MCH–004

P.G. DIPLOMA IN ANALYTICAL CHEMISTRY (PGDAC)

00860

Term-End Examination

December, 2012

MCH–004 : ELECTROANALYTICAL AND OTHER METHODS

Time : 3 hours *Maximum Marks : 75*

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

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1. (a) What is meant by Ion Selective Electrode   5
        (ISE) ? Draw a labelled diagram of a solid
        mambrane ISE.

    (b) Calculate the pH during titration of 100 cm^3
        M NaCN with 0.20 M HCL after the   5
        addition of the following volume of acid
        (dissociation   constant   of
        $HCN = 6.2 \times 10^{-10}$).

        (i)   0.00 cm^3 (ii)   20 cm^3

    (c) What is meant by molar conductivity ?   5
        How is it usually expressed ? Discuss the
        variation of molar conductivity of a strong
        electrolyte with concentration.

2. (a) What is stripping voltammetry ? Explain 5
the two basic steps involved in it.

   (b) What is biamperometry ? How does it 5
different from amperometry ? Discuss the
difference in the electrodes used in these
techniques.

   (c) Explain the basic principle of 5
thermogravimetry. How to curves can be
used in predicting relative quantities of the
components of a binary mixture ?

3. (a) How DTA curve is used to measure the heat 5
capacity (specific heat) of a substance ?
Explain your answer with an illustration.

   (b) Explain Isotope Dilution analyse (IDA) 5
technique. What are its limitations ?

   (c) What is the principle of radio immunoassay 5
(RIA) ? Write its applications.

4. Differentiate between the following pair of
techniques.   5x3=15

   (a) A galvanic cell and electrolytic cell.

   (b) Reference electrode and indicator electrode
in direct potentiometry.

   (c) Voltammetry and polarography

5.   (a)   5

Volume of base
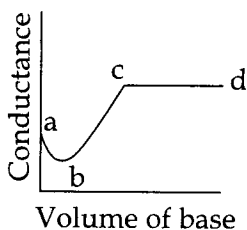
On the basis of this curveg identify the nature of acid and basis. Label the equivalence point in the curve. Explain the significance of the flat portion (cd) of the curve ?

   (b)   How can the coulometric method be used   5
to determine trace level concentration of oxygen in gas stream ?

   (c)   What are the different types of currents in   5
polarography ? Explain how can migration current be eliminated ?

6.   (a)   Explain the principle of cyclo voltommetry.   5
Discuss some of its applications.

   (b)   What is meant by equivalence point of a   5
potentiometric titrations ? Discuss different ways of its graphical determination.

   (c)   Explain the different components of a   5
thermobalance.

7. (a) Calculate the energy change (Q) in the   5
reaction ^{63}Cu (n, r) ^{64}Cu

Given that :

$^{63}Cu = 62.929590$ amu

$^{64}Cu = 63.929760$ amu

$^{1}_{0}n = 1.008665$ amu

(b) What do you mean by background   5
radiation ? Mention its principle sources.

(c) What is meant by the IR drop of the cell ?   5
What is the importance of this term during
the measurement of the applied potential
of the cell ?

8. (a) Derive an expression for calculating the   5
activity in a Neutron Activation Analysis
(NAA). What are limitations of this
technique ?

(b) What are various sources of neutron used   5
in NAA ?

(c) Explain how DTA is used for analysing   5
biological materials ?

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