

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

M.A./M.Sc. FIRST SEMESTER EXAMINATION, DECEMBER 2016

FIRST YEAR [BATCH 2016-18]

APPLIED CHEMISTRY

Date : 21/12/2016

Time : 11 am – 1 pm

Paper : IV

Full Marks : 50

(Use Separate Answer Script for each Group)

Group-A

Unit-I

(Answer any one question)

[1×13]

1. a) Brass is dissolved with 1:1 HNO₃ treatment – why? [1]
b) How will you estimate Cu from the above brass solution iodometrically? [3]
c) How will you analyse available oxygen quantitatively in Pyrolusite? Give the chemical reactions. [2+2]
d) Gravimetric estimation of Ni (II) can not be done in strong acidic or strong basic medium. Why? [1]
e) 1.5 g of an Iron sample is dissolved in acid and the solution is diluted to 250 ml. 25 ml of solution is pipetted out and titrated with 0.1026 (N) K₂Cr₂O₇ using Barium diphenylamine sulfonate solution as indicator; and the titre value is 20.10 ml. Calculate the percentage of Iron content in the sample. [4]
2. a) Discuss the principle of EDTA titration in a mixture of Fe⁺³ and Al⁺³. [3]
b) Although EDTA is an excellent complexing agent but it can not be applied as an injection into the body during lead poisoning. [1]
c) How will you determine the amount of SiO₂ in soil sample? [2]
d) Explain the role of Zimmermann-Reinhardt reagent during the permanganometric estimation of Fe⁺³. [3]
e) 0.5745 gm of an alloy containing mainly Bi & Pb is dissolved in HNO₃ and diluted to 250 ml. 50 ml of aliquot is pipetted & pH is adjusted to 1.5 and for Bi, 31 ml of 0.1025 (M) EDTA is required for end point. The pH of solution is then increased to 5.0 and for Pb the titre value is 20.0 ml with same EDTA. Calculate the % of Pb and Bi in the alloy. [4]

Unit-II

(Answer any one question)

[1×12]

3. a) What do you mean by accuracy and precision of measurements? [4]
b) Density of ice is 0.917 gm/cc. Calculate the mass of cubic block of ice which is 75 mm on each side. [2]
c) Complete the following to the appropriate significant number $\frac{3.24 \times 0.08666}{5.006}$. [3]
d) Analysis of a sample of Iron ore gives the following percentage of Iron content: 7.08, 7.12, 7.21, 7.09, 7.16 & 7.14. Calculate the standard deviation and co-efficient of variation for the values. [3]
4. a) Explain the Gaussian type curve for the error distribution of a determination. [2]
b) How many significant figures are present in 500.0? [1]

c) Calculate the following:

$$\frac{14.3(\pm 0.2) - 11.6(\pm 0.2) \times 0.050(\pm 0.001)}{[820(\pm 10) + 1030(\pm 5)] \times 423(\pm 0.4)} = 1.725(\pm ?) \quad [4]$$

d) What do you mean by confidence interval of the mean? [2]

e) A soda ash sample contains 93.50, 93.58, 93.43% Na_2CO_3 within what range are you confident 95% that the true value lies? (For 95% C.L; $t = 4.303$). [3]

Unit-III

(Answer any one question) [1×5]

5. a) Discuss the principle for the quantitative analysis of dissolved oxygen (DO) in water sample by 'Winkler's method' and explain the role of each reagent used for DO analysis. [3]

b) Which one of the Water samples will have higher DO level and why? [2]

(i) Waste water (ii) Fresh water.

6. a) The COD values are greater than of BOD for the same sample of water: Explain. [1]

b) Which relation is used to determine biological oxygen demand in water? [1]

c) What is COD and its significance? [2]

d) Discuss one method to detect CO in air. [1]

Group-B

Unit-IV

(Answer any one question) [1×10]

7. a) Why EPR spectra are plotted in a derivative mode? Mention the free electron 'g' value. [2+1]

b) Give examples of two Mössbauer active nuclear. [1]

c) What do you mean by 'Ion-selective Electrode'? Write down the basic principle of 'Fluoride selective Electrode'. [2+2]

d) Distinguish between Normal Phase and Reverse Phase HPLC. [2]

8. a) Write a short note on 'Solid state Fluoride Sensor'. [3]

b) How do you test for the quasi-reversibility of a redox reaction in CV? [2]

c) Write down the ILKövic equation as used in polarography. Mention of units of the various parameters involved in it. [1+2]

d) What do you mean by R_f factor in Paper chromatography? [2]

Unit-V

(Answer any one question) [1×10]

9. a) What are Stokes and Anti-Stokes Raman radiations? Stokes radiation is generally more intense than Anti-Stokes radiation – Explain. [1+1+3]

b) Mention some applications of 'Thin Layer Chromatography (TLC)'. [2]

c) The R_f value of three solutes (A, B and C) in TLC analysis is reported to be 0.2, 0.8 and 0.9 respectively. Put your suggestion about separation possibility from their binary mixtures. [3]

10. a) What is Derivative Thermogravimetry (DTG)? Mention its important features. [1+3]

b) What is Differential Scanning Calorimetry (DSC)? Show a typical melting DSC peak with proper labelling. Write down four applications of DSC. [2+2+2]

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