

**CHEMISTRY**  
**QUESTION BANK**  
**2012-2013**

**INORGANIC CHEMISTRY**

**5. f-BLOCK ELEMENTS:**

**5 mark questions (Q.No 54)**

1. Describe the extraction of lanthanides from monozite sand (Oct 06,10, June07,Mar10)
2. What is lanthanide contraction? Discuss its causes and consequences.(June06,07,Mar 07,12, Oct 07)
3. Difference between lanthanides and actinides (Mar 06,11,Jun08)
4. Write down the uses of lanthanides and actinides.

**6. COORDINATION COMPOUNDS AND BIOCOORDINATION COMPOUNDS**

**5 mark questions: (Q.No 55,65a)**

1. Explain Werner's theory of coordination compounds (Mar06,June06,07,08, Oct07,09)
2. Explain the postulates of VB theory.
3. How to differentiate  $[\text{FeF}_6]^{4-}$  from  $[\text{Fe}(\text{CN})_6]^{4-}$  (Mar09,11)
4.  $[\text{Ni}(\text{CN})_4]^{2-}$  is diamagnetic and  $[\text{Ni}(\text{NH}_3)_4]^{2+}$  is paramagnetic, why?
5. For the complexes  $\text{K}_4[\text{Fe}(\text{CN})_6]$ ,  $[\text{Cu}(\text{NH}_3)_4]\text{SO}_4$  Mention the following (March 07, 11)
  - a. IUPAC Name
  - b. Central metal ion
  - c. Ligand
  - d. Coordination number
  - e. Geometry
6. Explain the types of structural isomerism. (March 08, 10, 12, Oct 10)
7. What is ligand? Explain its types.
8. What are chelates? Give example.
9. How chlorophyll is important in environmental chemistry. Mention its function.
10. Mention the function of hemoglobin in natural process.

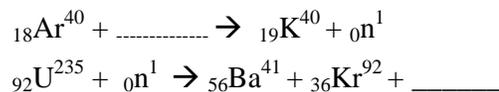
**7. NUCLEAR CHEMISTRY**

**3 mark questions (Q.No 37)**

1. What is half life period?
2. What is Q-value of a nuclear reaction?
3. Write difference between chemical reaction and nuclear reaction?
4. Explain the principle behind the Hydrogen bomb?
5. What is radiocarbon dating?
6.  ${}_{92}\text{U}^{238}$  undergoes a series of changes by emitting  $\alpha$  and  $\beta$  particles and finally  ${}_{82}\text{Pb}^{206}$  is formed. Calculate the number of  $\alpha$  and  $\beta$  particles emitted during the change.

7. What is nuclear fusion?

8. complete the following:



9. What is nuclear fusion?

10. What is spallation reaction?

11. State mass defect.

12. The half life period of  ${}_{79}\text{Au}^{198}$  is 150 days. Calculate its average life period.

13. The half life period of  $\text{Ag}^{108}$  is 2.31 minutes. Calculate its disintegration constant.

14. Half life period of a radio active element is 100 s. calculate the disintegration constant.

### 5 mark questions Q.no 65 B.

1. Explain the radio carbon dating and its uses. (Jun 06, oct 06, 10, mar 08, 10)

2. Differentiate nuclear fission from nuclear fusion reactions. (jun 08, oct 09)

3. Write down the nuclear reaction takes place in sun (jun 07)

4. Write down the uses of radio active isotopes in medicinal field. (jun 09)

5. Explain nuclear fission reactions.

6. Explain the use of radio active isotopes with specified examples..

## PHYSICAL CHEMISTRY

### 8. SOLID STATE –II

#### 3 marks questions

1. State Bragg's law

2. What are super conductors?

3. What are the uses of super conductors?

4. What is a vitreous state?

5. How are glasses formed?

#### 5 mark questions:

1. What is Bragg's Equation? Give its significance.

2. Explain Schottky and Frenkel defects.

3. Explain Bragg's spectrometer method.

4. Write the properties of Ionic crystals.

5. How crystals are classified

6. Explain the imperfection in solids.

### 9. THERMODYNAMICS – II

### 3 mark questions

- 1 Give Kelvin statements of second law of thermodynamics
- 2 When did the entropy will increase while the chemical reaction takes place?
- 3 What is entropy? What are the units of entropy?
- 4 Mention the essential condition for spontaneity in a chemical reaction.
- 5 What is meant by Gibb's free energy?
- 6 State: Troutons law.
- 7 What is the compound that does not obey the Troutons rule?

