
12. How are you convert boric acid to Boron nitride? ( 35 )
13. A hydride of second period alkali metal (A) on reaction with compound of Boron (B) to give you a reducing agent (C) identify A, B and C ( Creative )



14. A double salt which contains fourth period alkali metal (A) on heating at 500 K gives (B), aqueous solution of (B) give white precipitate with barium Chloride and gives a red colour compound with alizarin. Identify A and B (Creative)

15. CO if you are reducing agent. Justify with an example (43)

**Answer the following questions in detail : ( 5 Marks)**

1. Describe the structure of diborane (37)
2. Write a note on metallic nature of p block elements (28, 29)
3. Write note on zeolites (50, 51)

**ADDITIONAL QUESTIONS:**

**Answer the following questions briefly: ( 2 or 3 Marks)**

1. What is inert pair effect? (30)
2. How does boron react with alkali? (33)
3. Mention the uses of Boron (33)
4. How will you prepare Borax? (33)
5. How is borax beads formed? (34)
6. How is boric acid prepared? (34)
7. How does boric acid react with NaOH? (34)
8. What happened on heating boric acid? (34)
9. Mention the uses of boric acid (35)
10. How does borane react with H<sub>2</sub>O & NaOH? (36)
11. How will you prepare borazine? (37)
12. Mention the uses of diborane (38)
13. How will you prepare BH<sub>3</sub>? (38)
14. Note on McAfee process (39)
15. Mention the uses of aluminium chloride (39)
16. How is potash alum crystallized? (40)

17. How does potash alum decompose on heating? ( 40 )

18. Mention the uses of potash alum ( 40 )

19. What is producer gas? ( 43 )

20. Give the uses of CO & CO<sub>2</sub> ( 44, 45 )

21. What is water gas? ( 45 )

22. How does SiCl<sub>4</sub> react with alcohol & NH<sub>3</sub>? ( 46 )

23. Note on silicates ( 48 )

**Answer the following questions in detail : ( 5 Marks)**

1. Explain briefly the allotropes of carbon ( 41, 42 )

2. What are silicones? Explain the preparation and their structure. ( 46, 47 )

3. Explain various types of silicates with a neat diagram ( 48, 49, 50 )

### **3. P BLOCK ELEMENTS – II**

#### **EVALUATION :**

**Answer the following questions briefly: ( 2 or 3 Marks)**

1. What is inert pair effect? ( 30 )

2. Chalcogens belongs to P block. Give reason ( 73 )

3. Explain why fluorine always exhibit an Oxidation state of -1 ? ( Creative )

4. Give the Oxidation state of halogen in the following ( Creative )

a) OF<sub>2</sub> b) O<sub>2</sub>F<sub>2</sub> c) Cl<sub>2</sub>O<sub>3</sub> d) I<sub>2</sub>O<sub>4</sub>

5. What are interhalogen compounds? Give examples ( 89 )

6. Why fluorine is more reactive than other halogens? ( Creative )

7. Give the uses of helium ( 93 )

8. What is the hybridization of iodine in IF<sub>7</sub>? Give its structure ( Creative )

9. Give the balanced equation for the reaction between chlorine with cold sodium hydroxide and hot sodium hydroxide ( 84, 85 )

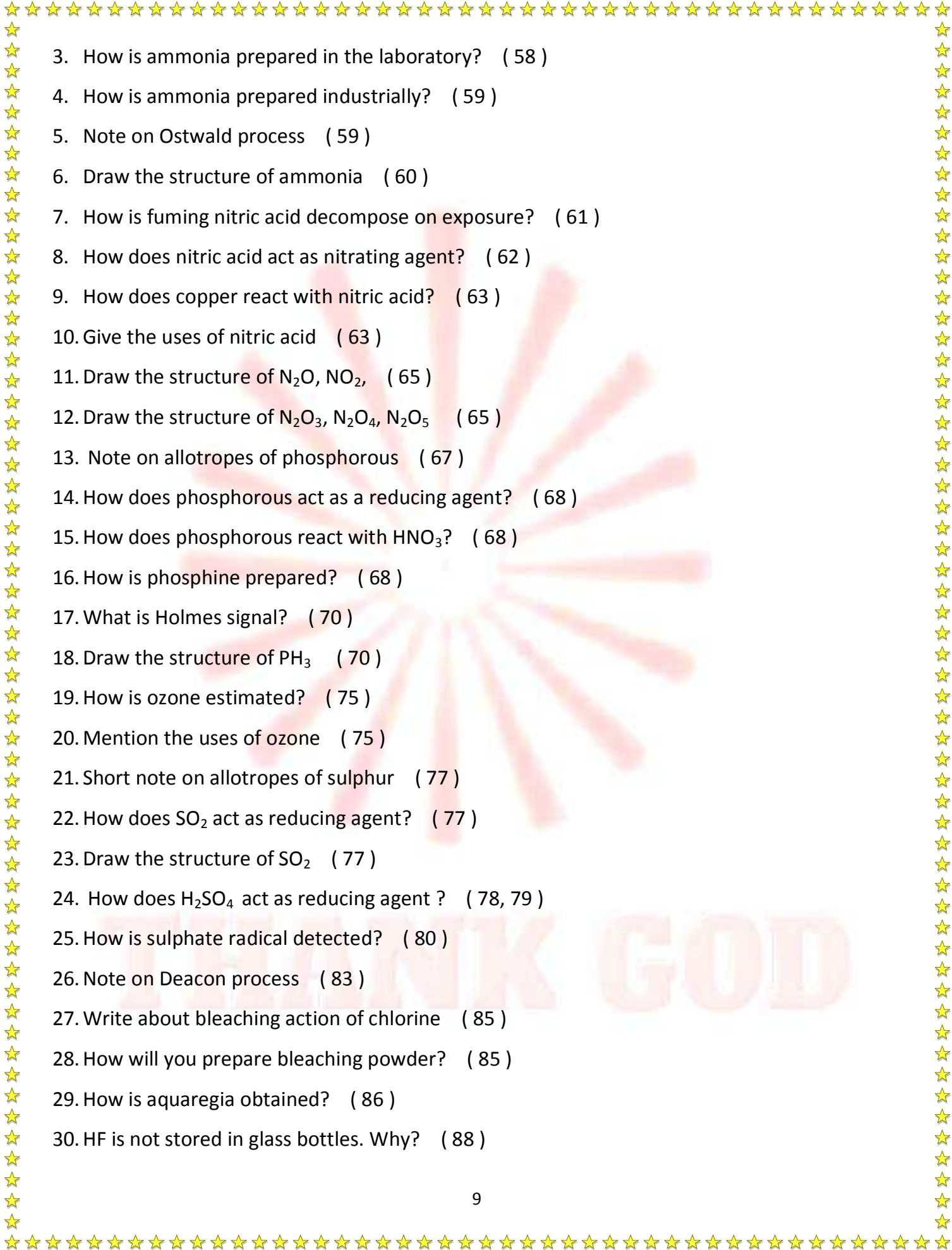
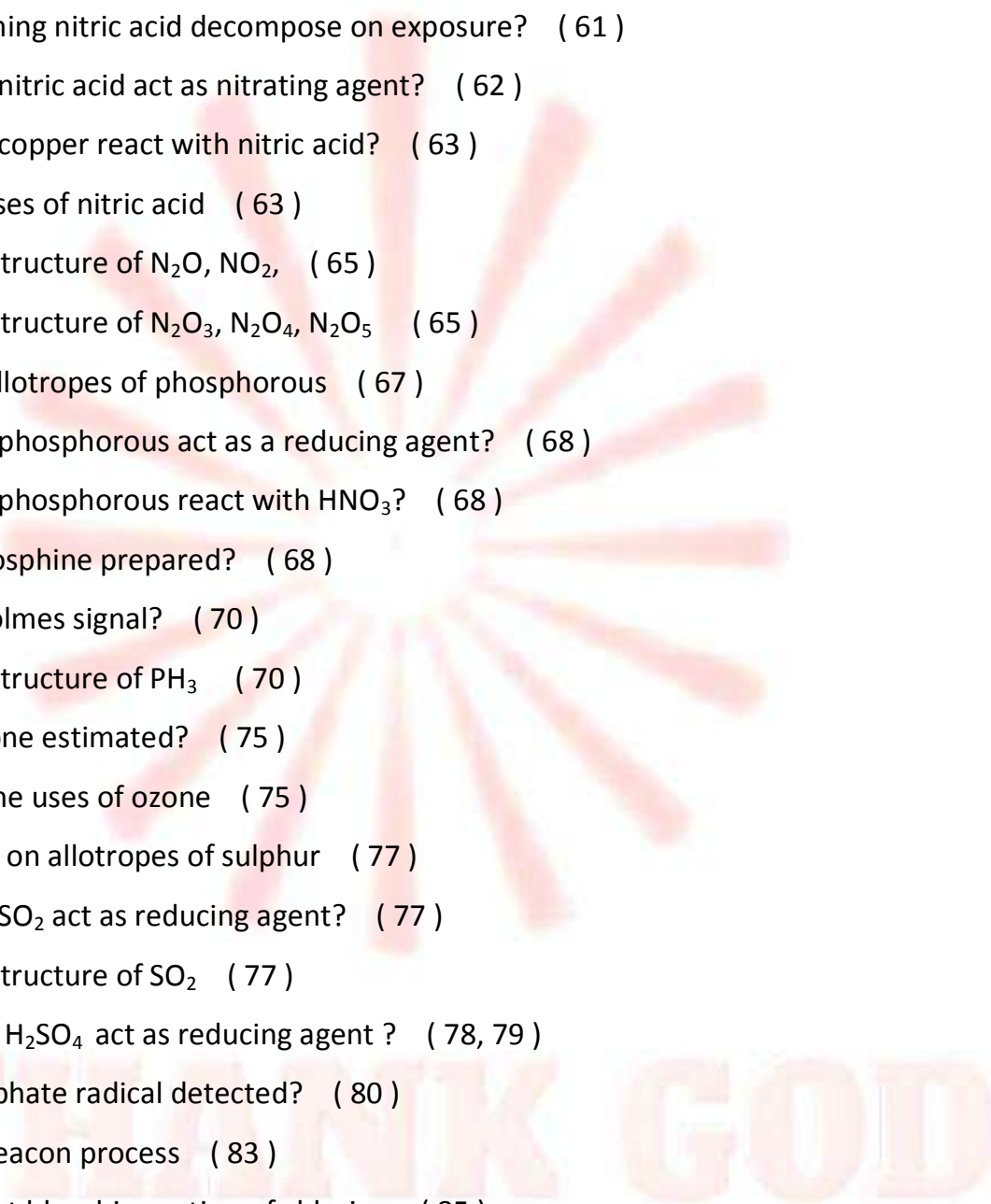
10. How will you prepare chlorine in the laboratory? ( 82 )
11. Give the uses of sulphuric acid ( 79 )
12. Give reason to support that sulphuric acid is a dehydrating agent ( Creative )
13. Write the reason for the anomalous behaviour of nitrogen ( Creative )
14. Write the molecular formula and structural formula of the following molecules ( Creative )  
i) nitric acid ii) dinitrogen pentoxide iii) phosphoric acid iv) phosphine
15. Give the uses of argon ( 93 )
16. Write the valence shell electronic configuration of group 15 elements ( Creative )
17. Give two Equations to illustrate the chemical behaviour of phosphine ( 69 )
18. Give the reaction between nitric acid and basic oxide ( 61 )
19. What happens when Phosphorus pentachloride is heated? ( 71 )
20. Suggest a reason why HF is a weak acid, where is binary acids of the all other halogen for strong acids ( Creative )
21. Deduce the oxidation number of oxygen in hypofluorous acid - HOF ( Creative )
22. What type of hybridisation occur in a)  $\text{BrF}_5$  b)  $\text{BrF}_3$  ( Creative )
23. Complete the following reactions ( Creative )
  - a.  $\text{NaCl} + \text{MnO}_2 + \text{H}_2\text{SO}_4 \rightarrow$
  - b.  $\text{NaNO}_2 + \text{HCl} \rightarrow$
  - c.  $\text{P}_4 + \text{NaOH} + \text{H}_2\text{O} \rightarrow$
  - d.  $\text{AgNO}_3 + \text{PH}_3 \rightarrow$
  - e.  $\text{Mg} + \text{HNO}_3 \rightarrow$
  - f.  $\text{KClO}_3 \rightarrow$
  - g.  $\text{Cu} + \text{H}_2\text{SO}_4 \rightarrow$
  - h.  $\text{Sb} + \text{Cl}_2 \rightarrow$
  - i.  $\text{HBr} + \text{H}_2\text{SO}_4 \rightarrow$
  - j.  $\text{XeF}_6 + \text{H}_2\text{O} \rightarrow$
  - k.  $\text{XeO}_6^{4-} + \text{Mn}^{2+} + \text{H}^+ \rightarrow$
  - l.  $\text{XeOF}_4 + \text{SiO}_2 \rightarrow$
  - m.  $\text{Xe} + \text{F}_2 \rightarrow$

