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**MCH-001**

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

**Term-End Examination**

**June, 2026**

**MCH-001 : BASIC ANALYTICAL  
CHEMISTRY**

*Time : 3 Hours*

*Maximum Marks : 75*

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**Note :** (i) Answer **five** questions in all. Q. No.

*1 is compulsory.*

(ii) *All questions carry equal marks.*

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1. Answer any *five* of the following :

- (a) Explain Gravimetry as an accurate  
macro-analysis procedure. 3

- (b) In an analysis the observed value is 5.32 g compared with the accepted (true) value of 5.30 g. What is the relative error in parts per thousand ? 3
- (c) In an iron determination (taking 1 g sample every time) the following four replicate results were obtained : 28.6, 29.7, 29.8 and 30.2 mg iron. Calculate the standard deviation of the given data. 3
- (d) What are the objectives of water quality monitoring system ? 3
- (e) Discuss any *three* important safety aspects in the design of a chemical laboratory. 3
- (f) Calculate rate constant of first order reaction. Initial concentration of reactant is 0.01 M. The concentration of reactant after 10 seconds is 0.005. ( $\ln 2 = 0.693$ ) 3

- (g) Write the chemical equations for the leveling of  $\text{HClO}_4$ ,  $\text{HCl}$  and  $\text{HNO}_3$  in water. 3
2. (a) Classify electrical methods of analysis, describing property measured. 5
- (b) Briefly describe the different methods of minimizing errors and improving the accuracy. 5
- (c) Explain the '4d' rule and criteria for rejection of data. 5
3. (a) Classify the methods of sampling of gaseous pollutants. 5
- (b) How are chemical burns caused ? Discuss relevant first aid procedures. 5
- (c) How is concentration of enzyme catalyst determined in enzyme catalyzed reactions when the rate is determined by the rate of complex formation ? 5

4. (a) Explain buffer capacity. Which one of the following has the greater buffer capacity ? 5
- (i) A mixture containing 0.10 mol of  $\text{NH}_3$  and 0.2 mol of  $\text{NH}_4\text{Cl}$ .
- (ii) A mixture containing 0.05 mol of  $\text{NH}_3$  and 0.1 mol of  $\text{NH}_4\text{Cl}$ .
- (b) Mention the requirements of a primary standard. How can secondary standards be used for standardizations ? 5
- (c) Discuss briefly the modern quinoid theory of an acid-base indicator (methyl orange). 5
5. (a) What is non-aqueous titration ? Why the end-point of such titration curve of a weak acid or a weak base is not sharp enough, when  $\text{pK}_A$  is about 7 ? 5
- (b) Discuss Hammett's acidity functions. What is the importance of dielectric constant ? 5

- (c) How is the equilibrium constant of a redox reaction obtained ? Explain using Nernst equation. 5
6. (a) Discuss how the nature of metal ion and basicity of the ligand affect stability of metal-ligand complexes. 5
- (b) Explain how Eriochrome black-T (metallochromic indicator) is used in complexometric determination of hardness of water. 5
- (c) What are precipitation titrations ? What are the difficulties that occur during precipitation titration ? 5
7. (a) Explain Fajan's method. How do adsorption indicators work ? 5
- (b) Discuss the role of coprecipitation for the separation of tracer quantities. 5

- (c) Give explanation : Thermogravimetric analysis data should be used with caution to assign drying or ignition temperature range for precipitates. 5
8. (a) What is Colorimetry ? Discuss Duboseq method. 5
- (b) What are the recommended ways of storing chemicals in the laboratory/store ? Why is random storage not recommended for storing chemicals ? 5
- (c) Explain the use of hollow cathode lamps and graphite furnace in atomic absorption spectrometry. 5

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