### 5 mark questions:

- 1 State the various statement of second law of thermodynamics.
- 2 What is meant by spontaneous process? What are the conditions for the spontaneity of a process?
- 3 What are characteristics of Gibbs free energy (G and  $\Delta G$ )?
- 4 What are the characteristics of entropy?
- 5 How  $\Delta G$  is related to  $\Delta H$  and  $\Delta S$ ? What is the meaning of  $\Delta G = 0$ ?

## 10. CHEMICAL EQUILIBRIUM-II

### 3 mark questions

1. What is equilibrium constant?
2. Why do equilibrium reactions referred to as dynamic equilibrium.
3. State Le chatelier's principle.
4. Calculate  $\Delta n_g$  for the following reactions
$$\text{H}_{2(g)} + \text{I}_2 <-----> 2\text{HI}_{(g)}$$
$$2\text{H}_2\text{O}_{(g)} + 2\text{Cl}_{2(g)} <-----> 4\text{HCl}_{(g)} + \text{O}_{2(g)}$$
$$3\text{H}_{2(g)} + \text{N}_{2(g)} <-----> 2\text{NH}_3$$
5. Dissociation of  $\text{PCl}_5$  decreases in presence of increase in  $\text{Cl}_2$ . why?

### 5 mark questions:

1. Derive the relation between  $K_p = K_c$ .
2. How the Le Chatelier principle used in Haber and contact process.
3. Derive the expression for  $K_p$  &  $K_C$  for decomposition of  $\text{PCl}_5$ .
4. Derive the value for  $K_p$  &  $K_c$  for the formation of HI.

## ORGANIC CHEMISTRY

### 15. ISOMERISM IN ORGANIC COMPOUNDS

1. Differentiate between diastereomer and Enantiomer.
2. Differentiate mesoform from racemic mixture.
3. What are the conditions for optical activity?

- Mesotartaric acid is an optical inactive. Why?
- What is a racemic mixture? Explain with suitable example.

### 17. ETHERS

- Give any 3 methods of preparing diethylethers?
- How does diethylether react with the following reagent?  
a)  $O_2$  b) excess of HI c)  $PCl_5$  d)  $dil.H_2SO_4$
- Differentiate Aromatic and Aliphatic ethers.
- Write the all possible isomers with the molecular formula  $C_4H_{10}O$  and name them.
- How to prepare anisole or aromatic ether.
- What happens when anisole is reacted with HI? Give its uses.

### 22. CHEMISTRY IN ACTION

- What is meant by Anaesthetics? Give example.
- What are the types of Anaesthetics?
- What is Analgesics? Give examples
- Give the significance of Antipyretics
- What is Antiseptic? Give examples
- What are Antimalarial drugs? Give examples
- What are antibiotics?
- What is the importance of antacids?
- What is Antipasmodics?
- Write the characteristics of Dyes?
- What is Chromophores? Give two examples
- What is meant by chromogen & auxochromes? Give example.
- What are food preservatives? Give examples.
- What is an Artificial sweetening agent?
- What are antioxidants?
- What are the characteristics of Rocket propellants?
- What is Buna -N, Buna -S and nylon 66? Give its uses.

### EXTRA QUESTION IN ORGANIC CHEMISTRY

- Explain the test for following compounds.
  - Phenol
  - Aldehyde
  - Carboxylic acid
  - Salicylic acid
- What are the uses of following compounds.

- a. Benzoic acid
- b. Oxalic acid
- c. Benzyl alcohol
- d. Formalin
- e. Salicylic acid
- f. Formic acid
- g. Lactic acid
- h. Formaldehyde + ammonia ----- > Hexamethylene tetramine

## **PART –II FOR EXTRA MARKS**

### **1. ATOMIC STRUCTURE –II**

#### **3 mark questions (Q.No: 31)**

1. Write the difference between particle and wave. **(June 06,)**
2. State Heisenberg's uncertainty principle. **(March 06, 08, 11 Oct 07, 09)**
3. What is the significance of negative electronic energy? **(June 08, 09, 10, march 12,)**
4. Define orbital.
5. What are molecular orbitals.
6. What is bond order? **(july 07, mar 10)**
7. Why He<sub>2</sub> is not formed.
8. Define hybridization. **(Mar 09)**
9. What are the conditions for formation of H<sub>2</sub> Bond.
10. What are the importances of H<sub>2</sub> bond?
11. How the H<sub>2</sub> bonds are formed.