**ADDITIONAL QUESTIONS:**

**Answer the following questions briefly: ( 2 or 3 Marks)**

1. How will you prepare nitrogen from sodium azide? ( 57 )
2. Note on Haber's process ( 58 )



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3. How is ammonia prepared in the laboratory? ( 58 )
  4. How is ammonia prepared industrially? ( 59 )
  5. Note on Ostwald process ( 59 )
  6. Draw the structure of ammonia ( 60 )
  7. How is fuming nitric acid decompose on exposure? ( 61 )
  8. How does nitric acid act as nitrating agent? ( 62 )
  9. How does copper react with nitric acid? ( 63 )
  10. Give the uses of nitric acid ( 63 )
  11. Draw the structure of  $N_2O$ ,  $NO_2$ , ( 65 )
  12. Draw the structure of  $N_2O_3$ ,  $N_2O_4$ ,  $N_2O_5$  ( 65 )
  13. Note on allotropes of phosphorous ( 67 )
  14. How does phosphorous act as a reducing agent? ( 68 )
  15. How does phosphorous react with  $HNO_3$ ? ( 68 )
  16. How is phosphine prepared? ( 68 )
  17. What is Holmes signal? ( 70 )
  18. Draw the structure of  $PH_3$  ( 70 )
  19. How is ozone estimated? ( 75 )
  20. Mention the uses of ozone ( 75 )
  21. Short note on allotropes of sulphur ( 77 )
  22. How does  $SO_2$  act as reducing agent? ( 77 )
  23. Draw the structure of  $SO_2$  ( 77 )
  24. How does  $H_2SO_4$  act as reducing agent ? ( 78, 79 )
  25. How is sulphate radical detected? ( 80 )
  26. Note on Deacon process ( 83 )
  27. Write about bleaching action of chlorine ( 85 )
  28. How will you prepare bleaching powder? ( 85 )
  29. How is aquaregia obtained? ( 86 )
  30.  $HF$  is not stored in glass bottles. Why? ( 88 )

31. How does  $\text{XeF}_6$  react with  $\text{NaOH}$ ? ( 92 )
32. How does sodium per xenate act as strong oxidizing property? ( 92 )
33. Mention the uses of Neon & Krypton ( 93 )
34. Mention the uses of Xenon & Radon ( 94 )

**Answer the following questions in detail : ( 5 Marks)**

1. Explain the commercial preparation of nitric acid ( 61 )
2. Draw the structure of oxides, oxoacids of phosphorous ( 71 )
3. How is ozone prepared in the laboratory? Mention its structure ( 74 )
4. Explain the manufacture of  $\text{H}_2\text{SO}_4$  by contact process ( 77, 78 )
5. What are the properties of interhalogen compounds? ( 89 )

#### **4. TRANSITION AND INNER TRANSITION ELEMENTS**

**EVALUATION :**

**Answer the following questions briefly: ( 2 or 3 Marks)**

1. What are transition metals? Give four examples ( 101 )
2. Explain the oxidation states of 4d series elements ( Creative )
3. What are inner transition elements? ( 118 )
4. What are actinides? Give three examples ( 122 )
5. What is Lanthanide contraction and what are the effects of Lanthanide contraction? ( 121 )
6. Complete the following ( Creative )
  - a.  $\text{MnO}_4^{2-} + \text{H}^+ \rightarrow$
  - b.  $\text{C}_6\text{H}_5\text{CH}_3 \rightarrow$
  - c.  $\text{MnO}_4^- + \text{Fe}^{2+} \rightarrow$
  - d.  $\text{KMnO}_4 \rightarrow$
  - e.  $\text{Cr}_2\text{O}_7^{2-} + \text{I}^- + \text{H}^+ \rightarrow$
  - f.  $\text{Na}_2\text{Cr}_2\text{O}_7 +$
  - g.  $\text{KCl} \rightarrow$
7. What are interstitial compounds? ( 111 )

8. Calculate the number of unpaired electrons in  $Ti^{3+}$ ,  $Mn^{2+}$  calculate the spin only magnetic moment ( Creative )
9. Write the electronic configuration of  $Ce^{4+}$  and  $Co^{2+}$  ( Creative )
10. Explain briefly how +2 States becomes more and more stable in the first half of the First row transition elements with increasing atomic number ( Creative )
11. Which is more stable?  $Fe^{2+}$  or  $Fe^{3+}$  Explain ( Creative )
12. Explain why  $Cr^{2+}$  is strongly reducing while  $Mn^{3+}$  strongly oxidizing ( Creative )
13. Actinoid Contraction is Greater from element to element than the lanthanide contraction. Why? ( Creative )
14. Out of  $Lu(OH)_3$  and  $La(OH)_3$  which is more basic and why? ( Creative )
15. Why europium (II) is more stable than cerium (II) ? ( Creative )
16. Why do zirconium and hafnium exhibit similar properties? ( Creative )
17. Which is stronger reducing agent  $Cr^{2+}$  or  $Fe^{2+}$ ? ( Creative )
18. The  $E^\circ_{M^{2+}/M}$  Value for copper is positive such a possible reason for this ( Creative )
19. Describe the variable Oxidation state of 3d series elements ( 106 )
20. Which metal in the 3d series exhibits +1 oxidation State most frequently and why ? ( 107 )
21. Why first ionization enthalpy of chromium is lower than that of zinc? ( Creative )
22. Transition metals have high melting points why? ( 103 )

**Answer the following questions in detail : ( 5 Marks)**

1. Justify the position of lanthanides and actinides in the periodic table ( 118, 119 )
2. Describe the preparation of potassium dichromate ( 112 )
3. Explain the variation in  $E^\circ_{M^{3+}/M^{2+}}$  3d series ( 107, 108 )
4. Compare lanthanides and actinides ( 123 )
5. Compare the ionisation enthalpies of first series of the transition elements ( 105 )

**ADDITIONAL QUESTIONS:**

**Answer the following questions briefly: ( 2 or 3 Marks)**

1. What is standard electrode potential? ( 107 )
2. State Hume Rothery rule ( 111 )
3. Why do transition elements form alloy? ( 111 )
4. Why do transition elements form complexes? ( 112 )
5. How does potassium dichromate decompose on heating? ( 113 )
6. Draw the structure of chromate, dichromate ions ( 113 )
7. How does potassium dichromate act as oxidizing agent? ( 113 )
8. Explain chromyl chloride test ( 114 )
9. Mention the uses of potassium dichromate ( 114 )
10. How will you prepare potassium chromate? ( 115 )
11. What is Bayer's reagent? ( 117 )
12. Give the uses of potassium permanganate ( 118 )
13. Mention the position of lanthanides in the periodic table ( 118 )
14. What is the cause of lanthanide contraction? ( 121 )

**Answer the following questions in detail : ( 5 Marks)**

1.  $\text{Ni}^{2+}$  compounds are thermodynamically more stable than  $\text{Pt}^{2+}$ . Why? ( 105 )
2. Potassium permanganate is a strong oxidizing agent in neutral, alkaline, acid medium. Give one example each ( 116, 117 )

THANK GOD



## 5. COORDINATION CHEMISTRY

### EVALUATION :

Answer the following questions briefly: ( 2 or 3 Marks)

- Write the IUPAC name of the following ( Creative )
  - $\text{Na}_2 [\text{Ni} (\text{EDTA})]$
  - $[\text{Ag}(\text{CN})_2]^-$
  - $[\text{Co} (\text{en})_3]_2(\text{SO}_4)_3$
  - $[\text{Co} (\text{ONO})(\text{NH}_3)_5]^{2+}$
  - $[\text{Pt} (\text{NH}_3)_2\text{Cl}(\text{NO}_2)]$
- Write the formula for the following coordination compounds ( Creative )
  - Potassiumhexacyanidoferrate(II)
  - Pentaamminenitrito-k-N-cobalt (III) ion
  - Pentacarbonyliron(0)
  - Sodiumtetrafluoridodihydroxidochromate(III)
  - Hexaamminecobalt(III)sulphate
- Arrange the following in order of increasing molecular conductivity ( Creative )
  - $\text{Mg} [\text{Cr} (\text{NH}_3)(\text{Cl}_5)]$
  - $[\text{Cr} (\text{NH}_3)_5\text{Cl}]_3[\text{CoF}_6]_2$
  - $[\text{Cr} (\text{NH}_3)_3\text{Cl}_3]$
- Give an example of coordination compound used in medicine and two example of biologically important coordination compounds ( Creative )
- Draw all possible geometrical isomers of the complex  $[\text{Co} (\text{en})_2\text{Cl}_2]^+$  and identify the optically active isomer ( Creative )
- $[\text{Ti} (\text{H}_2\text{O})_6]^{3+}$  is coloured, while  $[\text{Sc} (\text{H}_2\text{O})_6]^{3+}$  is colourless explain ( Creative )
- Give an example for the complex of the type  $[\text{Ma}_2\text{b}_2\text{c}_2]$  where a, b, c are monodentate ligand and give the possible isomers ( Creative )
- Give one test to differentiate  $[\text{Co} (\text{NH}_3)_5\text{Cl}] \text{SO}_4$  and  $[\text{Co} (\text{NH}_3)_5 \text{SO}_4] \text{Cl}$  ( Creative )
- In an octahedral crystal field draw the figure to show splitting of d orbitals (154)
- What is linkage isomerism? explain with an example ( 142 )
- Classify the following ligand based on the number of Donor atoms ( Creative )
  - $\text{NH}_3$
  - en
  - $\text{ox}^{2-}$
  - triaminotriethylamine
  - pyridine



