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MCH-001

**POST GRADUATE DIPLOMA IN
ANALYTICAL (PGDAC)**

Term-End Examination

June, 2024

MCH-001 : BASIC ANALYTICAL CHEMISTRY

Time : 3 Hours

Maximum Marks : 75

Note : Attempt any *five* questions. Question No. **1** is compulsory. All questions carry equal marks.

1. Answer any *five* of the following :

- (a) List all the steps the followed in quantitative analysis of a sample. 3
- (b) A student observed 9.87, 9.85, 9.56, 9.78, 9.64 values for analysis of sample. Calculate mean and median for these observations. 3
- (c) List any *three* category of hazardous materials in a laboratory giving an example for each. 3

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- (d) Write the chemical equations for the autodissociation of NH_3 , CH_3OH and $\text{C}_2\text{H}_5\text{OH}$. 3
 - (e) What are three groups in which non-aqueous solvents are classified ? Write an example for each. $1 \times 3 = 3$
 - (f) Draw structure of EDTA showing its tetracidic nature. 3
 - (g) Explain briefly volnard method. 3
2. (a) Classify different analytical techniques on the basis of type of properties describing any one of them briefly. 5
- (b) Define Error. In an analysis of 5 students, observed values were 2.39, 2.45, 2.78, 2.85 and 2.67 whereas true value is 2.59. Calculate mean error and % error. 2+3
 - (e) Explain accuracy and precision with example and in terms of mathematical expression. Illustrate these suitably. 2+2+1

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3. (a) Explain Gaussian distribution of data and write down the laws of probability. Draw the shape of normal error curve showing deviation from the mean in units of σ . 2+3
- (b) What special precautions are taken in sampling of food materials ? Explain two main procedures followed in sampling of food samples. 2+3
- (c) What are three types of samples ? Explain each one briefly. 3+2
4. (a) Discuss the precautions which one may follow during handling of glassware in reducing risks. Mention possible reasons for electrical mishaps in a chemical laboratory. 3+2
- (b) Describe emergency procedures (first aid) followed during possible accidents due to chemical burns and thermal burns that one may encounter in a chemical laboratory. 5
- (c) Define enzyme catalyzed reactions with an example. Derive the rate equation for enzyme catalyzed reaction by complex formation. 2+3

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5. (a) Explain basic principle of all three theories of acid-base considering examples in each case. 5
- (b) Define buffer solution. Derive mathematical expression for calculating pH of buffer solution in terms of concentrations of acid and base constituents. 1+4
- (c) Write any *six* requirements of a primary standard. Write names of any *two* commonly used primary standards. 3+2
6. (a) Classify non-aqueous solvents with examples for each type. Define autoprotolysis. Which type of solvent exert levelling effect ? 3+1+1
- (b) Explain redox reaction as two half reactions considering an example. Define Redox potential and discuss its significance. Explain giving reactions. Which one of KMnO_4 or $\text{K}_2\text{Cr}_2\text{O}_7$ is a better oxidizing agent in acid medium. 1+2+2
- (c) What are the criteria for solvent selection for use in non-aqueous studies ? Mention any *four* commonly used non-aqueous solvents. 3+2

7. (a) Define a chelate and chelating agent with examples. Write structures of EDTA and DMG indicating coordination position. 5
- (b) What are the strategies followed in selectivity in complexo-metric titrations ? Explain any *one* in detail. 5
- (c) Explain precipitation titration and mention difficulties encountered therein. Further explain, how rate of precipitation may be improved ?
2+3
8. (a) Which variables influence the particle size of precipitate ? Write briefly about the rate of precipitation and discuss its role in gravimetric estimations. 2+3
- (b) Explain precipitation from homogeneous solution and write down different approaches adopted. 5
- (c) What is the basic principle of colorimeter ? How this is useful in elemental analysis. 2+3