RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

M.A./M.Sc. FIRST SEMESTER EXAMINATION, JANUARY 2015

FIRST YEAR

Date : 19/01/2015 **APPLIED CHEMISTRY**

Time : 11 am – 1 pm Paper : IV Full Marks : 50

[Use a separate Answer Book for each Group]

Group – A

[*Answer one question from each Unit*]

Unit – I

1. a) Give outlines of the analytical procedures for estimation of CaO in portland Cement. [4]
   b) How can Cu^{2+} and Zn^{2+} in a mixture be estimated complexometrically using EDTA? State the principle involved. [4]
   c) Why starch is added in cold condition in iodometric titration? [2]

2. a) What is gravimetric factor? Give the principle for the gravimetric estimation of PO_4^{3-}. {2+3]
   b) Does complexometric titration depend on specific pH. Explain the role of buffer in complexometric titration. [3]
   c) Give a brief introduction on Argentometry. [2]

Unit - II

3. a) A sample of hematite was analysed by 11 students. The values obtained for the percentage of Fe were as follows : 22·62, 22·73, 22·75, 22·78, 22·79, 22·83, 22·84, 22·87, 22·87, 22·92 and 22·94.
      i) Is rejection of the first value (22·62) justifiable on the grounds of huge error? [2]
      ii) How can you minimise error in a quantitative chemical analysis? [2]
   b) What are systematic and random errors?
      Analysis of a sample of iron ore gave the following percentage value of iron content: 7·08, 7·21, 7·09, 7·16 and 7·14. Calculate the mean, standard deviation and co-efficient of variation for the values. [2+4]

4. a) What do you mean by accuracy and precision in quantitative analysis? For titrating 10 ml of a 0·1(N) solution with 0·1(N) titrant the following volumes of titrant where obtained by two analyst:
      Analyst A: 9·80, 9·91, 9·85, 10·08 and 10·25 ml
      Analyst B:10·09, 10·12, 10·10, 10·12 and 10·08 ml
      Calculate the mean and standard deviation for the above two sets of results and hence comment on the accuracy and precision of the results. [2+(1·5+1·5)+2]
   b) In a quantitative chemical analysis small errors occurs more frequently than large errors, explain with example. Give reasons. [3]

Unit - III

5. a) What do you mean by BOD and COD of water samples? What would be the permissible levels of these parameters for drinking water? Give the principle for determination of BOD in water sample. [2+2+3]
   b) What is SPM? Give the principle for the estimation of SPM in Water Sample. [1+2]

6. a) How would you detect and estimate CO in air sample. [3]
   b) What is the permissible limit of As and Pb in drinking water? Give the principle for the estimation of As in water sample. [2+2]
   c) What do you mean by DO? What is the permissible range of DO in drinking water? [1·5]
   d) COD is Superior than BOD. —Explain. [1·5]

Group – B

[*Answer one question from each Unit*]

Unit - IV

7. a) Why EPR spectra are So broad? [2]
   b) How do you determine the 'g' value of an unknown sample in EPR spectroscopy? [2]
   c) Write down the name and structure of a standard free radical that is used as a marker in EPR spectroscopy. [2]
   d) Mention the basic principle of Mössbauer spectroscopy. [4]

8. a) What do you mean by Evolved gas Analysis (EGA)? [3]
   b) What is TGA? Show a TG Curve. Mention the factors on which the characteristics of a TG curve depend? [2+1+2]
   c) Mention the principle of O_2 sensor. [2]

Unit - V

9. a) Write a short note on 'Pulse polarography'. [4]
   b) How do you test for the reversibility of a redox reaction in CV? [2]
   c) Write down the Randles-Sevcik equation in CV and mention the units of the various parameters involved in it. [1+2]
   d) In a three electrode assembly, the potential is applied between which electrodes? [1]

10. a) Write down the basic principle of glucose sensor. Mention the name of one enzyme mediator in glucose sensor. [3+1]
    b) Write a concise note on 'Carbon Dioxide Sensor'. [4]
    c) Mention the working principle of 'Ethanol Sensor'. [2]

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