12. Why tetrahedral complexes do not exhibit geometrical isomerism? ( Creative )
13. Explain optical isomerism in coordination compounds with example ( 146 )
14. What are hydrate isomers? Explain with an example ( 143 )
15. What is crystal field splitting energy? ( 155 )
16. What is crystal field stabilization energy? ( 157 )
17. What is the coordination entity formed when excess of liquid ammonia is added to an aqueous solution of copper sulphate ? ( Creative )
18. On the basis of theory explain the nature of bonding in  $[\text{Co}(\text{C}_2\text{O}_4)_3]^{3-}$  ( Creative )
19. What are the limitations of VB theory ? ( 152 )

**Answer the following questions in detail : ( 5 Marks)**

1. Based on VB theory explain why  $[\text{Cr}(\text{NH}_3)_6]^{3+}$  is paramagnetic while  $[\text{Ni}(\text{CN})_4]^{2-}$  diamagnetic ( Creative )
2. Give the difference between double salt and coordination compound ( Creative )
3. Write the postulates of Werner's theory ( 132 )
4. A solution of  $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$  is green whereas the solution of  $[\text{Ni}(\text{CN})_4]^{2-}$  is colorless. Explain ( Creative )
5. Discuss briefly the nature of bonding in metal carbonyls ( 162, 163 )
6. Write the oxidation State, co-ordination number, nature of Ligand, magnetic property and electronic configuration in octahedral Crystal Field for complex  $\text{K}_4[\text{Mn}(\text{CN})_6]$  ( Creative )

**ADDITIONAL QUESTIONS:**

**Answer the following questions briefly: ( 2 or 3 Marks)**

1. Define central metal ion ( 133 )
2. Note on ligand ( 134 )
3. Define isomerism ( 141 )
4. What is coordination isomers? ( 142 )
5. Write about ionization isomers ( 142 )

6. Note on solvate isomers ( 143 )
7. In an tetrahedral crystal field, draw the figure to show splitting of d orbitals ( 172 )
8. Note on spectrochemical series ( 156 )
9. Explain about d-d transition ( 159,160 )
10. How is metal carbonyls classified based on the number of metal atom? ( 161 )
11. How is metal carbonyls classified based on the structure ? ( 161, 162 )
12. How cant the stability of coordination complexes be interpreted? ( 163 )
13. What are the significance of stability constants? ( 164 )
14. Calculate the CFSE value of  $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$  in high spin and low spin complexes. ( 157 )
15. Calculate the CFSE value of  $[\text{Fe}(\text{CN})_6]^{3-}$  in high spin and low spin complexes. ( 158 )

**Answer the following questions in detail : ( 5 Marks)**

1. Explain the postulates of crystal field theory ( 153 )
2. Explain the importance and application of coordination compounds ( 166 )
3. Using VB theory , illustrate the hybridization geometry and magnetic property for  $[\text{Ni}(\text{CO})_4]$ ,  $[\text{Ni}(\text{CN})_4]^{4-}$  ( 149, 150 )
4. Using VB theory , illustrate the hybridization geometry and magnetic property for  $[\text{Fe}(\text{CN})_6]^{3-}$  ,  $[\text{CoF}_6]^{3-}$  ( 150, 151 )
5. Identify central metal ion, ligand, coordination number, geometry, IUPAC name of the following i)  $[\text{Pt}(\text{NO}_2)(\text{H}_2\text{O})(\text{NH}_3)_2]\text{Br}$  ii)  $\text{K}_4[\text{Fe}(\text{CN})_6]$  iii)  $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]\text{Cl}$  iv)  $[\text{Cr}(\text{en})_3][\text{CrF}_6]$  ( 135, 138, 139, creative )

**6. SOLID STATE**

**EVALUATION :**

**Answer the following questions briefly: ( 2 or 3 Marks)**

1. Define unit cell ( 180 )
2. Give any three characteristics of ionic crystals ( 179 )
3. Classify the following solids ( Creative )

i) P<sub>4</sub> b) Brass c) diamond d) NaCl e) Iodine

4. Distinguish tetrahedral and octahedral voids ( 190 )
5. What are point defects? ( 193 )
6. Explain schottky defect ( 193 )
7. Calculate the number of atoms in a fcc unit cell ( 184 )
8. Why ionic crystals are hard and brittle? ( 179 )
9. What's the two dimensional coordination number of a molecule in square close packed layer?  
( Creative )
10. What is mean by the term "coordination number"? What is the coordination number of atoms in a BCC structure ? ( Creative )
11. Aluminium crystallizes in a cubic close packed structure. Its metallic radius is 125 pm. Calculate the edge length of unit cell ( Creative )
12. Atoms X and Y form BCC crystalline structure. Atom X is percent is at the corners of the cube and Y is at the centre of the cube. What is the formula of the compound? ( Creative )
13. Sodium metal crystallizes in BCC structure with the edge length of the unit cell  $4.3 \times 10^{-8}$  cm. Calculate the radius of sodium atom ( Creative )
14. Write a note on Frankel defect ( 194 )

**Answer the following questions in detail : ( 5 Marks)**

1. Differentiate crystalline solids and amorphous solids ( 178 )
2. Explain briefly 7 types of unit cell ( 181 )
3. Distinguish between hexagonal close packing and cubic close packing ( 190, 191 )
4. Write short note on metal excess and metal deficiency defect with an example ( 194, 195 )
5. Explain AAAA and ABABA and ABCABC type of three dimensional packing with the help of neat diagram ( 186, 187, 190 )
6. Calculate the percentage efficiency of packing in body centred cubic crystal ( 188, 189 )
7. An element has BCC structure with a cell edge of 288 pm, the density of the element is  $7.2 \text{ g cm}^{-3}$ . How many atoms are present in 208 gram of the element? ( Creative )

8. If NaCl is doped with  $10^{-2}$  mol percentage of strancium chloride, what's the concentration of cation vacancy? ( Creative )
9. KF crystallizes fcc structure like sodium chloride. Calculate the distance between  $K^+$  and  $F^-$  in KF (density of KF -  $2.48\text{gcm}^{-3}$ ) ( Creative )
10. An atom Crystallizes fcc crystal lattice and has a density of  $10\text{ gcm}^{-3}$  with unit cell edge length of 100 pm. Calculate the number of atoms present in 1 gram of Crystal ( Creative )

**ADDITIONAL QUESTIONS:**

**Answer the following questions briefly: ( 2 or 3 Marks)**

1. What are the general characteristics of solids? ( 177 )
2. Give the outline of classification of solids ( 177 )
3. Define isotropy and anisotropy ( 178 )
4. Write about molecular solids ( 179 )
5. What are ionic and covalent solids? ( 179 )
6. What are primitive and non primitive unit cells? ( 181 )
7. Draw the structure of different type of cubic crystal system ( 182 )
8. Draw the structure of different type of orthorhombic crystal system ( 182 )
9. Calculate the number of atoms present in Simple cubic ( 183 )
10. Calculate the number of atoms present in BCC ( 183 )
11. Calculate the number of atoms present in FCC ( 183 )
12. Note on Bragg's equation ( 184 )
13. How will you calculate the density of the unit cell? ( 184, 185 )
14. Note on simple cubic arrangement ( 187 )
15. What is void and its type? ( 190 )
16. Note on radius ratio ( 192 )
17. Give the outline of various types of defects ( 193 )
18. What is impurity defect? ( 195 )
19. What is piezoelectricity? ( 195 )



**Answer the following questions in detail : ( 5 Marks)**

1. How will you calculate the packing efficiency for simple cubic? ( 187 )
2. How will you calculate the packing efficiency for FCC? ( 192 )

## **7. CHEMICAL KINETICS**

**EVALUATION :**

**Answer the following questions briefly: ( 2 or 3 Marks)**

1. Define average rate and instantaneous rate ( 205 )
2. Define Rate Law and rate constant ( 208 )
3. Define half life of a reaction show that for a first order reaction half life this is independent of initial concentration ( 215 )
4. What is an elementary reaction? Give the differences between order and molecularity of a reaction ( 210 )
5. Explain the rate determining step with an example ( 210 )
6. Write the rate law for the following reaction ( Creative )
  - a) A reaction that is  $3/2$  order in x and zero order in y
  - b) A reaction that is second order in NO and first order in  $Br_2$
7. Explain the effect of catalyst on reaction rate with an example ( 224 )
8. The rate of formation of a dimer in a second order reaction is  $7.5 \times 10^{-3} \text{ mol L}^{-1} \text{ S}^{-1}$  at  $0.05 \text{ mol L}^{-1}$  monomer concentration calculate the rate constant ( Creative )
9. For a reaction  $x + y + z \rightarrow \text{products}$  the rate law is given by  $\text{rate} = k [x]^{3/2} [y]^{1/2}$  what is the overall order of the reaction and what is the order of the reaction with respect to z. ( Creative )
10. Write Arrhenius equation and explain the terms involved ( 220 )



11. The decomposition of  $\text{Cl}_2\text{O}_7$  at 500 K in the gas Phase to  $\text{Cl}_2$  and  $\text{O}_2$  is a first order reaction. after one minute at 500K , the pressure of  $\text{Cl}_2\text{O}_7$  falls from 0.08 to 0.04 atm. Calculate the rate constant  $\text{s}^{-1}$  ( Creative )

12. Explain pseudo first order reaction with an example ( 214 )

13. Identify the order of the following reactions ( Creative )

a) rusting of iron ii) radioactive disintegration of  ${}_{92}\text{U}^{238}$

b)  $2\text{A} + 3\text{B} \rightarrow \text{products}$ ; rate =  $k [\text{A}]^{1/2} [\text{B}]^2$

14. A gas phase reaction has energy of activation  $200\text{kJ mol}^{-1}$ . If the frequency factor of the reaction is  $1.6 \times 10^{13} \text{ s}^{-1}$  calculate the rate constant at 600K (  $e^{-40.09} = 3.8 \times 10^{-18}$  ) ( Creative )

15. How do concentrations of the reactant influence the rate of reaction? ( 222 )

16. How do nature of the reactant influence the rate of reaction? ( 222 )

17. The rate constant for a first order reaction is  $1.54 \times 10^{-3} \text{ s}^{-1}$ . Calculate its half lifetime ( Creative )

18. The half life of the homogeneous gaseous reaction  $\text{SO}_2\text{Cl}_2 \rightarrow \text{SO}_2 + \text{Cl}_2$  feature based first order kinetics is 8 minutes. How long will it take for the concentration of  $\text{SO}_2\text{Cl}_2$  to be reduced to 1 percentage of the initial value? ( Creative )

19. Zero order reaction is 20 percentage complete in 20 minutes. Calculate the rate constant in what time will the reaction be 80 percentage complete? ( Creative )

