

## CHAPTERWISE QUESTIONS

SUBJECT- ENGINEERING CHEMISTRY

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### CH-01: ATOMIC STRUCTURE

#### SHORT TYPE QUESTIONS :

1. What are fundamental sub-atomic particle?
2. Write any two drawbacks of Rutherford's atomic model.
3. What are the results of Rutherford's gold foil experiment?
4. What do you mean by quantization of energy?
5. What do you mean by the stationary states of atoms?
6. How electronic transition occurs according to Bohr's atomic model?
7. What is the origin of spectral lines according to Bohr's atomic model?
8. Which circular orbits are allowed for the electrons to revolve?
9. Arrange the following in the increasing order of their energy content: 4f, 5p, 6s, 4p, 3d.
10. Write down the electronic configurations of Cr and Cu.
11. Write down the electronic configurations of  $\text{Ca}^{2+}$  and  $\text{O}^{2-}$ .
12. Write down the electronic configurations of  $\text{Mg}^{2+}$  and  $\text{N}^{3-}$ .
13. Write down the electronic configurations of  $\text{Mn}^{2+}$  and Cu.
14. Write down the electronic configurations of  $\text{Cr}^{3+}$  and  $\text{Fe}^{2+}$  ions.
15. Define mass number. How many protons, electrons and neutrons are present in an ion of  $\text{N}^{3-}$ ?
16. Define isotope with suitable example.
17. Define isotope. What are the isotopes of chlorine?
18. Define isobar with a suitable example.
19. Define isotone with a suitable example.

#### LONG TYPE QUESTIONS :

1. Explain the Discovery of atomic nuclei.
2. Explain Rutherford's atomic model.
3. Explain the failures of Rutherford's atomic model.
4. Write down the postulates of Bohr-Bury Scheme.
5. Define and explain Aufbau principle. Write down the electronic configuration of manganese.
6. How did Bohr overcome Rutherford's atomic model?
7. Define and explain Hund's rule of maximum multiplicity.
8. Explain electronic transition according to Bohr's atomic theory.
9. Explain the origin of atomic spectral lines.

### CH-02: CHEMICAL BONDING

#### SHORT TYPE QUESTIONS :

1. Define chemical bonding.
2. Define electrovalent bonding.
3. Define covalent bonding.

4. Define co-ordinate bonding.
5. Mention the conditions for formation of co-ordinate bonding.
6. Define ionization potential. What should be the value of it for the metals to form ionic bond?
7. Define electron affinity. What should be the value of it for the metals to form ionic bond?
8. Which types of chemical bondings exist in  $\text{MgCl}_2$  and  $\text{NH}_3$ ?
9. Which types of chemical bondings exist in  $\text{MgCl}_2$  and  $\text{H}_2\text{O}$ ?

### LONG TYPE QUESTIONS :

1. Define and explain electrovalent bonding with a suitable example.
2. Define and explain covalent bonding with a suitable example.
3. Define and explain co-ordinate bonding with a suitable example.
4. Explain the formation of  $\text{NH}_3$  and  $\text{NH}_4^+$ .
5. Explain the conditions of formation of electrovalent bond.
6. Explain the conditions of formation of co-ordinate bond.
7. Define covalent bond. Explain the formation of  $\text{CH}_4$  molecule.
8. Define covalent bond. Explain the formation of  $\text{H}_2\text{O}$  molecule.
9. Define covalent bond. Explain the formation of  $\text{O}_2$  molecule.
10. Define covalent bond. Explain the formation of  $\text{N}_2$  molecule.
11. Define covalent bond. Explain the formation of  $\text{NH}_3$  molecule.
12. Define electrovalent bonding. Explain the formation of  $\text{MgCl}_2$  molecule.
13. Define and explain co-ordinate bonding and explain the formation of  $\text{NH}_4^+$  ion.
14. Define and explain co-ordinate bonding and explain the formation of  $\text{SO}_2$  molecule.
15. Write down at least ten properties of ionic compounds.