#### **Other questions:**

1. What do you understand by the dual character of matter?
2. What is Bohr's quantum condition?
3. Write the experiments for the conformation of particle character of electron.

#### **5 mark questions (Q.No: 52)**

1. Explain the formation of N<sub>2</sub> molecule by molecular orbital theory. **(june 09, oct 08, 10).**
2. Derive De Broglie's equation. What is its significance? **(oct 06, june – 07, march 11)**
3. Discuss the Davisson and Germer experiment. **(Mar 07)**
4. Explain the types of hydrogen bonds. Give examples.
5. Explain the principle of molecular orbital. **(March -08)**
6. Explain the formation of O<sub>2</sub> molecule by molecular orbital theory. **(june 06,07, oct 07, mar 06,10)**

### 3. p - BLOCK ELEMENTS (Q.No: 64 B)

1. How fluorine is separated by Dennis method? (Mar 09, Oct 10)
2. Explain the anomalous nature of fluorine.
3. What are the uses of silicones? (Mar 08, 10, Oct 08)
4. Explain the separation of noble gases by Ramsay Raleigh's method. (Mar 08, 11, Oct 09)
5. Explain the separation of noble gases by Dewar's method. (Mar 07, 09, 11)

### PROBLEMS

#### 4. d- BLOCK ELEMENTS (Q.No: 70 B)

Metals	Group No	Period No	Colour
Chromium (Cr)	6	4	Silvery white
Copper (Cu)	11	4	Reddish brown
Zinc (Zn)	12	4	Bluish white
Silver (Ag)	11	5	White lustrous metal
Gold (Au)	11	6	Lustrous yellow metal

#### Metallic compound:

$\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  - Blue vitriol  
 $\text{ZnO}$  - Philosopher's wool  
 $\text{AgNO}_3$  - Lunar caustic  
 $\text{ZnCO}_3$  - calamine

1. A sulphate compound of group 11. This compound is also called as Blue vitriol. The compound undergoes decomposition at various temperatures



Identify the compounds A, B, C, D.

(June 09)

2. A reddish brown metal **A** belongs to 11<sup>th</sup> group and period number is 4. An element **A** heated below 1370K to give black colored compound **B**. the compound **B** which is heated above 1370 K to give red colored compound **C**. Element **A** reacts with Conc. $\text{HNO}_3$  to give compound **D** with the liberation of  $\text{NO}_2$  gas. Identify **A, B, C, D**. Write the reactions.

3. When silver is treated with Dil. $\text{HNO}_3$  to give compound **A**. Then the compound **A** is heated at 723 K to give compound **B**. on further heating of compound **B** to give compound **C**. Compound **A** is treated with  $\text{KBr}$  to give compound **D**, which is used in photography. Identify **A, B, C, D**. Write the reactions. (March 09, June 06)

4. A bluish white metal is treated with Dil.HNO<sub>3</sub> to give Zinc nitrate and H<sub>2</sub>O with compound **A**. Then the same metal is treated with very Dil.HNO<sub>3</sub> to give Zinc nitrate, Water and compound **B**. The metal is heated in the presence of air to give compound **C**. Identify **A, B, C**. Write the reactions. (October 09)

5. A reddish brown Metal **A** belongs to 11<sup>th</sup> group and period number is 4. Metal **A** is extracted from its sulphide ore of **B**. Element **A** is treated with Dil.H<sub>2</sub>SO<sub>4</sub> in presence of air to give compound **C**. Element **A** react with Conc.HNO<sub>3</sub> to give compound **D**. Identify **A, B, C, D**. Write the reactions. (June 2010)