**Answer the following questions in detail : ( 5 Marks)**

1. Derive integrated Rate Law for zero order reaction  $\text{A} \rightarrow \text{product}$  ( 215 )

2. Describe the graphical representation of first order reaction ( 213 )

3. The rate law for reaction of a b and c e has been found to be rate =  $k [\text{A}]^2 [\text{B}] [\text{L}]^{3/2}$  how the rate of reaction change when ( Creative )

i. concentration of  $[\text{L}]$  is quadrupled

ii. concentration of both  $[\text{A}]$  and  $[\text{B}]$  are doubled

iii. concentration  $[\text{A}]$  is halved

iv. concentration of  $[\text{A}]$  is reduced to  $1/3$  and concentration of  $[\text{L}]$  is quadrupled

4. Explain briefly the collision theory of bimolecular reaction ( 217, 218 )

[x] (min)	[y] (min)	rate (M s <sup>-1</sup> )
0.2	0.02	0.15
0.4	0.02	0.30
0.4	0.08	1.20

5. Hydrolysis of methyl acetate in aqueous solution has been studied by titrating the liberated Acetic Acid against sodium hydroxide. The concentration of an Ester at different temperature is given ( Creative )

6. For the reaction  $2x + y \rightarrow L$  find the rate law from the following data ( Creative )

7. The time for half change in a first order decomposition of a substance A is 60 seconds. Calculate the rate constant. How much of a will be left after 180 seconds? ( Creative )

8. Activation energy of a reaction is 225 k cal mol<sup>-1</sup> and the value of the rate constant at 40° C is 1.8 x10<sup>-5</sup> s<sup>-1</sup>. Calculate the frequency factor ( Creative )

t (min):	6	12	18	24	30	∞
Vol. of N <sub>2</sub> (ml):	19.3	32.6	41.3	46.5	50.4	58.3

9. Benzene diazonium chloride in aqueous solution decomposes according to the equation  $C_6H_5N_2Cl \rightarrow C_6H_5Cl + N_2$  starting with initial concentration of 10g L<sup>-1</sup>, the volume of N<sub>2</sub> gas Obtained at 50° C at different intervals of time was found to be in the table. Show that the above reaction follows the first order kinetics. What's the value of the rate constant? ( Creative )

10. From the following data, show that the decomposition of hydrogen peroxide is a reaction of the first order

t (min)	0	10	20
V (ml)	46.1	29.8	19.3

Where t is the time in minutes and V is the volume of standard potassium permanganate solution required for titrating the same volume of the reaction mixture ( Creative )

11. A first order reaction is 40 percentage complete in 50 minutes. Calculate the value of the rate constant. In what time will the reaction be 80 percentage complete? ( Creative )

## ADDITIONAL QUESTIONS:

Answer the following questions briefly: ( 2 or 3 Marks)

1. Define order ( 208 )
2. What are the differences between rate and rate constant of a reaction? ( 209, 210 )
3. Define molecularity ( 210 )
4. What are the differences between order and molecularity? ( 210 )
5. Give the examples of first order reaction ( 213 )
6. What is zero order reaction? ( 214 )
7. Give the examples of zero order reaction ( 215 )
8. Derive the relationship between half life period and first order rate constant ( 215 )
9. Derive the relationship between half life period and zero order rate constant ( 216 )
10. Define activation energy ( 218 )
11. What is Arrhenius equation? Expand the terms ( 205 )
12. How does surface area of the reactant affect the reaction? ( 223 )

Answer the following questions in detail : ( 5 Marks)

1. Derive the rate constant for first order reaction ( 212 )
2. Explain about collision theory ( 217, 218 )
3. What are the factors affecting the reaction rate? ( 222 )

## 8. IONIC EQUILIBRIUM

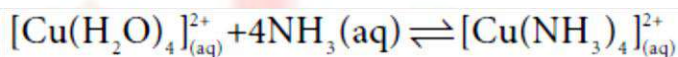
### EVALUATION :

Answer the following questions briefly: ( 2 or 3 Marks)

1. What are Lewis acids and bases? Give two example for each (Vol - II, Page No : 4)
2. Discuss the Lowery - Bronsted concept of acids and bases (3)
3. Identify the conjugate acid, base pair of the following reaction in aqueous solution (Creative)



4. Account for the acidic nature of  $\text{HClO}_4$ . In terms of Bronsted - Lowry theory, identify its conjugate base (Creative)
5. When aqueous ammonia is added to  $\text{CuSO}_4$  solution, the solution turns deep blue due to the formation of tetraamminecopper (II) complex, among  $\text{H}_2\text{O}$  and  $\text{NH}_3$  which is stronger Lewis base. (Creative)



6. The concentration of hydroxide ion in water sample is found to be  $2.5 \times 10^{-6}$  M. Identify the nature of the solution (Creative)
7. A Lab assistant prepared a solution by adding a calculated quantity of HCl gas  $25^\circ\text{C}$  to get a solution with  $[\text{H}_3\text{O}^+] = 4 \times 10^{-5}$  M. Is the solution neutral or acidic or basic? (Creative)
8. Calculate the pH of 0.04 M  $\text{HNO}_3$  solution (Creative)
9. Define solubility product (25)
10. Define ionic product of water. Give its value at room temperature (7)
11. Explain common Ion effect with an example (15)
12. Define  $\text{p}^{\text{H}}$  (9)
13. Calculate the pH of  $1.5 \times 10^{-3}$  M solution of  $\text{Ba}(\text{OH})_2$  (Creative)
14. The  $K_a$  value for HCN is  $10^{-9}$ . What is the pH of 0.4 M HCN solution? (Creative)
15. Calculate the extent of hydrolysis and the pH of 0.1M ammonium acetate given that  $k_a = k_b = 1.8 \times 10^{-5}$ . (Creative)
16. Solubility product of  $\text{Ag}_2\text{CrO}_4$  is  $1 \times 10^{-12}$ . What is the solubility of  $\text{Ag}_2\text{CrO}_4$  in 0.01M  $\text{AgNO}_3$  solution? (Creative)
17. Write the expression for the solubility product of  $\text{Ca}_3(\text{PO}_4)_2$  (Creative)
18. A saturated solution, prepared by dissolving  $\text{CaF}_2$  (s) in water, has  $[\text{Ca}^{2+}] = 3.3 \times 10^{-4}$  M what is the  $K_{\text{sp}}$  of  $\text{CaF}_2$ ? (Creative)
19.  $K_{\text{sp}}$  of  $\text{AgCl}$  is  $1.8 \times 10^{-10}$ . Calculate molar solubility in 1M  $\text{AgNO}_3$  (Creative)
20. A particular saturated solution of silver chromate  $\text{Ag}_2\text{CrO}_4$  has  $[\text{Ag}] = 5 \times 10^{-5}$  and  $[\text{CrO}_4]^{2-} = 4.4 \times 10^{-4}$  M. what is the value of  $K_{\text{sp}}$  for  $\text{Ag}_2\text{CrO}_4$ ? (Creative)



21. Write the expression for the solubility product of  $\text{Hg}_2\text{Cl}_2$  (Creative)
22.  $K_{sp}$  of  $\text{Ag}_2\text{CrO}_4$  is  $1.1 \times 10^{-12}$ . What is the solubility of  $\text{Ag}_2\text{CrO}_4$  in  $0.1\text{M}$   $\text{K}_2\text{CrO}_4$ ? (Creative)
23.  $K_{sp}$  of  $\text{Al}(\text{OH})_3$  is  $1 \times 10^{-15}$  M. At what pH does  $1.0 \times 10^{-3}$  M,  $\text{Al}^{3+}$  precipitate on the addition of buffer of  $\text{NH}_4\text{Cl}$  and  $\text{NH}_4\text{OH}$  solution? (Creative)

**Answer the following questions in detail : ( 5 Marks)**

1. Derive an expression for Ostwald's dilution law (12,13)
2. 50 ml of  $0.05\text{M}$   $\text{HNO}_3$  is added to 50 ml of  $0.025\text{M}$   $\text{KOH}$ . Calculate the pH of the resultant solution (Creative)
3. Derive an expression for the hydrolysis constant and degree of hydrolysis of salt of strong acid and weak base. (22,23)
4. Will a precipitate be formed when  $0.150$  L of  $0.1$  M  $\text{Pb}(\text{NO}_3)_2$  and  $0.100$  L of  $0.2$  M  $\text{NaCl}$  are mixed?  $K_{sp}(\text{PbCl}_2) = 1.2 \times 10^{-5}$  (Creative)

**ADDITIONAL QUESTIONS:**

**Answer the following questions briefly: ( 2 or 3 Marks)**

1. Mention the Arrhenius concept of acid and base (2)
2. What are the limitations of Arrhenius concepts? (3)
3. Differentiate Lewis acids and Lewis bases (5)
4. How will you measure the strength of an acid? (6)
5. What are buffer solutions? Mention its types (15)
6. What is buffer index? (18)
7. How will you calculate solubility product from molar solubility? (26)
8. Give a condition for a compound to be precipitated (25)

**Answer the following questions in detail : ( 5 Marks)**

1. Derive the relationship between  $\text{P}^{\text{H}}$  and  $\text{P}^{\text{OH}}$  (9)
2. Explain the buffer action of a solution (16)
3. Derive Henderson-Hasselbalch equation (18)



- Derive a relationship between the equilibrium constant and the dissociation constant for the salt of strong base and weak acid. (21,22)

## 9. ELECTROCHEMISTRY

### **EVALUATION :**

**Answer the following questions briefly: ( 2 or 3 Marks)**

- Define anode and cathode (45)
- Why does conductivity of a solution decrease on dilution of the solution? (Creative)
- State Faraday's Laws of electrolysis (54)
- Why is anode in galvanic cell considered to be negative and cathode positive electrode? (45)
- Which of 0.1M HCl and 0.1 M KCl do you expect to have greater  $\Lambda^{\circ}_m$  and why? (Creative)
- Arrange the following solutions in the decreasing order of specific conductance. (Creative)  
i) 0.01 M KCl ii) 0.005 M KCl iii) 0.1 M KCl iv) 0.25 M KCl v) 0.5 M KCl
- Why is AC current used instead of DC in measuring the electrolytic conductance? (38)
- 0.1M NaCl solution is placed in two different cells having cell constant 0.5 and  $0.25\text{cm}^{-1}$  respectively. Which of the two will have greater value of specific conductance? (Creative)
- Can  $\text{Fe}^{3+}$  oxidise bromide to bromine under standard conditions? (Creative)  
Given:  $E^{\circ}_{\text{Fe}^{3+}|\text{Fe}^{2+}} = 0.771$   $E^{\circ}_{\text{Br}_2|\text{Br}^-} = 1.09 \text{ V}$
- Is it possible to store copper sulphate in an iron vessel for a long time? (Creative)  
Given :  $E^{\circ}_{\text{Cu}^{2+}|\text{Cu}} = 0.34\text{V}$  and  $E^{\circ}_{\text{Fe}^{2+}|\text{Fe}} = -0.44 \text{ V}$
- Two metals  $M_1$  and  $M_2$  have reduction potential values of  $-x\text{V}$  and  $+y\text{V}$  respectively. Which will liberate  $\text{H}_2$  and  $\text{H}_2\text{SO}_4$ ? (Creative)
- Reduction potential of two metals  $M_1$  and  $M_2$  are  $E^{\circ}_{M_1^{2+}|M_1} = -2.3\text{V}$  and  $E^{\circ}_{M_2^{2+}|M_2} = 0.2\text{V}$   
Predict which one is better for coating the surface of iron. Given :  $E^{\circ}_{\text{Fe}^{2+}|\text{Fe}} = -0.44 \text{ V}$   
(Creative)
- Calculate the standard emf of the cell:  $\text{Cd}|\text{Cd}^{2+}||\text{Cu}^{2+}|\text{Cu}$  and determine the cell reaction.  
The standard reduction potentials of  $\text{Cu}^{2+}|\text{Cu}$  and  $\text{Cd}|\text{Cd}^{2+}$  are  $0.34\text{V}$  and  $-0.40 \text{ volts}$  respectively. Predict the feasibility of the cell reaction. (Creative)

14. The same amount of electricity was passed through two separate electrolytic cells containing solutions of nickel nitrate and chromium nitrate respectively. If 2.935g of Ni was deposited in the first cell. The amount of Cr deposited in the another cell? (Creative)

Give : molar mass of Nickel and chromium are 58.74 and 52gm<sup>-1</sup> respectively.

