

**DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/
COMMERCIAL PRACTICE, APRIL- 2023**

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 nanomaterial. Give two examples.
2. What is principle of volumetric analysis? Give its mathematical formula.
3. Differentiate between soft and hard water.
4. Write the composition of Brass and Solder.
5. What is meant by ionic product of water? What is its value at 25⁰C? (5 x 2 = 10)

PART – B

Maximum marks : 30

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

1. (a)What is meant by Carbon Nano Tubes? What are the different types of CNT (3)
(b)Calculate the number of neutrons, protons and electrons of the following elements.
(i) $^{31}_{15}\text{P}$ (ii) $^{35}_{17}\text{Cl}$ (iii) $^{28}_{14}\text{Si}$ (3)
2. (a)Give reasons for temporary hardness of water. Discuss with detailed chemical equation any one method for the removal of temporary hardness. (3)
(b)Soaps do not produce lather in hard water. Why? (3)
3. (a)Explain neutralisation reaction based on Arrhenius and Lewis acid theories. (3)
(b)Calculate the mass of K_2CO_3 required in preparing 250ml of 0.15N solution. (3)
4. (a) Mention any three physical properties of metals. (3)
(b) Give the percentage composition of cast iron, wrought iron and steel. (3)
5. (a) Distinguish between homogenous and heterogeneous catalysis. Give an example for each. (3)
(b) Write any three differences between atom and molecule. (3)

6. (a) What is meant by powder metallurgy? Write two uses of powder metallurgy. (3)
 (b) Give any three disadvantages of powder metallurgy. (3)
7. (a) What indicators will you choose for the following acid base titrations? Give reasons for your choice. (i) Na_2CO_3 X H_2SO_4 (ii) Oxalic acid X NaOH (3)
 (b) Calculate the pH of the following solutions.
 (i) 1/100 M HNO_3 . (ii) 0.004 N HCl (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) Explain HiPCO method and Arc Discharge method for the synthesis of Carbon Nano Tubes. (5)
 (b) Write five applications of CNT. (5)
 (c) Distinguish between promoters and poisons in terms of catalysis. Give an example for each. (5)

OR

- IV.(a) Discuss any five important properties of CNT. (5)
 (b) Give five applications of Nano materials. (5)
 (c) What is meant by an atom? What are fundamental particles of an atom? Give their masses in grams and charges in coulomb. (5)

UNIT-II

- V.(a) With the help of a suitable acid-base reaction, explain Lowry-Bronsted theory of acids and bases. Also define the terms Conjugate Pair and Amphoteric Substance. (5)
 (b) What is meant by Buffer solution? How is it classified? Give one example for each. (5)
 (c) A solution was prepared by dissolving 0.5326g of Na_2CO_3 in 100ml of distilled water. Pipetted out 20ml of this solution and titrated it against HCl solution taken in a burette. After the experiment, the burette reading was found to be 21ml. Calculate the mass of HCl in 150ml of the given solution. (5)

OR

- VI. (a) Discuss any five applications of pH measurements. (5)
 (b) Diluted 200ml of 0.02 N H_2SO_4 by adding 1800ml of water. Calculate the normality and pH of the resulting solution. (5)

- (c) Define the term Buffer capacity and give its mathematical expression. Calculate the pH of 0.004M NaOH(Na = 23, O = 16, H =1) (5)

UNIT-III

- VII. (a) Define the term potable water. Write any four characteristics of potable water. (5)
- (b) What causes of permanent hardness of water? Explain the Ion exchange method for the removal of permanent hardness. (5)
- (c) Explain with detailed chemical reaction the sterilization of water using bleaching powder and ozone. What is the advantage of ozone sterilization over chlorine? (5)

OR

- VIII.(a) What is meant by desalination of sea water? Explain desalination of sea water using reverse osmosis. (5)
- (b) Write short note on various steps involved in production of potable water. (5)
- (c) What is meant by boiler scales? How is it formed? What are the problems caused by boiler scales? (5)

UNIT-IV

- IX. (a) Define the term alloys. Give any four purposes for making alloys. (5)
- (b) What is the effect of the following impurities in steel?
(i) Si (ii) C (iii) Mn (iv) P (v) S (5)
- (c) Discuss the heat treatment of steel. Why is it done? (5)

OR

- X. (a) Explain various steps involved in powder metallurgy. (5)
- (b) Write any five advantages of powder metallurgy. (5)
- (c) With the help of a proper diagram explain the preparation of alloys using fusion method. (5)