## CH-03: ACID-BASE THEORIES

### SHORT TYPE QUESTIONS :

1. Define Arrhenius theory of acids and bases.
2. Define Bronsted-Lowery theory of acids and bases.
3. Define Lewis theory of acids and bases.
4. Justify that all Arrhenius acids are Bronsted-Lowery acids.
5. Explain how  $\text{BF}_3$  is a Lewis acid.
6. Explain how  $\text{SiCl}_4$  is a Lewis acid.
7. Explain how  $\text{BF}_3$  is a Lewis acid.
8. Explain how  $\text{AlCl}_3$  is a Lewis acid.
9. Explain how  $\text{SO}_2$  is a Lewis acid.
10. Explain how  $\text{NH}_3$  is both a Bronsted-Lowery base and a Lewis base.
11. Write down the conjugate acids and conjugate bases of  $\text{H}_2\text{O}$  &  $\text{NH}_3$ .
12. What do you mean by conjugate acid-base pair? Explain with a suitable example.
13.  $\text{CH}_3\text{COOH}$  is a weak acid while  $\text{CH}_3\text{COO}^-$  is a strong base. Explain.
14. What is neutralization reaction? Give an example of it.
15. Define salt. How does an acidic salt form?
16. Define salt. How does a basic salt form?
17. What is double salt? Give an example.
18. What is co-ordination salt? Give an example.
19. What is mixed salt? Give an example.
20. Explain how bleaching powder is a mixed salt.

21. Explain how potash alum is a double salt.

### LONG TYPE QUESTIONS :

1. Define and explain Arrhenius theory of acids and bases.
2. Define and explain Bronsted-Lowery theory of acids and bases.
3. Define and explain Lewis theory of acids and bases.
4. Explain the limitations of Arrhenius theory.
5. Explain the limitations of Bronsted-Lowery theory.
6. Explain the limitations of Lewis theory.
7. Justify that all Arrhenius acids are Bronsted-Lowery acids, but all Arrhenius bases are not Bronsted – Lowery bases.
8. Explain how  $\text{SiCl}_4$  and  $\text{BF}_3$  are acids.
9. Explain why  $\text{SiCl}_4$  is an acid but  $\text{CCl}_4$  is not.
10. Define and explain conjugate acid-base pair with a suitable example.
11. Justify your answer that  $\text{H}_2\text{O}$  is amphoteric.

## CH-04: SOLUTIONS

### SHORT TYPE QUESTIONS :

1. Find out the  $p^H$  values of the following solutions.
  - i. 0.01M HCl solution
  - ii. 0.001 M  $\text{HNO}_3$  solution
  - iii. 0.01M NaOH solution
  - iv. 0.01M  $\text{H}_2\text{SO}_4$  solution
2. Define atomic weight.
3. Define molecular weight. What is the molecular weight of sulphuric acid?
4. Define equivalent weight. What is the equivalent weight of  $\text{H}_3\text{PO}_4$ ?
5. Find the molecular weights of  $\text{Al}_2(\text{SO}_4)_3$  and  $\text{CuCO}_3$ .
6. Find the equivalent weights of  $\text{H}_3\text{PO}_4$  and  $\text{H}_3\text{PO}_3$ .
7. Find the equivalent weights of  $\text{Ca}(\text{HCO}_3)_2$  and  $\text{H}_3\text{BO}_3$ .
8. Find the equivalent weights of acetic acid and calcium hydroxide.
9. Derive a relationship between atomic weight, equivalent weight and valency.
10. Define variable equivalent weights. Give suitable examples.
11. Why do the equivalent weights of FeO and  $\text{Fe}_2\text{O}_3$  vary?
12. Find the equivalent weights of  $\text{Ca}(\text{OH})_2$  and  $\text{CH}_3\text{COOH}$ .
13. Define molarity. Mention its unit.
14. How many grams of NaCl are required to prepare 2 liters of its solution having molarity 1M?
15. Define normality.
16. 4 grams of NaOH are present 2 lit of its solution. Find its normality.
17. Define molality.
18. 5.6 gram of KOH are present in 200 grams of water. Find molality of the solution.
19. Find the equivalent weights of calcium chloride and nitric acid.
20. 8 grams of NaOH are present in 108 gram of its solution. Find molality of the solution.
21. Define normality. Mention its unit.
22. What do you mean by decimolar solution?

23. How many gms of  $\text{Na}_2\text{CO}_3$  are required to prepare one litre of its decimolar solution?

### LONG TYPE QUESTIONS :

1. Write down the importance of  $\text{p}^{\text{H}}$  in industries.
2. Define molarity. Convert  $10^{-2} \text{ N H}_2\text{SO}_4$  in to molarity.
3. Define normality. 4 grams of NaOH are present 2 lit of its solution. Find its normality.
4. Obtain a relationship between molarity and normality.
  - i. Convert 0.01 M  $\text{H}_2\text{SO}_4$  in to normality.
  - ii. Convert  $10^{-2} \text{ N H}_2\text{SO}_4$  in to molarity.