15. A copper electrode is dipped in 0.1M copper sulphate solution at 25°C . Calculate the electrode potential of copper. [Given:  $E^{\circ}_{\text{Cu}^{2+}|\text{Cu}} = 0.34$  ] (Creative)

16. Write a note on sacrificial protection. (61)

17. Ionic conductance at infinite dilution of Al<sup>3+</sup> and SO<sub>4</sub><sup>2-</sup> are 189 and 160 mho cm<sup>2</sup> equiv<sup>-1</sup>.

Calculate the equivalent and molar conductance of the electrolyte Al<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub> at infinite dilution.

(Creative)

**Answer the following questions in detail : ( 5 Marks)**

1. State Kohlrausch Law. How is it useful to determine the molar conductivity of weak electrolyte at infinite dilution (41,42)

2. Describe the electrolysis of molten NaCl using inert electrodes (53)

3. Describe the construction of Daniel cell. Write the cell reaction (44)

4. The conductivity of a 0.01M solution of a 1:1 weak electrolyte at 298 K is 1.5 x 10<sup>-4</sup> Scm<sup>-1</sup>

i) Molar conductivity of the solution

ii) Degree of dissociation and the dissociation constant of the weak electrolyte given that

$$\lambda^{\circ}_{\text{cation}} = 248.2 \text{ S cm}^2 \text{ mol}^{-1} \quad \lambda^{\circ}_{\text{anion}} = 51.8 \text{ Scm}^2 \text{ mol}^{-1} \quad (\text{Creative})$$

5. A current of 1.608 A is passed through 250 ml of 0.5M solution of copper sulphate for 50 Minutes. Calculate the strength of Cu<sup>2+</sup> after electrolysis assuming volume to be constant and the current efficiency is 100% (Creative)

6. In fuel cell H<sub>2</sub> and O<sub>2</sub> react to produce electricity. In the process, H<sub>2</sub> gas is oxidised at the anode and O<sub>2</sub> at cathode. If 44.8 litre of H<sub>2</sub> at 25°C and 1atm pressure reacts in 10 minutes, what is average current produced? If the entire current is used for electro deposition of Cu from Cu<sup>2+</sup> , how many grams of Cu deposited? (Creative)

7. For the cell Mg (s)| Mg<sup>2+</sup>(aq) || Ag<sup>+</sup> (aq) Ag (s), calculate the equilibrium constant

at 25°C and maximum work that can be obtained during operation of cell.

Given :  $E^\circ_{\text{Mg}^{2+}|\text{Mg}} = -2.37 \text{ V}$  and  $E^\circ_{\text{Ag}^{2+}|\text{Ag}} = 0.80 \text{ V}$  (Creative)

8.  $8.2 \times 10^{12}$  litres of water is available in a lake. A power reactor using the electrolysis of water in the lake produces electricity at the rate of  $2 \times 10^6 \text{ Cs}^{-1}$  at an appropriate voltage. How many years would it take to completely electrolyze the water in the lake. Assume that there is no loss of water except due to electrolysis. (Creative)
9. Derive an expression for Nernst equation (51)
10. Explain the function of  $\text{H}_2 - \text{O}_2$  fuel cell. (59)

### ADDITIONAL QUESTIONS:

Answer the following questions briefly: ( 2 or 3 Marks)

1. What is conductivity cell? (34)
2. State ohm's law (34)
3. What is specific resistance? Mention its unit (35)
4. What is specific conductance? Mention its unit (35)
5. Define Molar conductance. Give its unit (36)
6. Define equivalent conductance (36)
7. What are the factors affecting electrolytic conductance? (38,39)
8. Calculate the molar conductance at infinite dilution of a weak electrolyte (42)
9. Calculate the degree of dissociation of weak electrolytes (42)
10. Calculate the solubility of sparingly soluble salts (43)
11. Write the cell reaction of Galvanic cell (44)
12. What is Standard Hydrogen Electrode? (48)
13. Define electrode potential and standard electrode potential (49)
14. Mention the electrochemical mechanism of corrosion (60)
15. What are electrochemical series? (62)
16. Explain the function of a salt bridge in an electrochemical cell (46)
17. What is intercalation? (59)

18. Define electrochemical equivalent (54)

**Answer the following questions briefly: ( 5 Marks)**

1. How is the conductivity of an electrolytic solution is determined by using a wheatstone bridge arrangement? (38)
2. Explain the relationship between free energy of the cell and its emf (50)
3. Explain the cell reaction of Leclanche cell with a neat diagram (56)
4. Explain the cell reaction of Lead storage battery (58)
5. Explain the process of recharging of lead storage battery (58)
6. Explain the function of mercury button cell (57)
7. Explain the function of lithium ion battery (58)

### **10. SURFACE CHEMISTRY**

**EVALUATION :**

**Answer the following questions briefly: ( 2 or 3 Marks)**

1. Give two important characteristics of physisorption (71)
2. In case of chemisorptions, why adsorption first increases and then decreases with temperature? (73)
3. Which will be adsorbed more readily on the surface of charcoal and why?  $\text{NH}_3$  or  $\text{CO}_2$ ?
4. Heat of adsorption is greater for chemisorptions than physisorption. Why? (Creative)
5. Peptizing agent is added to convert precipitate into colloidal solution. Explain with an example (90)
6. What happens when a colloidal sol of  $\text{Fe}(\text{OH})_3$  and  $\text{As}_2\text{O}_3$  are mixed? (Creative)
7. Why are lyophilic colloidal sols are more stable than lyophobic colloidal sol? (87)
8. Addition of alum purifies water. Why? (Creative)
9. What are factors which influence the adsorption of a gas on a solid? (72)
10. What are enzymes? Write a brief note on the mechanism of enzyme catalysis (83)
11. What do you mean by activity and selectivity of catalyst? (25)



12. Give three uses of emulsions (Creative)
13. Why does bleeding stop by rubbing moist alum? (Creative)
14. Why is desorption important for a substance but it is a state of substance? (Creative)
15. Comment on the statement: Colloid is not a substance but it is a state of substance (Creative)
16. Explain any one method for coagulation (96)
17. Write a note on electro osmosis (95)
18. Write a note on catalytic poison (79)
19. Explain intermediate compound formation theory of catalysis with an example (80)
20. What is the difference between homogenous and heterogeneous catalysis? (77)
21. Describe adsorption theory of catalysis (81)


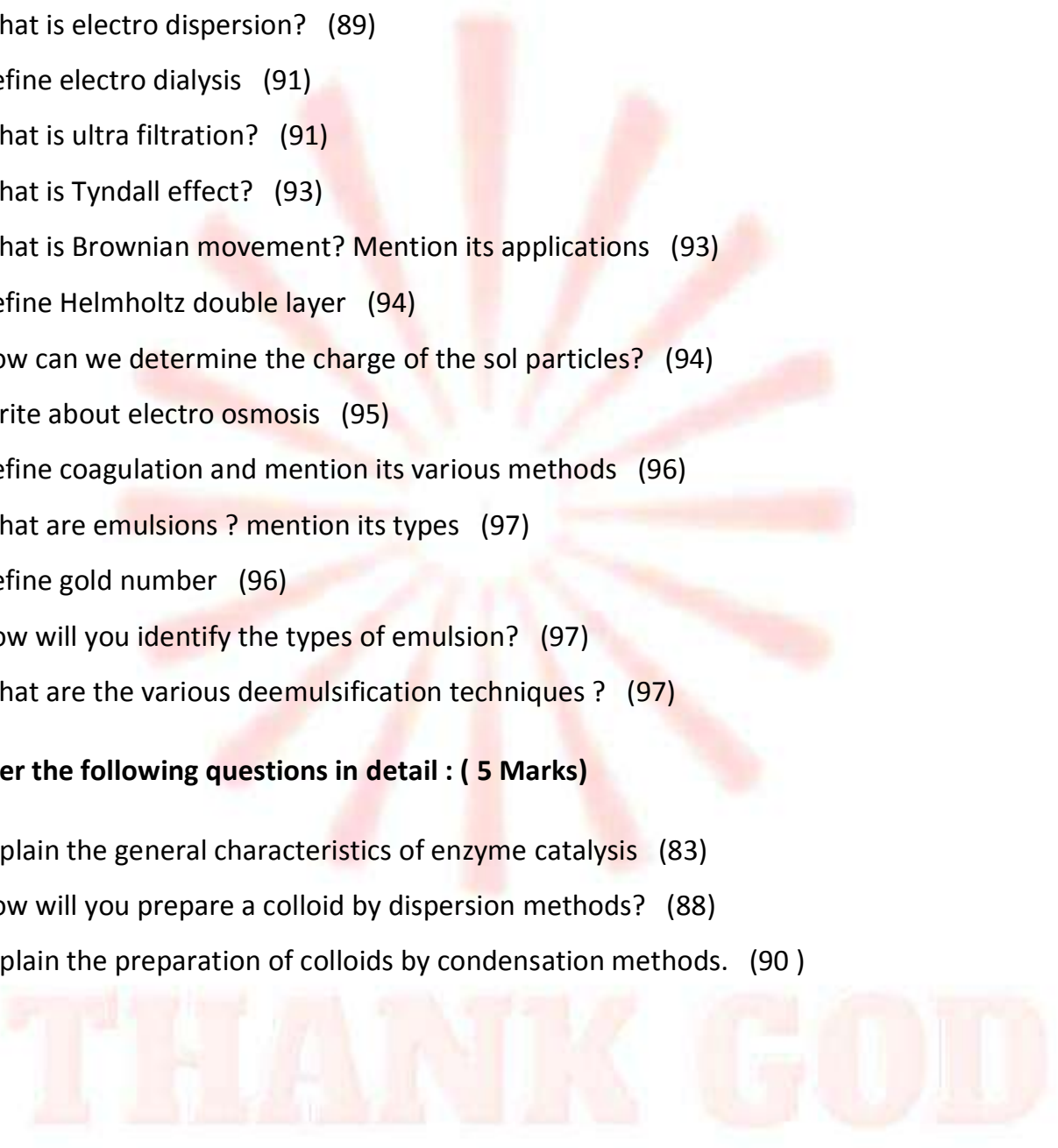
**Answer the following questions in detail : ( 5 Marks)**

