

No. of Printed Pages : 5

MCH-004

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

Term-End Examination

June, 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) Explain the metal-metal ion interface during the development of electrode potential with a suitable illustration. 5
(b) Calculate the potential of a zinc electrode immersed in 0.120 M ZnSO_4 . (Standard electrode potential of Zn electrode is -0.763 V). 5

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- (c) Explain the boundary potential of the glass electrode when it is placed in a test solution. How is it affected on pH? 5
2. (a) Why are ordinary laboratory voltmeters not used for measuring e.m.f. of a glass electrode cell? Which instrument should be used in such cases? 5
- (b) The empirical relation regarding limiting molar conductivity was suggested by Kohlrausch of which type of electrolytes and what kind of solution? Explain its limitations. 5
- (c) Why mercury cathode is very useful in electrogravimetry? Explain with a suitable application. 5
3. (a) Explain the nature of plots of conductometric titration of a mixture of a strong acid and a weak acid vs. a strong base. 5
- (b) Explain cathodic stripping voltammetry with suitable equations. 5

- (c) Write the Ilkovic equation and explain how the diffusion current depends on the concentration of an electroactive substance. 5
4. (a) Discuss the advantages of amperometric titrations over potentiometric or visual indicator methods with suitable examples. 5
- (b) Describe any *one* application of cyclic voltammetry with the help of a suitable example. 5
- (c) Explain the nature of thermo-gravimetric curve for a mixture of calcium and magnesium carbonates. 5
5. (a) Explain the principle of Differential Thermal Analysis (DTA). 5
- (b) How is DTA a useful technique for characterizing polymeric materials? 5
- (c) Explain the principle of thermometric titrations with a suitable example. 5

6. (a) Calculate the Q value for the reaction ${}^9\text{Be}(d, p){}^{10}\text{Be}$. Given that : 5
- ${}^9\text{Be} = 9.012183 \text{ a.m.u.}$
- $d = 2.014102 \text{ a.m.u.}$
- $p = 1.007825 \text{ a.m.u.}$
- ${}^{10}\text{Be} = 10.012938 \text{ a.m.u.}$
- (b) Explain the basic principle of Isotope Dilution Analysis (IDA). 5
- (c) Describe various methodologies of Neutron Activation Analysis (NAA) with a suitable illustration. 5
7. (a) What are the two broad classifications of electroanalytical methods ? Discuss the sub-groups of interfacial methods. 5
- (b) Which metals are not used as indicator electrodes ? Explain why ? 5
- (c) What is the main advantage of the conductometric end point ? Discuss its most common application. 5

8. (a) Compare Cathodic Stripping Voltammetry with Anodic Stripping Voltammetry, describing advantages and limitations. 5
- (b) What are the salient features of a Differential Scanning Calorimetry (DSC) curve ? How would you determine the area under such DSC curves ? 5
- (c) Explain radiometric titration with a suitable example. Discuss its advantages and limitations. 5