

No. of Printed Pages : 6

MCH-001

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

Term-End Examination

December, 2022

MCH-001 : BASIC ANALYTICAL CHEMISTRY

Time : 3 Hours

Maximum Marks : 75

Note : (i) *Answer any **five** questions.*

(ii) *All questions carry equal marks.*

1. (a) What are 'determinate errors' ? Write the sources of these errors. 5
- (b) What is the significance of standard deviation ? How is it different from population standard deviation ? 5

P. T. O.

- (c) Calculate the pH of a 5.0×10^{-3} M solution of hydrochloric acid. [Given mantissa of 50 is 6990. Report the result up to same number of significant figures as the conc. of HCl]. 5
2. (a) What is the full form of SPM ? Write the procedure of measuring SPM. 5
- (b) Write any *ten* precautions for the safe handling of glasswares. 5
- (c) What is 'Suspended Particulate Matter' (SPM) ? How does it cause damage to human body ? How can it be controlled ? 5
3. (a) Explain turbidimetry and nephelometry. Comment on the accuracy of the results of these determinations. 5
- (b) Explain null hypothesis. Describe how a null hypothesis is tested. 5
- (c) Describe the Bronsted-Lowry's theory of acids and bases with the help of examples.

4. (a) What are 'Pseudo First Order Reaction' ?
Illustrate with the help of an example. 5
- (b) Identify the conjugate base amongst the products shown in the following equations : 5
- (i) $\text{NH}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NH}_4^+ + \text{OH}^-$
- (ii) $\text{NH}_3 + \text{CH}_3\text{OH} \rightleftharpoons \text{NH}_4^+ + \text{CH}_3\text{O}^-$
- (iii) $\text{NH}_2\text{OH} + \text{H}_2\text{O} \rightleftharpoons \text{HONH}_3^+ + \text{OH}^-$
- (iv) $\text{CH}_3\text{COOH} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{CH}_3\text{COO}^-$
- (v) $\text{CH}_3\text{COOH} + \text{HClO}_4 \rightleftharpoons \text{CH}_3\text{COOH}_2^+ + \text{ClO}_4^-$
- (c) It is required to prepare buffer of pH 4.3. For this purpose formic acid ($\text{pK}_a = 3.68$), acetic acid ($\text{pK}_a = 4.74$) and benzoic acid ($\text{pK}_a = 4.18$) besides their salts are available. Which acid and its salt will you choose for the purpose ? Give reason. 5

5. (a) What is an indicator ? Explain indicator error. 5
- (b) Explain amphiprotic and non-ionisable solvents giving examples for each type. 5
- (c) Why the end point of the titration between a weak acid and weak base is not sharp ? Explain. 5
6. (a) Distinguish between the terms 'Iodimetry' and 'Iodometry'. Write the indicator used in each case. 5
- (b) What are the essential requirements of a metallochromic indicator to be used in complexometric titrations ? 5
- (c) Describe the method of determining Zn (II) in presence of Mg (II) complexometrically. 5
7. (a) How will you determine Br^- volumetrically by Volhard's method ? Give details including calculations. 5

(b) Explain, why it is necessary to wash the precipitate obtained, by a suitable wash liquid, before drying and weighing while estimating gravimetrically. Suggest suitable wash liquid for precipitates of :

(i) BaSO_4

(ii) CaC_2O_4

(iii) AgI

Give reason for your choice. 5

(c) Write any *five* advantages of using the organic reagents as the precipitants in inorganic gravimetric analysis. 5

8. (a) Differentiate between co-precipitation and post-precipitation. How can co-precipitation be minimised ? 5

(b) A sample was weighed 10 times; weight (in mg) obtained is as follows :

29.8, 29.7, 30.2, 30.1, 30.5, 28.8, 29.2, 29.5, 30.3 and 29.8

Calculate mean, median and mode. 5

- (c) Match the indicators given in Column A with the type of titration in Column B : 5

Column A	Column B
(1) Diphenylamine	(i) Acid-base
(2) Eriochrome Black T	(ii) Complexometric
(3) Dichlorofluorocein	(iii) Precipitation (Fajan's method)
(4) Methyl Orange	(iv) Precipitation (Mohr's method)
(5) Potassium Chromate	(v) Redox