

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

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

FIRST YEAR [BATCH 2015-17]

APPLIED CHEMISTRY

Date : 31/12/2015

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) How would you determine the following : [3+3]
i) MnO_2 in Pyrolusite ii) Calcium in dolomite
- b) 0.100gm sample of brass is dissolved in acid and the volume is made upto 250ml. 25ml of solution is pipetted and is titrated iodometrically with 0.1050 (N) $\text{Na}_2\text{S}_2\text{O}_3$ to give 15.5ml titre value. Calculate the percentage of Cu in the given sample. [3]
- c) Starch solution as an indicator is added near the end point of titration— Explain. [1]
2. a) Discuss the principle of gravimetric estimation of Aluminium. [2]
- b) Name one adsorption indicator and discuss its action in titration of NaCl with AgNO_3 solution. [1+2]
- c) Mention the main constituents of Portland cement. [1]
- d) Why Edta is a very suitable reagent in complexometric titration? [1]
- e) 100ml sample of water containing Ca^{+2} and Mg^{+2} is titrated with 16.0ml of 0.0120(M) Edta in an NH_3 buffer at pH ~ 10. Again 100ml same water sample is treated with NaOH to precipitated $\text{Mg}(\text{OH})_2$ and then titrated at pH ~ 13 with 10.4ml of same Edta. Calculate CaCO_3 & MgCO_3 in ppm. [3]

Unit - II

3. a) The experimentally measured values of A, B, C are 235.4 ± 0.5 , 216.3 ± 0.25 and 107.95 ± 0.55 respectively. Calculate the value of $\frac{A-B}{C}$. [4]
- b) A liquid weighing 100.1g has a volume of 80.1ml. Calculate the density of the liquid to the appropriate number of significant numbers. [1]
- c) Five set of estimations of Cr content of a steel sample by persulfate method were done and the percent of Cr found are 1.12, 1.15, 1.11, 1.16 and 1.12 respectively. Calculate the standard deviation of the results. [3]
- d) What do you mean by accuracy and precision of measurements? [2]
4. a) Differentiate between Determinate and Indeterminate error. [3]
- b) Calculate the error in the result of the following calculations $\frac{7.00(+0.07)}{14.00(+0.01)}$. [3]
- c) A soda ash sample is analysed by titration with standard HCl. The analysis is performed in triplicate with the following results, 93.50%, 93.58% and 93.43% Na_2CO_3 . Within what range are you 95% confident that the true value lies? At 95% C.L and two degrees of freedom $t = 4.303$. [4]

Unit - III

5. a) What do you understand by DD? How can you estimate DO in a water sample. [1+2]
- b) How the quantity of Arsenic is measured in a sample of water? [2]

- c) What is COD? Discuss its significance. [2+2]
- d) How small amount of CO is detected in air sample. [1]
- 6. a) Discuss briefly the principle about the collection and estimation of CO_x in air sample. [3]
- b) i) How are F⁻ ion in water estimated? [2]
- ii) Mention the limit of F⁻ ion that is really needed for health. [1]
- c) Give the principle for determining BOD. How is BOD calculated? [2+2]

Group – B

(Answer one question from each Unit)

Unit - IV

- 7. a) Distinguish between Rayleigh Scattering and Raman Scattering. [2]
- b) Stokes' lines are generally more intense than anti-Stokes' lines in Raman Spectroscopy— Explain why. [2]
- c) Why EPR spectra are inherently broad? [2]
- d) Name the best known free radical as used in calibrating EPR spectrum. [1]
- e) What do you mean by R_f factor in paper chromatography? [2]
- f) Name two Mössbauer active nuclides. [1]
- 8. a) What do you mean by DTA? Show a DTA curve. What is Glass Transition Temperature? [2+2+1]
- b) Mention some applications of EPR Spectroscopy. [2]
- c) Distinguish between Normal phase HPLC and Reverse phase HPLC. [3]

Unit - V

- 9. a) Mention the original cause(s) of reversibility, quasi-reversibility and irreversibility of an electrochemical redox reaction. [2]
- b) Write down the Ilkovic equation. Mention the units of the various parameters involved in it. [1+2]
- c) Give the name and structure of one important enzyme mediator as used in glucose biosensor. Show its scheme of mediation. [1+1]
- d) Compare acid contrast between LSV and CV. [3]
- 10. a) What do you mean by polarographic maxima? [2]
- b) Write a short note on Fluoride Sensor. [3]
- c) What do you mean by 'Tissue and Bacteria Electrodes'? [2]
- d) In a three electrode assembly, the current flows between which electrodes? [1]
- e) Mention the working principle of CO₂ sensor. [2]

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