1. Differentiate physisorption and chemisorptions (71)
2. What is the difference between a sol and a gel? (84)
3. Describe some feature of catalysis by zeolites (84)

**ADDITIONAL QUESTIONS:**

**Answer the following questions briefly: ( 2 or 3 Marks)**

1. What are the characteristics of adsorption? (71)
2. What are the factors affecting adsorption? (72)
3. Write about Freundlich adsorption isotherm (74)
4. What is the use of adsorption in the softening of hard water? (75)
5. Define chromatography (75)
6. What are the characteristics of catalysis? (78)
7. Define promoters and catalytic poison with suitable example (79)
8. Define auto catalyst (79)
9. Define negative catalyst (79)
10. What are active centres? (82)

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11. Write about phase transfer catalysis (85)
  12. Define nano catalysis (86)
  13. What are lyophilic and lyophobic colloids? (87)
  14. Define peptisation (90)
  15. What is electro dispersion? (89)
  16. Define electro dialysis (91)
  17. What is ultra filtration? (91)
  18. What is Tyndall effect? (93)
  19. What is Brownian movement? Mention its applications (93)
  20. Define Helmholtz double layer (94)
  21. How can we determine the charge of the sol particles? (94)
  22. Write about electro osmosis (95)
  23. Define coagulation and mention its various methods (96)
  24. What are emulsions ? mention its types (97)
  25. Define gold number (96)
  26. How will you identify the types of emulsion? (97)
  27. What are the various deemulsification techniques ? (97)

**Answer the following questions in detail : ( 5 Marks)**

1. Explain the general characteristics of enzyme catalysis (83)
2. How will you prepare a colloid by dispersion methods? (88)
3. Explain the preparation of colloids by condensation methods. (90 )

**11. HYDROXY COMPOUNDS AND ETHERS**

**EVALUATION :**

**Answer the following questions briefly: ( 2 or 3 Marks)**

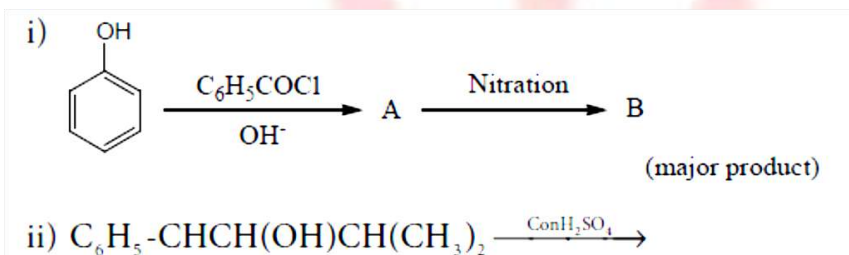
1. Identify the product (s) is / are formed when 1 – methoxy propane is heated with excess HI.  
Name the mechanism involved in the reaction (Creative)
2. Draw the major product formed when 1-ethoxyprop-1-ene is heated with one equivalent of HI (Creative)
3. Suggest a suitable reagent to prepare secondary alcohol with identical group using Grignard reagent. (108)
4. What is the major product obtained when two moles of ethyl magnesium bromide is treated with methyl benzoate followed by acid hydrolysis? (Creative)
5. Arrange the following in the increasing order of their boiling point and give a reason for your ordering  
(i.) Butan – 2- ol, Butan -1-ol, 2 –methylpropan -2-ol  
(ii.) Propan -1-ol, propan -1,2,3-triol, propan -1,3 – diol, propan -2-ol (Creative)
6. Can we use nucleophiles such as  $\text{NH}_3$  ,  $\text{CH}_3\text{O}^-$  for the Nucleophilic substitution of alcohols?  
(Creative)
7. Is it possible to oxidise t – butyl alcohol using acidified dichromate to form a carbonyl compound? (Creative)
8. What happens when 1-phenyl ethanol is treated with acidified  $\text{KMnO}_4$ ? (Creative)
- 9.. Write the mechanism of acid catalysed dehydration of ethanol to give ethane. (115)
10. Explain Kolbe’s reaction (130)
11. Writes the chemical equation for Williamson synthesis of 2-ethoxy – 2- methyl pentane starting from ethanol and 2 – methyl pentan -2-ol (Creative)
12. Write the structure of the aldehyde, carboxylic acid and ester that yield 4- methylpent -2-en-1-ol. (Creative)
13. What is metamerism? Give the structure and IUPAC name of metamers of 2-methoxy propane (Creative)

14. How are the following conversions effected

i) benzylchloride to benzylalcohol      ii) benzylalcohol to benzoic acid      (Creative)

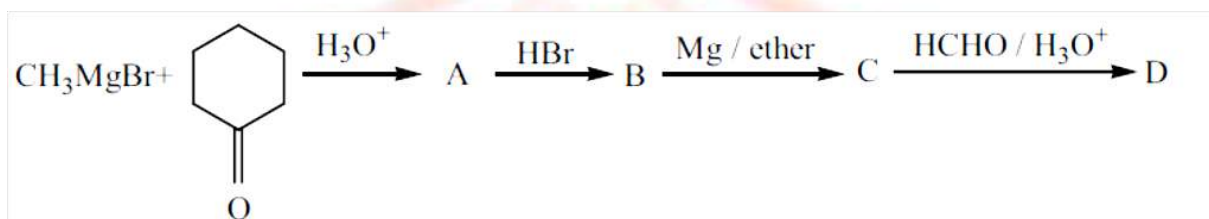
15. 0.44g of a monohydric alcohol when added to methyl magnesium iodide in ether liberates at STP  $112 \text{ cm}^3$  of methane with PCC the same alcohol form a carbonyl compound that answers silver mirror test. Identify the compound.      (Creative)

16. Complete the following reactions      (Creative)

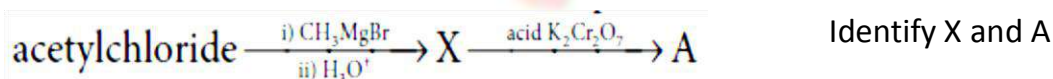


17. Phenol is distilled with Zn dust followed by Friedel – crafts alkylation with propyl chloride to give a compound B, B on oxidation gives (c) Identify A,B and C.      (Creative)

18. Identify A,B,C,D and write the complete equation      (Creative)



19. What will be the product X and A for the following reaction?      (Creative)



n-butyl alcohol?      (Creative)

21. 3,3 – dimethylbutan -2-ol on treatment with conc. $\text{H}_2\text{SO}_4$  to give tetramethyl ethylene as a major product. Suggest a suitable mechanism      (Creative)

**Answer the following questions in detail : ( 5 Marks)**

1. Predict the major product, when 2-methyl but -2-ene is converted into an alcohol in each of the following methods. (i.) Acid catalysed hydration (ii.) Hydroboration      (109)

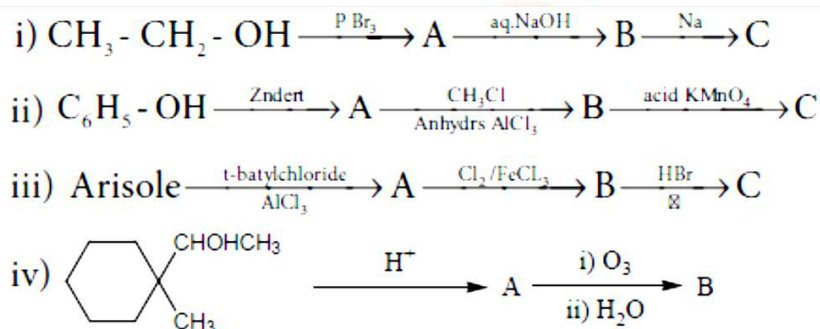


(iii.) Hydroxylation using bayers reagent (Creative)

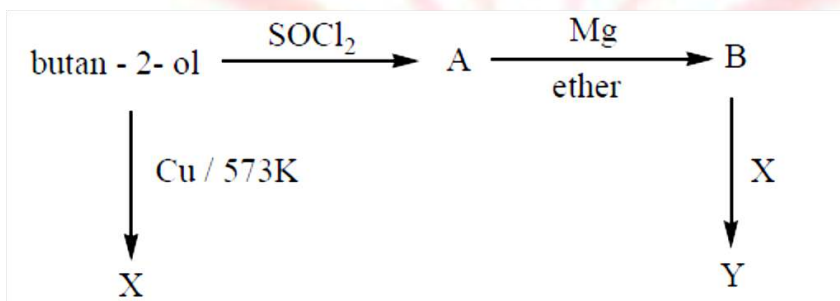
2. How is phenol prepared from (Creative)

i) chloro benzene (126) ii) iso propyl benzene (126)

3. Complete the following reactions (Creative)



4. Predict the product A,B,X and Y in the following sequence of reaction (Creative)



#### ADDITIONAL QUESTIONS:

Answer the following questions briefly: ( 2 or 3 Marks)

1. How does ethane react with  $\text{KMnO}_4$ ? (110)
2. How does methanol react with thionyl chloride? (114)
3. Explain the dehydration of tertiary alcohol by E1 mechanism (115)
4. Explain Saytzeff's rule (116)
5. Swern oxidation (117)
6. How does  $1^\circ$ ,  $2^\circ$ ,  $3^\circ$  alcohol react with Cu at 573 K? (118)
7. How is oxirane prepared by ethane 1,2 diol? (119)
8. How will you prepare 1,4 dioxane? (120)

9. How is nitroglycerine prepared? (121)
10. How will you prepare acrolein? (121)
11. Mention the uses of glycol (122)
12. Note on Dow's process (126)
13. How will you prepare phenol from benzene? (126)
14. Note on Schotten-Baumann reaction (127)
15. Note on Williamson ether synthesis (127)
16. How does phenol react with acidified  $K_2Cr_2O_7$ ? (128)
17. How will you prepare cyclohexanol from phenol? (128)
18. How will you prepare picric acid? (129)
19. How will you prepare 2,4,6 tribromo phenol? (130)
20. Riemer – Tiemann reaction (130)
21. Phthalein reaction (131)
22. Cupling reaction (131)
23. Test to differentiate alcohol and phenol (131)
24. How does ether react with HI ? Explain with mechanism (137)
25. What is autooxidation? (137)
26. Friedel craft's reaction (138)

**Answer the following questions briefly: ( 5 Marks)**

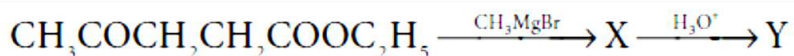
1. Lucas Test (110)
2. Victor Meyer's Test (111)
3. How does primary alcohol reacts with alkyl halides? Explain with mechanism. (113)
4. How does Tertiary alcohol reacts with alkyl halides? Explain with mechanism (114)
5. How will you prepare diethyl ether? (134)

## 12. CARBONYL COMPOUNDS

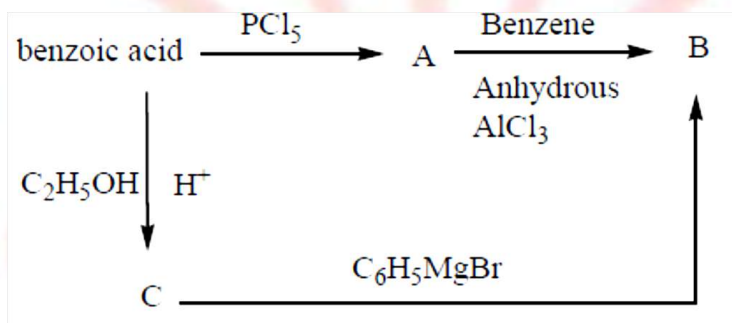
### EVALUATION :

Answer the following questions briefly: ( 2 or 3 Marks)

1. Identify X and Y. (Creative)



2. Identify A, B and C (Creative)



3. How will you convert benzaldehyde into the following compounds? (Creative)

(i) benzophenone      (ii) benzoic acid      (iii)  $\alpha$  hydroxyphenylacetic acid.