## CH-5: ELECTROCHEMISTRY

### SHORT TYPE QUESTIONS :

1. Define electrolyte. Give an example of it.
2. Define strong and weak electrolytes with examples.
3. What are non-electrolytes? Give examples.
4. Define electrolysis. Which gas is evolved at the cathode during electrolysis of acidulated water?
5. Define Faraday's 1<sup>st</sup> law of electrolysis.
6. Define Faraday's 2<sup>nd</sup> law of electrolysis.
7. Define electrochemical equivalent. Mention its unit.
8. Find the electrochemical equivalent of calcium.
9. Find the electrochemical equivalent of aluminium.
10. How many coulombs of charge are required to get 10 grams of calcium from molten calcium chloride?
11. Define electroplating.
12. What is Galvanisation?
13. What is the relationship between the masses of the substances and their equivalent weights, when the same quantity of electricity is passed through different electrolytes?
14. What is the difference between electrolytes and non-electrolytes?

### LONG TYPE QUESTIONS :

1. Define electrolyte and electrolysis. What are strong and weak electrolytes? Give examples.
2. Define electrolysis. Explain the process of electrolysis of molten NaCl.
3. Define Faraday's 1<sup>st</sup> law of electrolysis. How many grams of calcium will be deposited at the cathode by passing 15 ampere of currents through molten  $\text{CaCl}_2$  for 30 minutes?
4. Define electrochemical equivalent. Find the ECE of Ca and Al.
5. Define and explain Faraday's 2<sup>nd</sup> law of electrolysis.
6. Explain the process of applying a coating of zinc over an iron article by the process of electrolysis.
7. Explain the electro refining process of a crude copper bar.
8. Define and explain electrometallurgy.
9. Explain the electrolysis of acidulated water.
10. Define and explain Galvanisation.
11. Define Faraday's 1<sup>st</sup> law of electrolysis. How many coulombs of charges are

required to get 36 grams of magnesium from molten magnesium chloride?

## **CH-06: CORROSION**

### **SHORT TYPE QUESTIONS :**

1. What do you mean by corrosion?
2. What is atmospheric corrosion?
3. What is water-line corrosion?
4. How is corrosion prevented by the alloy durriron?

### **LONG TYPE QUESTIONS :**

1. Define and explain atmospheric corrosion.
2. Define corrosion. Explain waterline corrosion.
3. Explain the alloying process of protection of corrosion.

## **CH-07: METALLURGY**

### **SHORT TYPE QUESTIONS :**

1. What do you mean by gangue?
2. Mention the basic steps involved in the metallurgical operation.
3. What do you mean by concentration of ore?
4. What happens during oxidation step of metallurgical operation?
5. What happens during reduction step of metallurgical operation?
6. Why only sulphide ores are concentrated by froth floatation method?
7. Which types of ores are concentrated by magnetic separation?
8. Which types of ores are concentrated by gravity separation method?
9. What is leaching?
10. What is the purpose of adding charcoal or coke during smelting?
11. What do you mean by smelting?
12. Define calcinations and roasting.
13. What is slag?
14. What is the principle of distillation method of refining of crude metals?
15. What is electrometallurgy?
16. What is the purpose of addition of flux during smelting?

### **LONG TYPE QUESTIONS :**

1. Explain the gravity separation method of concentration of ores.
2. Explain the froth floatation method of concentration of ores.
3. Explain the magnetic separation method of concentration of ores.
4. Explain the gravity leaching process of concentration of ores.
5. Define calcinations. Write down its functions.
6. Define roasting. Write down its function.
7. Define and explain smelting.

## **CH-09: ALLOYS**

### **SHORT TYPE QUESTIONS :**

1. What is alloy? Give an example of non-ferrous alloy.

2. What is amalgam? How is it formed?
3. What is the composition and uses of Brass?
4. What is the composition and uses of Bronze?

### LONG TYPE QUESTIONS :

1. Define alloy. Write down the composition and uses of Brass and Bronze.
2. Define alloy. Classify alloys into different types with examples.
3. Define alloy. What do you mean by amalgam? Write the important uses of amalgams.

