

**P.G. DIPLOMA IN ANALYTICAL CHEMISTRY
(PGDAC)**

Term-End Examination

00596

June, 2016

**MCH-004 : ELECTROANALYTICAL AND OTHER
METHODS**

Time : 3 hours

Maximum Marks : 75

Note : Attempt any five questions. All questions carry equal marks.

1. (a) What do you understand by cell potential ? Describe a Galvanic cell and write an expression for its cell potential. 5
- (b) Explain the term Coulometry and list the different types of coulometric methods. 5
- (c) What are the characteristics of a reference electrode ? Describe the construction of hydrogen electrode with a suitable diagram. 5
2. (a) Define the units of radioactivity, Curie (Ci) and Becquerel (Bq). Calculate the strength of 9.6 ng of ^{198}Au ($t_{1/2} = 2.7\text{d}$) in Curie. 5

- (b) Explain molar conductivity and equivalent conductivity for an electrolyte. Explain how they are related to each other. 5
- (c) The conductivity of a 0.1 M HCl solution is $0.0394 \Omega^{-1} \text{cm}^{-1}$. What is the molar conductivity of the solution? 5
3. (a) Explain anodic stripping voltammetry with the help of a suitable illustration. 5
- (b) What is meant by diffusion current? Write down the Ilkovic equation explaining all the terms. 5
- (c) Explain the difference between controlled potential coulometry and constant current coulometry. 5
4. (a) What do you mean by thermogravimetric analysis (TGA)? Describe the sources of errors in TGA briefly. 5
- (b) Explain the principle of differential thermal analysis. Draw a suitable diagram of a differential thermal analyzer. 5
- (c) Explain the difference between thermometric and classical titrations. Draw the nature of titration curve in both the cases. 5

5. (a) Discuss the important criteria for the choice of radiotracer. Which radioisotope will you use for the determination of Mn in steel, ^{54}Mn ($t_{1/2} = 312\text{d}$) or ^{56}Mn ($t_{1/2} = 2.56\text{h}$) ? 5
- (b) Explain the technique isotope dilution analysis (IDA) and derive its equation for the determination of percentage content of unknown. 5
- (c) What do you mean by polarisation ? Discuss concentration polarisation and the importance of overvoltage. 5
6. (a) Explain linear sweep voltammetry and sampled DC polarography. 5
- (b) Discuss the terms polarography and the dropping mercury electrode (DME). 5
- (c) Define the terms Kinetic currents and Catalytic currents. Distinguish between the two. 5
7. (a) Draw the thermogravimetric curve for a mixture of MgCO_3 and CaCO_3 . How would you calculate the masses of Mg and Ca ? 5
- (b) How will you analyze biological materials with the help of differential thermal analysis ? 5

- (c) Explain the principle of neutron activation analysis and derive its equation for the determination of concentration by comparator method. 5

8. Write brief notes on any *five* of the following : 5×3=15

- (a) Liquid Junction Potential
 - (b) Amperometry
 - (c) Sources of Neutrons
 - (d) Ionic Product of Water
 - (e) Cyclic Voltammetry
 - (f) Radioimmunoassay
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