

**DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/  
COMMERCIAL PRACTICE, NOVEMBER - 2024**

**ENGINEERING CHEMISTRY - I**

[Maximum marks: 100]

[Time: 3 Hours]

**PART – A**

**Maximum marks: 10**

**I.** (Answer *all* the questions in one or two sentences. Each question carries **2** marks)

1. Define a proton. What is its absolute charge?
2. What are the disadvantages of sterilization by bleaching powder?
3. Define the term buffer capacity. Write its mathematical expression.
4. List any four characteristics of metals.
5. Define the term normality. Write its mathematical expression. (5 x 2 = 10)

**PART – B**

**Maximum marks: 30**

**II.** (Answer any *five* of the following questions. Each question carries **6** marks)

1. (a) Differentiate between atoms and molecules. (3)  
(b) Calculate the number of electrons and neutrons of the following elements.  
(i)  ${}_8\text{O}^{16}$  (ii) positively charged  ${}_{11}\text{Na}^{23}$  (iii) negatively charged  ${}_{17}\text{Cl}^{35}$  (3)
2. (a) What are the importance of pH value? (3)  
(b) Calculate the pH of the following solutions.  
(i) 0.01M HCl (ii) 0.002 M  $\text{H}_2\text{SO}_4$  (iii) 0.001 M  $\text{HNO}_3$  (3)
3. (a) Write any three differences between hard water and soft water. (3)  
(b) Write any three differences between temporary hardness and permanent hardness. (3)
4. (a) Give the composition of following alloys. (3)  
(i) Brass (ii) Bronze (iii) Duralumin (3)  
(b) What are the limitations of powder metallurgy? (3)
5. (a) Define nanochemistry and write any two examples of nanosized materials. (3)  
(b) Write any three applications of carbon nanotubes. (3)
6. (a) What you meant by pH range of an indicator? Explain with examples. (3)  
(b) Write a note on choice of indicators in acid-base titrations. (3)

7. (a) What is break point chlorination? Explain with a diagram. (3)  
(b) Write any three advantages of break point chlorination. (3)  
(5 x 6= 30)

**PART – C**

**Maximum marks: 60**

(Answer *one full* question from each unit. Each full question carries **15** marks)

**UNIT – I**

- III.** (a) Define carbon nanotubes. What are the different types of carbon nanotubes? (4)  
(b) What are the properties of carbon nanotubes? (5)  
(c) Explain different methods used for the synthesis of carbon nanotubes. (6)

**OR**

- IV.** (a) Explain two important features of catalysts with examples. (4)  
(b) What is homogeneous and heterogeneous examples? Write two examples each. (5)  
(c) Define the following terms with one example each.  
(i) positive catalyst (ii) catalytic promoter (iii) catalytic poison (6)

**UNIT - II**

- V.** (a) Define the term acid and base with three examples each. (4)  
(b) Define pH and pOH. Give its mathematical expressions. What is the relation between pH, pOH and pK<sub>w</sub>? (5)  
(c) Define the term molarity. Write its mathematical expression. Calculate the pH of a solution obtained by diluting 25 ml of 0.001 M HCl to 500 ml, assuming complete ionisation. (6)

**OR**

- VI.** (a) What is an acid base indicator. Write two examples. (4)  
(b) What is a buffer solution? Explain two types with examples. (5)  
(c) What is normality equation? 20 ml of KOH solution containing 5.6 g of KOH per litre of the solution is titrated against H<sub>2</sub>SO<sub>4</sub> solution. The volume of acid required is 18.8 ml. Calculate the normality and strength of the acid solution. (6)

### UNIT - III

- VII.** (a) Explain different disadvantages of hard water. (4)  
(b) What are the methods for the removal of temporary hardness? (5)  
(c) Explain the desalination of water by reverse osmosis. What are the disadvantages of reverse osmosis? (6)

**OR**

- VIII.** (a) What are the characteristics of potable water? (4)  
(b) Define the term sterilization of water and write different chemical changes involved in the sterilization of water by bleaching powder. (5)  
(c) Explain the various steps involved in the treatment process of making potable water. (6)

### UNIT – IV

- IX.** (a) Define alloys. Give any three purposes of making alloys. (4)  
(b) Explain preparation of alloys by fusion method with the help of a diagram. (5)  
(c) Distinguish between cast iron, wrought iron and steel. (6)

**OR**

- X.** (a) Define powder metallurgy. What are the advantages of powder metallurgy? (4)  
(b) Explain powder metallurgy with different steps involved. (5)  
(c) Explain the following heat treatment of steel. (6)  
(i) Tempering (ii) Quenching (iii) Nitriding

-----