## CH-09: HYDROCARBONS

### SHORT TYPE QUESTIONS :

1. To which class of compound  $C_4H_{10}$  belongs and how?
2. To which class of compound  $C_5H_{10}$  belongs and how?
3. To which class of compound  $C_6H_{10}$  belongs and how?
4. What are saturated hydrocarbons?
5. What are unsaturated hydrocarbons?
6. How  $C_4H_8$  is unsaturated?
7. What are aliphatic hydrocarbons? Give any two examples of it.
8. What is the IUPAC name of isopropyl alcohol?
9. What is the IUPAC name of tertiary butyl alcohol?
10. What is the IUPAC name of isobutyl chloride?
11. Give the structural formula of 4-Chloro-5-methylpent-2-en-2-ol.
12. Define Huckel's rule for aromaticity.
13. How benzene is aromatic?
14. What is tertiary alkyl halide? Give an example of it.

### LONG TYPE QUESTIONS :

1. What are saturated and unsaturated hydrocarbons? Is benzene saturated? Justify your answer.
2. Define and explain Huckel's rule of aromaticity with suitable examples.
3. What are aliphatic hydrocarbons? How can you classify them?
4. Define with example: Prefix, word root, primary suffix and secondary suffix.
5. What are the conditions of aromaticity?
6. Mention any two uses of benzene and toluene.
7. Mention any two uses of toluene and phenol
8. Mention any two uses of toluene naphthalene.
9. Mention any two uses of benzene and Anthracene
10. Mention any two uses of benzene and BHC.

## CH-10: WATER TREATMENT

### SHORT TYPE QUESTIONS :

1. Define soft water and hard water.
2. What is hardness of water?
3. Why hard water does not produce lather with soap solution?
4. What do you mean by temporary and permanent hardness?

5. How temporary hardness can be removed?
6. What is the principle of Lime soda process?
7. What are the advantages of Hot Lime-Soda process?
8. What are the advantages of Ion-exchange process?

### **LONG TYPE QUESTIONS :**

1. Explain the softening of water by Lime-Soda process.
2. How hard water can be softened by Ion-exchange process?
3. Write the difference between cold lime-soda process and hot lime-soda process

## **CH-11: LUBRICANTS**

### **SHORT TYPE QUESTIONS :**

1. Define lubricant. Give an example of a semi-solid lubricant.
2. Give example of solid lubricants.
3. Write the uses of graphite. 3. What are liquid lubricants?

### **LONG TYPE QUESTIONS :**

1. What is a lubricant? Write the major functions of lubricants.
2. Define lubricant. Write the classification of lubricants with examples.

## **CH-12: FUEL**

### **SHORT TYPE QUESTIONS :**

1. Define fuel. Write the characteristics of a good fuel in terms of calorific value and moisture.
2. What is calorific value of fuel? Write its unit.
3. What is CNG?
4. Write the composition of coal gas.
5. Write the composition of producer gas.
6. What are derived fuels? Give two examples.

### **LONG TYPE QUESTIONS :**

1. Define fuel. What are the characteristics of a good fuel?
2. Write the composition and uses of water gas and producer gas.
3. Write short notes on LPG and CNG.

## **CH-13: POLYMERS**

### **SHORT TYPE QUESTIONS :**

1. Define monomer and polymer with example.
2. Define homo-polymer and co-polymer.
3. What is degree of polymerization?
4. Name the monomer of PVC. Write its two important applications.
5. Name the monomers of Bakelite. Write its two uses.
6. What is natural rubber?

7. Write two advantages of vulcanization.

### **LONG TYPE QUESTIONS :**

1. Explain the terms monomer, polymer, homo-polymer, co-polymer & degree of polymerization with examples.
2. What is a polymer? Write the composition and uses of Bakelite.
3. Define polymer? Write the composition and uses of PVC.
4. What is vulcanization of rubber. Write the advantages of vulcanization.
5. What are the differences between thermoplastic and thermosetting polymers?

## **CH-14: CHEMICALS IN AGRICULTURE**

### **SHORT TYPE QUESTIONS :**

1. What are insecticides? Give two examples.
2. What are fungicides? Write its uses.
3. What are herbicides? Write its uses.

### **LONG TYPE QUESTIONS**

1. Define pesticide. Classify pesticides into different types with examples.
2. Define insecticide, herbicide and fungicide with suitable examples.
3. What are bio-fertilizers? Mention its different types with examples.