### 11. CHEMICAL KINETICS – II (Q.No: 41, 42)

#### 3 mark questions

1. Define order of the reaction. (Mar 09, Oct 10)
2. Define: Half life
3. What is the activation energy? (Mar 08, 10, Oct 10)
4. Define pseudo first order reaction and give examples. (Mar 08, 11, Oct 09)
5. Write the Arrhenius equation and explain the terms. (Mar07, 09, 11)
6. Difference between the simple and complex reaction. (Oct 08)
7. What is Consecutive reaction? Give examples (Mar 12, Oct 09)
8. What is parallel reaction? Give examples (Mar 07, 10)
9. What is opposing reaction? Give examples (Mar 06)
10. Derive the relationship between Half life period and rate constant for a first order reaction. (Mar 12)
11. If the Half life period of the first order reaction is 20 minutes means calculate the rate constant. (Mar 06)
12. The rate constant of first order reaction is  $1.54 \times 10^{-3} \text{ sec}^{-1}$ . calculate the half life period. (Oct 10)

#### 5 mark questions

- 1 State the characteristics of the order of the reaction (Mar 06, 10, 11, Oct 08)
- 2 Derive the rate equation for the first order reaction. (June 09)
- 3 State the characteristics of the first order of the reaction. (Oct 06)
- 4 Difference between the simple and complex reaction. (Oct 08)
- 5 Explain the experimental determination of rate constant of acid hydrolysis of Methyl-acetate. (Mar 07)
- 6 Write short notes on:
  1. Consecutive reaction,
  2. Parallel reaction,
  3. Opposing reaction (March, June 08)
- 7 Show that for the first order reaction the time required for 99.9% completion is about 10 times its half life period.
- 8 Compound A undergoes first order reaction at 25<sup>o</sup>C and its rate constant is **zero**. Calculate the half life period at 45 sec<sup>-1</sup>. Calculate the time required for the unreacted 12.5% compound A. (March 09)
- 9 A first order reaction completes 75% of the reaction in 100 minutes. What are the rate constant and half life values of the reaction? (Oct 09)
- 10 Explain the experimental determination of rate constant for decomposition of H<sub>2</sub>O<sub>2</sub> in aqueous solution.

## 12. SURFACE CHEMISTRY (Q.No: 43)

### **3 mark question:**

- 1 What is Brownian movement? Give reason. (Mar 12)
- 2 What is Tyndall effect? (Oct 12)
- 3 What are promoters? Give example. (Mar 10)
- 4 What are characteristics of catalysts?
- 5 What is electrophoresis? (March 06)
- 6 What is autocatalyst? Give examples. (Oct 07)
- 7 What is heterogenous catalysis? Give examples. (March 08)
- 8 What is electro dialysis? (Oct 08)
- 9 What is peptisation? (March 09)
- 10 What is tanning?
- 11 Differentiate physical adsorption and chemical adsorption. (Oct 09)
- 12 Why colloidal solution of gas in gas is not possible? (Mar 07)
- 13 What are the applications of colloids in medicinal field?
- 14 What is emulsion? (June 06)
- 15 What is a catalytic poison? Give example (Jun 07)

### **5 mark question: (Q.No: 66 B)**

- 1 State the general characteristics of catalysts.
- 2 Explain the intermediate compound formation theory for homogenous catalysis.
- 3 Explain the adsorption theory for heterogeneous catalysis.
- 4 Explain:
  - i. Mechanical dispersion
  - ii. Electro dispersion
- 5 Write briefly about preparation of colloids by condensation methods.
- 6 Explain the dialysis method? (Mar 11)
- 7 Explain ultrafiltration.
- 8 Explain electrophoresis.
- 9 Briefly explain electroosmosis
- 10 Explain:
  - i. Auto catalyst
  - ii. promoters
- 11 Differentiate physical adsorption and chemical adsorption.

## 13. ELECTRO CHEMISTRY- I

**3 mark question: (Q.No: 47)**

1. What is common ion effect? (June 07, Oct 07, Mar 08, 10, 11)
2. State Oswald law. (Mar 09)
3. Define: molar conductance. (Mar 09)
4. Define: equal conductance. (June 08)
5. What is electrochemical equivalent? (June 09)
6. Define: Buffer solution and its types and give example (June 10, 11, Oct 10)
7. Define :p<sup>H</sup>
8. Define: Ionic product of the water
9. Define Kohlraush's law (Oct 08, 08)
10. Why the phenolphthalein is not used in the titration of strong acid Vs weak base?
11. 10 Amp current is passed through the solution for 1 sec. Calculate the electro chemical equivalent if 150 g of compound is precipitated.
12. Calculate the pH of 0.001M HCl.

