No. of Printed Pages : 4 **MCH-001**

P.G. DIPLOMA IN ANALYTICAL CHEMISTRY

00193

Term-End Examination

June, 2012

MCH-001 : BASIC ANALYTICAL CHEMISTRY

Time : 3 hours *Maximum Marks : 75*

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

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1. (a) Describe briefly NMR and mass spectrometry. 5

(b) Differentiate between accuracy and precision. 5

(c) The value of a physical quantity, X, depends on the values of three physical quantities, namely, a, b, and c which are related as $X = a - b + c$. The absolute standard deviations of the three quantities measured are given below. 5

$a = 3.70 \ (\pm 0.04)$; $b = 4.22 \ (\pm 0.02)$; $c = 1.77 \ (\pm 0.03)$

Calculate the standard deviation in the value of X.

2. (a) Write a short note on methods of sampling of gaseous pollutants. 5

(b) What are poisonous substances ? How are they different from infectious substances ? 5

(c) Explain the Lewis concept of acids and bases with the help of suitable examples. 5

3. (a) Enlist the factors affecting the rate of a chemical reaction. Explain any one of the factors. 5

(b) Explain modern quinoid theory of indicators with the help of a suitable example. 5

(c) What are amphiprotic solvents ? How does the amphiprotic nature of acetic acid explain the enhancement of basic character of pyridine when dissolved in it. 5

4. (a) Write a short note on potassium permanganate as an oxidimetric reagent. 5

(b) Name the type of indicators used in complexometric titrations. Explain their functioning with the help of a suitable example. 5

(c) Lead - EDTA chelate having the formula PbY^{2-} has a formation constant of 1.1×10^{14}. Compute the conditional formation constant at pH=11. (αy^{4-} at pH 11 is 0.85) 5

5. (a) Explain the principle involved in the volhard method employed for determination of chloride ions. 5

(b) Explain the terms, Nucleation and super saturation. 5

(c) What is error ? Discuss different types of errors. 5

6. (a) Draw a general redox titration curve. Explain its different regions using a suitable example. 5

(b) List different optical instrumental methods used for analytical purposes and state the principles on which these are based. 5

(c) Urea of concentration 0.05 mM was hydrolysed using Urease of concentration of 5.0 micro mole. Using the values $K_2 = 3 \times 10^4\ s^{-1}$ and Michaelis constant for Urease 2.0 mM, calculate the initial rate of the reaction. 5

7. (a) Crystalline $BaCL_2$ was found to contain 14.70%, water of crystallization as against the true value of 14.75% for $BaCL_2 . 2H_2O$. Estimate the absolute error, relative error and the relative accuracy. 5

(b) Calculate the pH of 0.02 M solution of acetic acid ($Ka = 1.8 \times 10^{-5}$) 5

(c) What is a chemical burn. Suggest the first aid procedures for chemical burns. 5

8. (a) Express the result with correct number of significant figures : 5

$$\frac{40.36 \times 0.0999 \times 51.9961}{346.6}$$

(b) Differentiate between primary and secondary standards, giving suitable examples. 5

(c) Calculate mean and median for the data given below : 5

14.1, 13.8, 14.3, 13.7, 13.4 and 13.5