4. What is the action of HCN on (i) propanone (ii) 2,4-dichlorobenzaldehyde (iii) ethanol

(Creative)

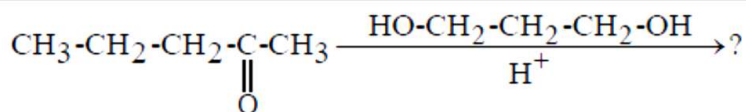
5. A carbonyl compound A having molecular formula  $\text{C}_5\text{H}_{10}\text{O}$  forms crystalline precipitate with sodium bisulphate and gives positive iodoform test. A does not reduce Fehling solution.

Identify A. (Creative)

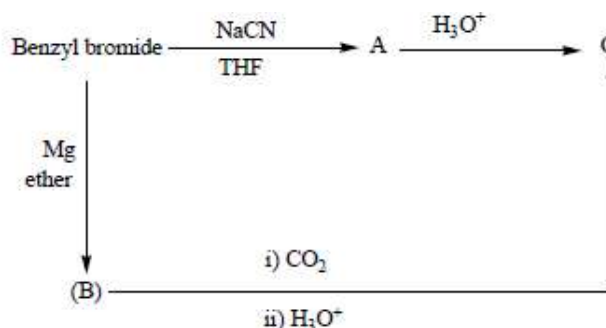
6. Write the structure of the major product of the aldol condensation of benzaldehyde with acetone. (163)

7. Complete the following reaction.

(Creative)



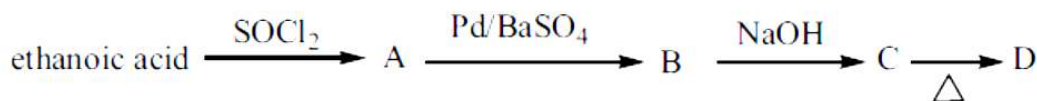
8. Identify A, B and C  
(Creative)



9. Oxidation of ketones involves carbon – carbon bond cleavage. Name the product (s) is / are formed on oxidising 2,5 – dimethylhexan – 2- one using strong oxidising agent. (Creative)

**Answer the following questions in detail : ( 5 Marks)**

- How is propanoic acid is prepared starting from? (Creative)  
(a) an alcohol      (b) an alkylhalide      (c) an alkene
- A Compound (A) with molecular formula  $\text{C}_2\text{H}_3\text{N}$  on acid hydrolysis gives(B) which reacts with thionylchloride to give compound(C). Benzene reacts with compound (C) in presence of anhydrous  $\text{AlCl}_3$  to give compound(C). Compound (C) on reduction with gives (D). Identify (A), (B), (C) and D. Write the equations. (Creative)
- Identify A, B, C and D (Creative)



- An alkene (A) on ozonolysis gives propanone and aldehyde (B). When (B) is oxidised (C) is obtained. (C) is treated with  $\text{Br}_2/\text{P}$  gives (D) which on hydrolysis gives (E). When propanone is treated with HCN followed by hydrolysis gives (E). Identify A, B, C, D and E. (Creative)
- How are the following conversions effected (Creative)  
(a) propanal into butanone      (b) Hex-3-yne into hexan-3-one.  
(c) phenylmethanal into benzoic acid      (d) phenylmethanal into benzoin (164)
- How will you prepare (Creative)  
i. Acetic anhydride from acetic acid (175)      ii. Ethylacetate from methylacetate



- |   |   |
|---|---|
| iii. Acetamide from methylcyanide (187)   | viii. Malachitegreen from benzaldehyde    |
| iv. Lactic acid from ethanal (165)        | ix. Cinnamic acid from benzaldehyde (165) |
| v. Acetophenone from acetylchloride (153) | x. Acetaldehyde from ethyne (149)         |
| vi. Ethane from sodium acetate (175)      |   |
| vii. Benzoic acid from toluene (171)      |   |

**ADDITIONAL QUESTIONS:**

**Answer the following questions briefly: ( 2 or 3 Marks)**

1. How will you prepare ethanol by ozonolysis? (149)
2. Rosenmund reduction (151)
3. Stephen's reaction (151)
4. Etard reaction (151)
5. Gattermann Koch reaction (151)
6. Friedel crafts acylation (151)
7. How is benzaldehyde manufactured commercially? (152)
8. How will you prepare aldimine? (158)
9. Urotropine and uses (158)
10. Popoff's rule (159)
11. Clemmensen reduction (160)
12. Wolf kishner reduction (161)
13. Haloform reaction (161)
14. Crossed aldol condensation (162)
15. What happens on heating of aldol? (161)
16. Claisen Schmidt condensation (163)
17. Crossed cannizaro reaction (164)
18. Perkin's reaction (165)

19. Knoevenagal reaction (165)
20. Note on Schiff's base (165)
21. Uses of formaldehyde and acetone (167)
22. How does sodium salt react with soda lime? (175)
23. HVZ reaction (176)
24. Reducing nature of formic acid (177)
25. Trans esterification (185)
26. Ammonolysis (185)
27. Claisen condensation (186)
28. Haffmann's degradation (188)

**Answer the following questions briefly: ( 5 Marks)**

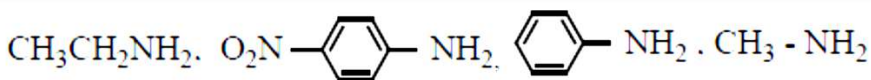
1. How does acetone reacts with hydroxylamine, hydrazine, phenyl hydrazine? (152)
2. Explain Aldol condensation with mechanism (161)
3. Explain Cannizaro reaction with mechanism (163)
4. Test for aldehyde (166)
5. Esterification reaction with mechanism (173)

### **13. ORGANIC NITROGEN COMPOUNDS**

**EVALUATION :**

**Answer the following questions briefly: ( 2 or 3 Marks)**

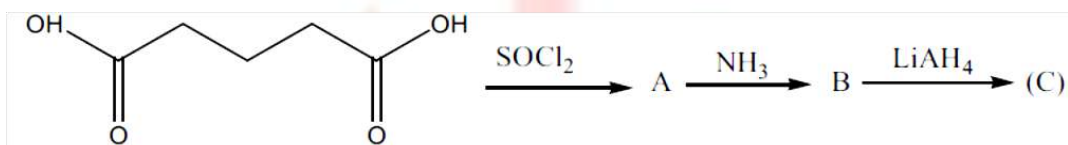
1. Write down the possible isomers of the  $C_4H_9NO_2$  give their IUPAC names (Creative)
2. There are two isomers with the formula  $CH_3NO_2$  . How will you distinguish between them?  
(Creative)
3. How will you prepare propan – 1- amine from (Creative)  
i) butane nitrile ii) propanamide ii) 1- nitropropane
4. Identify A,B,C and D (Creative)



5. How will you convert diethylamine into (Creative)

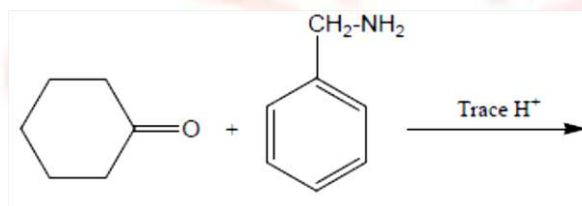
- i) N, N – diethylacetamide                      ii) N – nitrosodiethylamine

6. Identify A, B and C (Creative)



7. Identify A, B, C and D      Aniline + benzaldehyde  $\xrightarrow{\text{Con HNO}_3}$  C + D (Creative)

8. Complete the following reaction (Creative)



**Answer the following questions in detail : ( 5 Marks)**

1. What happens when (Creative)

- 2 – Nitropropane boiled with HCl
- Nitrobenzene undergo electrolytic-reduction in strongly acidic medium
- Oxidation of tert – butylamine with  $\text{KMnO}_4$
- Oxidation of acetoneoxime with trifluoroperoxy acetic acid.

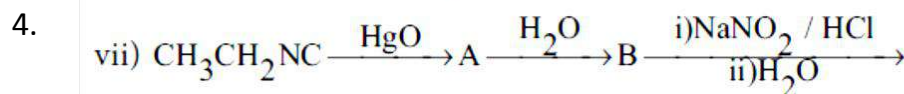
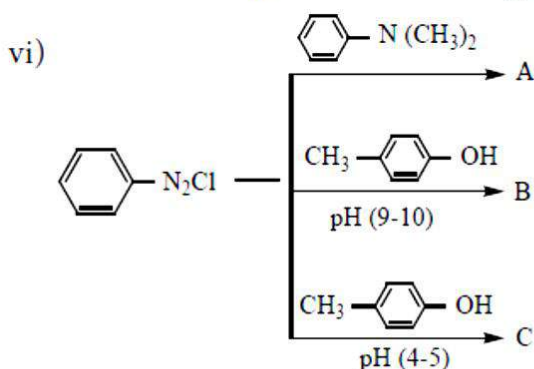
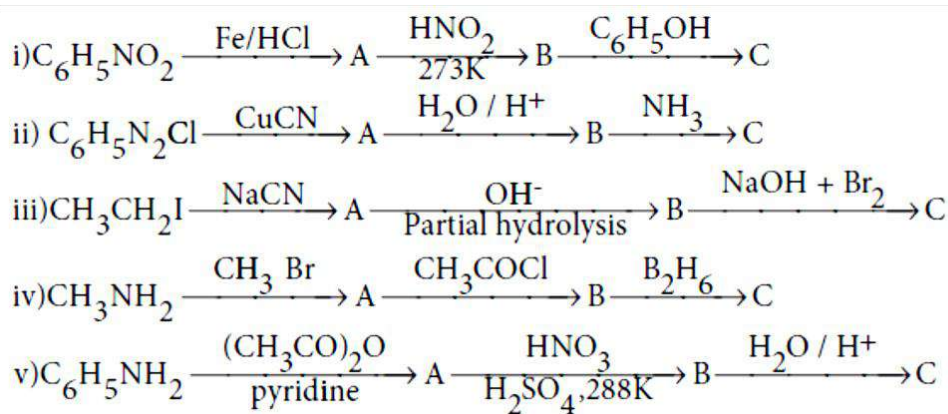
2. How will you convert nitrobenzene into (Creative)