**5 mark question (Q.No: 67 A)**

1. State Oswald dilution law. (Mar 09, Oct 08)
2. State the Handerson equation. (June 07, Mar 11)
3. Write notes on quinononide theory of indicators (Oct 07, 10, Mar 09, June 09)
4. State and explain the Kohlraush's law and give its uses.
5. Give the statement of Arrhenius theory.
6. Explain the buffer action with suitable examples.
7. Difference between the electronic and Electrolytic conductors. (June 11)

**13. ELECTROCHEMISTRY- I**

**Compulsory problems**

1. Calculate the pH for the following buffer: 0.04M NH<sub>4</sub>Cl and 0.02 M NH<sub>4</sub>OH.. K<sub>b</sub> value of NH<sub>4</sub>OH is 1.8X10<sup>-5</sup>. (Mar 07).
2. Calculate the pH for the following buffer: 0.02 Mol/lit CH<sub>3</sub>COONa and 0.15 Mol/lit CH<sub>3</sub>COOH. K<sub>a</sub> value of CH<sub>3</sub>COOH is 1.8X10<sup>-5</sup>. (oct - 07)
3. If the electric current is passed through three cells in series containing respective solutions are copper sulphate, silver nitrate and potassium nitrate. Calculate the weight of silver and iodine will be liberated while 1.25g of copper is deposited. (Mar 08).
4. When the potassium iodide is liberated to 10 g of Iodine in one hour. Calculate the electric current.
5. 0.1978 g of copper is deposited in the 0.2 A electric current in 50 mins. Calculate the electrochemical equivalent. (march -09)
6. Calculate the pH of 0.1 M Acetic acid.

- Ionic conductance at infinite dilution of  $\text{Al}^{3+}$  and  $\text{SO}_4^{2-}$  are  $189 \text{ ohm}^{-1} \text{cm}^2 \text{gm.equiv.}^{-1}$  and  $160 \text{ ohm}^{-1} \text{gm.equiv.}^{-1}$ . Calculate equivalent and molar conductance of the electrolyte at infinite dilution. (mar - 10)
- The equivalent conductance at infinite dilution of HCl,  $\text{CH}_3\text{COONa}$  and NaCl are 426.16, 91.0 and 126.45  $\text{ohm}^{-1} \text{cm}^2 \text{gm.equiv.}^{-1}$  respectively. Calculate the  $\lambda_\alpha$  of acetic acid.

#### 14. ELECTRO CHEMISTRY- II (Q.No: 67 B)

##### 5 mark questions

- What are the IUPAC conventions for the representation of a cell. (Mar 07 , 09, 10, 11, oct 11)
- Write the Nernst equation for reversible cell. (Jun 08, 10, 11, Oct 08, 10, Mar 09.)
- Briefly explain Daniel cell. (Jun 07, Oct 09)
- How to determine emf of a half cell. (Mar 08, Jun 08)
- Explain the function of standard hydrogen electrode. (Oct 09)
- Derive the relationship between free energy and emf. (Oct 07, Jun 09)
- explain the important terms in the cell. (Jun 09, Mar 12)

#### PART -III

#### Section - B

##### PROBLEMS

- Calculate the emf of the following cell. (Mar 2011)  
 $\text{Zn}/\text{Zn}^{2+} = (0.001 \text{ M}) // \text{Ag}^+ 0.1 \text{ M}/\text{Ag}$   
 $E^0 \text{Ag}/\text{Ag}^+ = +0.80 \text{v}, E^0 \text{Zn}/\text{Zn}^{2+} = -0.76 \text{v}$
- Calculate the e.m.f of the Zn-Ag cell at  $25^\circ\text{C}$ . (Oct 2008)
- The emf of the half cell  $\text{Cu}^{2+} \text{ ag/cs (s)}$  which contains 0.01 M  $\text{Cu}^{2+}$  and 0.301 V. Calculate its Standard e.m.f (June 2010)
- Determine the standard emf of the cell and standard free energy change of the cell reaction. (Mar 2008)



\*\*\*\*\*All the best \*\*\*\*\*

JAIRAM COLLEGE