

**P.G. DIPLOMA IN ANALYTICAL CHEMISTRY  
(PGDAC)**

**Term-End Examination**

**June, 2021**

**MCH-001 : BASIC ANALYTICAL CHEMISTRY**

*Time : 3 hours*

*Maximum Marks : 75*

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**Note :** Answer any **five** questions. All questions carry equal marks.

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1. (a) Classify electrochemical methods of analysis and explain any one of these methods briefly. 5
- (b) Define and differentiate between Accuracy and Precision, with a suitable example. 5
- (c) What is Standard Deviation (SD) and Relative Standard Deviation (RSD) ? Calculate the SD for the following sets of values for some measurement :  
36.5, 37.8, 35.8, 36.2, 37.3, 35.1 and 36.8. 5

2. (a) What are the various types of errors ?  
Explain their sources. 5
- (b) What are the various types of samples ?  
Write their characteristics. 5
- (c) Discuss general requirements of sampling  
of food materials, with the help of an  
illustration. 5
3. (a) What are Hazardous Materials ? Give an  
example each for the following classes of  
hazardous materials : 5
- (i) Explosives
- (ii) Flammable liquids
- (iii) Flammable solids
- (iv) Bio-hazardous substances
- (v) Radioactive substances
- (vi) Corrosive substances
- (b) Differentiate between Physical and  
Chemical adsorption and give any two  
factors influencing adsorption. 5
- (c) Discuss emergency procedures to be  
followed in case of chemical and thermal  
burns. 5

4. (a) Explain the initial rate method of measurement of reaction rate. Give any two of its advantages over the other methods. 5
- (b) Derive an expression for rate law of first order reactions. Draw the nature of plot between concentration and time. 5
- (c) Give any three advantages and any two disadvantages of graphical logarithmic extrapolation methods. 5
5. (a) Classify solvents in terms of donor-acceptor properties. Explain autoprotolysis for the following three solvents :  
 $\text{CH}_3\text{OH}$ ,  $\text{CH}_3\text{COOH}$  and  $\text{NH}_3$  5
- (b) Define Polyprotic Acid and give any four examples. Explain the dissociation pattern for any triprotic acid in terms of chemical equations. 5
- (c) Define Buffer Capacity and give the factors affecting it. Calculate buffer capacity of a solution containing 0.1 M acetic acid and 0.1 M sodium acetate.  
Given  $\text{pK}_a$  of  $\text{CH}_3\text{COOH} = 4.75$ . 5

6. (a) Name any three common indicators used for titrations of strong acid and strong base. Draw the nature of plot between 1 M strong acid (HCl) and 1 M strong base (NaOH) with corresponding change in pH. Which indicator will be more suitable ? 5
- (b) Explain Ostwald's theory of indicators and derive expressions for  $H^+$  concentration considering these as acid or base. 5
- (c) What are non-aqueous titrations ? Explain the role of these solvents in acid-base reactions based on the concept of Bronsted and Lowry. 5
7. (a) Explain electrochemical cell with the help of schematic diagram. Write the Nernst equation for the same. 5
- (b) Describe characteristics of any two non-aqueous solvents used in redox titrimetry. Give any two types of compounds that can be studied in non-aqueous solvents. 5
- (c) Explain the principle of complexometric titrations. Write the full name of EDTA and draw its structure showing its hexadentate nature. 5

8. (a) Explain how precipitation titration curve is plotted considering the examples of  $\text{KBr} - \text{AgNO}_3$  or  $\text{KCl} - \text{AgNO}_3$ . How is equivalence point determined in this titration ? 5
- (b) Define and differentiate between Coprecipitation and Post-precipitation. Explain how coprecipitation can be minimized. 5
- (c) Explain the principle of working of a flame photometer and discuss its advantages and limitations. 5
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