P.G. DIPLOMA IN ANALYTICAL CHEMISTRY (PGDAC)

Term-End Examination

June, 2022

MCH-001 : BASIC ANALYTICAL CHEMISTRY

Time : 3 hours *Maximum Marks : 75*

Note : *Attempt any* ***five*** *questions. All questions carry equal marks. Marks of each sub-part are indicated.*

1. (a) List the modern methods of separation techniques and explain any one. *5*

(b) Explain the term 'interfering substance' when analysing a sample. How can interference be avoided ? *5*

(c) Write the full forms of the following :

(i) BOD (ii) COD (iii) DO (iv) TOC

Write the temperature at which the water sample should be preserved for BOD determination. *5*

2. (a) Calculate the pH of a 10^{-5} M aqueous sodium hydroxide solution at room temperature 25°C. *5*

(b) List the steps involved in performing quantitative analysis and explain any one. *5*

(c) Describe determinate errors and its sources. *5*

3. (a) What are the causes of chemical burns ? Write the steps of first aid for chemical burns. *5*

(b) Explain the term 'significant figures'. State the number of significant figures in each of the following : *5*

(i) 0·162 (ii) 10·06 (iii) 200·0 (iv) 0·0260

(c) What is meant by pseudo first-order reaction ? Write the rate law for second-order reaction. *5*

4. (a) Consider the following equations and identify conjugate acid, if any, from RHS : *5*

(i) $CH_3OH + HNO_2 \rightleftharpoons CH_3OH_2^+ + NO_2^-$

(ii) $NH_3 + CH_3OH \rightleftharpoons NH_4^+ + CH_3O^-$

(iii) $CH_3COOH + H_2O \rightleftharpoons CH_3COO^- + H_3O^+$

(iv) $CH_3COOH + HClO_4 \rightleftharpoons CH_3COOH_2^+ + ClO_4^-$

(v) $AlCl_3 + :OR_2 \rightleftharpoons Cl_3Al:OR_2$

(b) Explain the following terms : *5*

(i) Mean (ii) Median (iii) Mode

(c) How is coprecipitation useful in separation of trace quantities of radioisotopes ? Explain. *5*

5. (a) With reference to analytical chemistry, explain the terms (i) primary standard, and (ii) secondary standard. Give one example of each. *5*

(b) Explain the role of an indicator in volumetric analysis. Name two indicators each for (i) Acid-base titrations, and (ii) Redox titration. *5*

(c) Iodine solution can be used for the determination of (i) an oxidising agent, and (ii) a reducing agent. Explain, giving one example of each. *5*

6. (a) Explain the following terms :

(i) Amphiprotic solvent

(ii) Aprotic solvent

Give one example of each type. *5*

(b) Explain, giving suitable example, the masking-demasking method of estimating different ions in a mixture by EDTA titration. *5*

(c) What are the different ways to use electrochemical cells ? *5*

7. (a) Describe Volhard's method for determining Ag^+. *5*

(b) Name the liquids used for washing the following precipitates obtained during estimation of Ag^+, Ba^{2+} and Ca^{2+} respectively :

(i) $AgCl$

(ii) $BaSO_4$

(iii) CaC_2O_4

Give reasons for your answer. *5*

(c) Why is sodium kept under kerosene oil and phosphorus under water ? Explain. *5*

8. (a) Differentiate between accuracy and precision, giving suitable examples. *5*

(b) Describe in brief the collection of gaseous pollutants with concentration. *5*

(c) Write a short note on Personal Protective Devices. *5*