

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

**Term-End Examination**

**December, 2016**

00784

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

*Time : 3 hours*

*Maximum Marks : 75*

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

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1. (a) What are the basic laws of electrochemistry ?  
Write the units of current, resistance and emf. 5
  - (b) What is reference electrode ? Describe the function of silver-silver chloride electrode with a suitable diagram. 5
  - (c) What are potentiometric titrations ? Explain with the help of neutralization titration or oxidation-reduction titration. 5
  2. (a) Explain the working of glass membrane electrodes with a suitable diagram. 5
  - (b) Derive an equation for half-life of a radionuclide. If  $^{32}\text{P}$  has half-life of 14.2 days, then calculate its  $\lambda$  value. 5
  - (c) What do you mean by conductance ? Explain the various factors affecting the conductivity of an electrolyte solution. 5

3. (a) What is electrogravimetric analysis ? Describe constant potential electrolysis briefly. 5
- (b) What are conductometric titrations ? Explain the curves obtained in the titration of (i) a strong acid with a strong base, and (ii) a strong acid with a weak base. 5
- (c) What is ohmic potential ? Determine its units. How is it related to cell potential and applied potential ? 5
4. (a) Define half-wave potential and discuss the effect of complexing agents on it. What is the nature of a plot between  $E_{1/2}$  and  $\log [x]$  ? 5
- (b) Distinguish between limiting current and diffusion current. Discuss the effect of the concentration of electrolyte substance on the diffusion current. 5
- (c) Explain amperometric titrations. Discuss its any four advantages. 5
5. (a) Write the polarographic equation and explain all the terms. Draw a typical polarogram showing diffusion current, residual current and half-wave potential. 5
- (b) What are the different pulse methods in voltammetry ? Briefly explain any one method. 5
- (c) Explain hydrodynamic voltammetry with a suitable diagram. 5

6. (a) Write down various neutron-induced reactions of  $^{27}\text{Al}$  with varying neutron energy. Predict the products formed. 5
- (b) Explain the principle of Isotope Dilution Analysis (IDA). What are the conditions that must be fulfilled to carry out IDA procedure? 5
- (c) Draw a labelled diagram of a differential thermal analyser and discuss its different components. 5
7. (a) Draw the sketch of the thermogravimetric curve for a mixture of calcium and magnesium carbonates. How will you calculate the mass of Ca and Mg from this curve? 5
- (b) Discuss any five instrumental factors affecting thermogravimetric curve. 5
- (c) Explain thermometric titration with a suitable example. Draw the sketch of a schematic layout for thermometric titration assembly. 5

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

- (a) Nature of Neutron to Proton Curve
  - (b) Cathodic Stripping Voltammetry
  - (c) Sources of Background Radiation
  - (d) Polarography
  - (e) Cyclic Neutron Activation Analysis
  - (f) Constant Current Coulometry
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