Total No. of Questions : 6]

P1395

SEAT No :

[5123]-314

[Total No. of Pages :3

M.Sc. - II

ANALYTICAL CHEMISTRY

CHA-390: Electroanalytical and Radioanalytical Methods of Analysis

(2013 Pattern) (Credit System) (Semester-III)

Time : 3 Hours]   *[Max. Marks : 50*

Instructions to the candidates:

1) *Answers to the two sections should be written in separate answer books.*

2) *All questions are compulsory.*

3) *Neat diagrams must be drawn wherever necessary.*

4) *Use of logarithmic table, non programmable calculator is allowed.*

SECTION -I

Q1) Answer the following: **[10]**

a) State any two applications of amperometry.

b) State and explain Faraday's second law of electrolysis.

c) Explain the following terms:

    i) Limiting current.

    ii) Residual current.

d) State two applications of hydrodynamic voltammetry.

e) Give disadvantages of dropping mercury electrode.

Q2) Attempt any two of the following: **[10]**

a) Distinguish between differential pulse polarography and square-wave polarography.

b) Explain the criteria of reversibility of electrochemical reactions.

c) Explain the principle of amperometric titrations. Draw and discuss nature of amperometric titration curve when an electroactive reagent added into an electroinactive solution.

P.T.O.

d) An electroactive species yielded a wave with limiting current of 15.2µA at a rotating disk electrode which was rotated at 10 r/s. What limiting current would be expected at 30 r/s?

Q3) Attempt any one of the following: **[5]**

a) What are applications of coulometric titrations? List the advantages and limitations of coulometric titrations.

b) A sample of copper ore weighing 3.325 g is dissolved in acid and the copper is electrolysed using constant current of 2.5 A for 7.5 min. Calculate the percentage of copper in ore.

[Given: At. Wt. of Cu = 63.54]

SECTION - II

Q4) Answer the following: **[10]**

a) State applications of radiometric titration.

b) Distinguish between DTA and DSC.

c) Give the applications of neutron activation analysis.

d) Explain the following terms:

   i) Flux.

   ii) Saturation activity.

e) Explain the principle of inverse isotope dilution analysis.

Q5) Attempt any two of the following: **[10]**

a) Discuss the principle and technique of radiometric titrations. Draw and describe the nature of radiometric titration curve when only titrant is radioactive.

b) Explain, How to determine the volume of blood in patient by isotope dilution analysis?

c) Describe with suitable examples the effect of particle size of the sample, heating rate and furnace atmosphere on the nature of TGA curve.

d) An ancient gold coin weighting 3.5g was irradiated for 5 hours in neutron flux of 10^7 n cm^{-2} s^{-1} and activity of ^{198}Au formed, having t ½= 64.373 hours measured immediately after irradiation was found to be 5×10^5 counts per sec. The neutron absorption cross-section of ^{197}Au is 98.8 barns. Calculate percentage purity of gold coin.

Q6) Attempt any one of the following: **[5]**

a) Explain the principle of thermometric titrations. Describe the nature of thermometric titration curve for exothermic and endothermic reactions.

b) Calculate the percentage of $MgCO_3$ and $CaCO_3$ in 65 mg of limestone sample that exhibits thermogram showing weight of 56 mg at 500°C and 36 mg at 900°C.

[Given: At. Wt. of Ca = 40.08, Mg = 24.31, C = 12, O = 15.99]

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