- 1,3,5 - trinitrobenzene (204)
- o and p- nitrophenol
- m – nitro aniline (204)
- azoxybenzene
- hydrozobenzene

vi. N – phenylhydroxylamine (203)

vii. aniline (203)

3. Identify compounds A,B and C in the following sequence of reactions. (Creative)



Write short notes on the

following

i. Hofmann's bromide reaction (209)

vi. Mustard oil reaction (216)

ii. Ammonolysis (Creative)

vii. Coupling reaction (222)

iii. Gabriel phthalimide synthesis (209)

viii. Diazotisation (Creative)

iv. Schotten – Baumann reaction (214)

ix. Gomberg reaction (221)

v. Carbylamine reaction (216)

5. How will you distinguish between primary secondary and tertiary aliphatic amines? (Creative)

6. Account for the following (Creative)

i. Aniline does not undergo Friedel – Crafts reaction

ii. Diazonium salts of aromatic amines are more stable than those of aliphatic amines

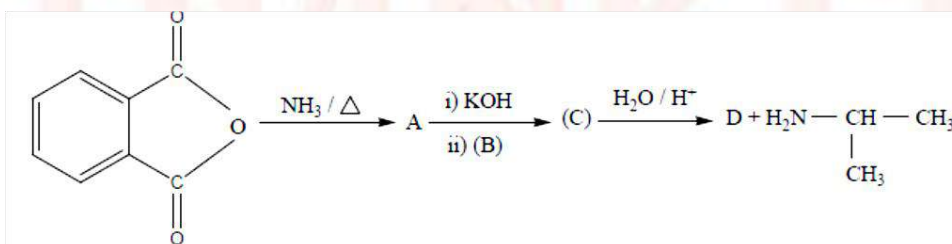


- iii.  $pK_b$  of aniline is more than that of methylamine
- iv. Gabriel phthalimide synthesis is preferred for synthesising primary amines.
- v. Ethylamine is soluble in water whereas aniline is not
- vi. Amines are more basic than amides
- vii. Although amino group is o – and p – directing in aromatic electrophilic substitution reactions, aniline on nitration gives a substantial amount of m – nitroaniline.

7. Arrange the following (Creative)

- i. In increasing order of solubility in water,  $C_6H_5NH_2$ ,  $(C_2H_5)_2NH$ ,  $C_2H_5NH_2$
- ii. In increasing order of basic strength
  - a) aniline, p- toluidine and p – nitroaniline
  - b)  $C_6H_5NH_2$ ,  $C_6H_5NHCH_3$ ,  $C_6H_5NH_2$ , p-Cl- $C_6H_4-NH_2$
- iii. In decreasing order of basic strength in gas phase  
 $C_2H_5NH_2$ ,  $C_2H_5NH$ ,  $(C_2H_5)_3N$ ,  $NH_3$
- iv. In increasing order of boiling point  
 $C_6H_5OH$ ,  $(CH_3)_2NH$ ,  $C_2H_5NH_2$
- v. In decreasing order of the  $pK_b$  values  
 $C_2H_5NH_2$ ,  $C_6H_5NHCH_3$ ,  $(C_2H_5)_2NH$  and  $CH_3NH_2$
- vi. Increasing order of basic strength  
 $C_6H_5NH_2$ ,  $C_6H_5N(CH_3)_2$ ,  $(C_2H_5)_2NH$  and  $CH_3NH_2$
- vii. In decreasing order of basic strength  
 $CH_3CH_2NH_2$ ,  $O_2N-C_6H_5-NH_2$ ,  $C_6H_5NH_2$ ,  $CH_3NH_2$

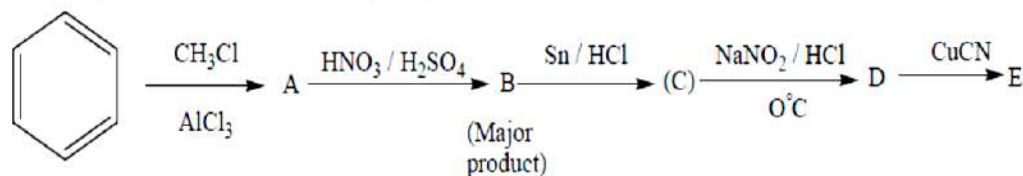
8. Predict A,B,C and D for the following reaction (Creative)



9. A dibromo derivative (A) on treatment with KCN followed by acid hydrolysis and heating

gives a monobasic acid (B) along with liberation of  $\text{CO}_2$ . (B) on heating with liquid ammonia followed by treating with  $\text{Br}/\text{KOH}$  gives (c) which on treating with  $\text{NaNO}_2$  and  $\text{HCl}$  at low temperature followed by oxidation gives a monobasic acid (D) having molecular mass 74. Identify A to D. (Creative)

10. Identify A to E in the following frequency of reactions. (Creative)



### ADDITIONAL QUESTIONS:

Answer the following questions briefly: ( 2 or 3 Marks)

1. Tautomerism (199)
2. How will you prepare oil of mirbane? (201)
3. Chloropicrin (203)
4. Hoffmann's ammonolysis (209)
5. Sabatier – Mailhe method (210)
6. How will you prepare phenyl mustard oil? (216)
7. How does aniline react with  $\text{Br}_2$ ? (217)
8. Sandmeyer reaction (220)
9. Gattermann reaction (220)
10. Baltz – Schiemann reaction (221)

Answer the following questions briefly: ( 5 Marks)

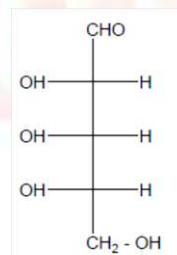
1. Explain the reaction of  $\text{C}_6\text{H}_5\text{NO}_2$  in acid, neutral, alkaline medium. (203)

**14. BIOMOLECULES**

**EVALUATION :**

**Answer the following questions briefly: ( 2 or 3 Marks)**

1. What type of linkages hold together monomers of DNA? (Creative)
2. Give the differences between primary and secondary structure of proteins (254)
3. Name the vitamins whose deficiency cause i) rickets ii) scurvy (260)
4. Write the Zwitter ion structure of alanine (Creative)
5. Write a short note on peptide bond (252)
6. Give two difference between Hormones and vitamins (Creative)
7. Write a note on denaturation of proteins (256)
8. What are reducing and non reducing sugars? (Creative)
9. Why carbohydrates are generally optically active? (Creative)
10. Classify the following into monosaccharides, oligosaccharides and polysaccharides (Creative)  
i) Starch ii) fructose iii) sucrose iv) lactose v) maltose
11. How are vitamins classified? (258)
12. What are hormones? Give examples (266)
13. Write the structure of all possible dipeptides which can be obtained form glycine and alanine (253)
14. Define enzymes (257)
15. Write the structure of  $\alpha - D (+)$  glucopyranose (Creative)
16. What are different types of RNA which are found in cell? (264)
17. What are the functions of lipids in living organism? (258)
18. Is the following sugar, D-sugar or L-sugar? (Creative)



**Answer the following questions in detail : ( 5 Marks)**

1. Give any three difference between DNA and RNA (264)

2. Write a note on formation of  $\alpha$  helix (254)

**ADDITIONAL QUESTIONS:**

**Answer the following questions briefly: ( 2 or 3 Marks)**

1. Outline the classification of carbohydrates giving example for each (239)
2. Write about the structure of sucrose (247)
3. What are starch and cellulose? (248,249)
4. Define isoelectric point (252)
5. What is zwitter ion? (252)
6. What is denaturation of proteins? (256)
7. Explain the mechanism of enzyme actions (257)
8. Mention the biological importance of lipids (256)
9. What are hormones? How are they classified? (266,267)

**Answer the following questions briefly: ( 5 Marks)**

1. Elucidate the structure of glucose (241)
2. Explain the cyclic structure of glucose (243)
3. Elucidate the structure of fructose (244)
4. Explain the structure of lactose and maltose (247,248)
5. Explain the secondary structure of proteins (247)
6. Explain the double strand helix structure of DNA. (262)
7. Explain the method of DNA finger printing (265)



## 15. CHEMISTRY IN EVERYDAY LIFE

### **EVALUATION :**

**Answer the following questions briefly: ( 2 or 3 Marks)**

1. What are antibiotics? (Creative)
2. Name one substance which can act as both analgesic and antipyretic (Creative)
3. Write a note on synthetic detergents (285)
4. How do antiseptics differ from disinfectants? (Creative)
5. What are food preservatives? (283)
6. What are drugs? How are they classified? (273)
7. How the tranquilizers work in body? (Creative)
8. Write the structural formula of aspirin (Creative)
9. Which sweetening agent are used to prepare sweets for a diabetic patient? (283)
10. What are narcotic and non narcotic drugs? Give examples (278)
11. What are anti fertility drugs? Give examples (Creative)
12. Write a note on co polymer (291)
13. What are bio degradable polymers? Give examples (293)
14. How is terylene prepared? (289)
15. Write a note on vulcanization rubber (292)
16. Classify the following as linear, branched or cross linked polymers
  - a) Bakelite
  - b) Nylon
  - c) polythene (Creative)

**Answer the following questions in detail : ( 5 Marks)**

1. Explain the mechanism of cleansing action of soaps and detergents (284)

### **ADDITIONAL QUESTIONS:**

**Answer the following questions briefly: ( 2 or 3 Marks)**

1. What are tranquilizers? (277)

2. Note on Analgesics (278)
3. Anesthetics (279)
4. Antacids (279)
5. Antioxidants (283)
6. Antiseptic (282)
7. What is TFM? (284)
8. How will you prepare Teflon? (288)
9. How will you prepare nylon 6, nylon 6,6 ? (289)
10. Mention the preparation of Bakelite (290)
11. How does Melamine undergo condensation polymerization? (291)
12. Mention the preparation of Neoprene (292)
13. How will you prepare Buna -N , Buna-S rubber? (292)
14. What is vulcanization? (292)

**Answer the following questions in detail : ( 5 Marks)**

1. Explain enzyme as drug targets (275)
2. Explain receptor as drug targets (276)

----ALL THE BEST----



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**Note:**

- ✓ I hope this material will be useful for practice the evaluation and additional questions with the help of teachers.
- ✓ It will be better to give importance to the evaluation part questions then can study additional questions.
- ✓ The question setter only can decide as 2, 3 marks or mixed together as 5 marks. The above mentioned questions are some suggestions
- ✓ But the Annual exam questions will be based on creative and higher order thinking (HOT) manner not as direct questions
- ✓ If any mistakes or your suggestions, please send your valuable thoughts to that email to help the students

**DEDICATED TO : ALL THE TEACHERS AND STUDENTS**

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**“ALL THE BEST”**