No. of Printed Pages : 4

MCH-004

P. G. DIPLOMA IN ANALYTICAL CHEMISTRY (PGDAC)

Term-End Examination

December, 2020

MCH-004 : ELECTROANALYTICAL AND OTHER METHODS

Time : 3 Hours *Maximum Marks : 75*

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

1. (a) Which complexing agents provide the best deposits in electrogravimetry ? How would you determine electrode potential in this methods ? 5

   (b) Calculate the pH during the titration of 75.00 cm^3 of 0.15 M HCl with 0.3 M NaOH at different stages of titration : 5

   (i) initial point

   (ii) after addition of 10 cm^3 of NaOH.

(c) Explain the difference between concentration polarization and kinetic polarization with an suitable example. 5

2. (a) Explain ionic product of water. The conductivity of pure water is 7.0×10^{-6} S m^{-1}. Calculate the ionic product of pure water if $\wedge^{\alpha}_{H^+} = 0.035$ S m^2 mol^{-1} and $\wedge^{\alpha}_{OH^-} = 0.020$ S m^2 mol^{-1}. 5

(b) List pulse methods and describe any *one* of these briefly. 5

(c) Draw the nature of polarogram and describe the information one can get from it. Define half wave potential. 5

3. (a) Discuss salient features of a thermo-gravimetric curve. How this can be used to find out if gravimetric precipitates should be dried or ignited ? 5

(b) Discuss all the errors in Differential Scanning Calorimetry (DSC). 5

(c) Calculate the mass of 5 m Ci the following radionuclide source of : 5

$^{232}Th \left(t^{1/2} = 1.4 \times 10^{10} y \right)$ as ThO_2.

4. (a) Explain the basic principle of Isotope Dilution Analysis (IDA). Derive its equation. How substoichiometric isotope dilution analysis (SIDA) method in an improvement over IDA ? 5

   (b) Discuss the principle of radioimmunoassay and its application briefly. 5

   (c) Explain the role of furnace atmosphere have an effect on the Thermogravimetric (TG) curve with a suitable example. 5

5. (a) How can equilibrium constants be determined from electrode potential measurements ? 5

   (b) Explain 'alkaline error' in pH measurement. 5

   (c) Define the term limiting molar conductivity. List all the factors affecting conductivity. 5

6. (a) Discuss classification of coulometric methods briefly. 5

   (b) What are capillary characteristics ? How does it affect diffusion current in polarography ? 5

(c) Discuss applications of amperometric titrations. 5

7. (a) Explain the method of measurement of crystallinity using Differential Thermal Analysis (DTA). 5

(b) Explain, how thermometric titrations are different from classical titrations. 5

(c) Discuss advantages and limitations of thermometric titrations. Name all the mentioning their parent and end products in each case. How many α and β particles are emitted in each case ? 5

8. (a) Discuss all the factors that affect choice of radiotracers with the help of an illustration. 5

(b) Draw a labelled diagram of a experimental setup used in potentiometric titration. 5

(c) Draw a schematic diagram for the instrumentation setup in cyclic voltammetry. 5