BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: IMSc, MSc & PRE_PhD | **SEMESTER : VIII (IMSc)/II (MSc)**
BRANCH: CHEMISTRY | **SESSION : SP/22**

SUBJECT: ANALYTICAL CHEMISTRY (CH 412)

TIME: 2 HOURS | **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a) What do you mean by 'Control chart'? Explain with appropriate example. [5]

Q.1(b) What are indeterminate errors? Explain with suitable examples. With the help of schematic, indicate how this type of error can be statistically eliminated. [5]

Q.2(a) Compare and contrast 'Headspace-GC' vs 'SPME-GC'. Elaborate the advantages of 'SPME-GC' analysis over 'headspace-GC' analysis. [5]

Q.2(b) What do you mean by *normal phase* and *reverse phase* chromatography? Comment on their applications. [5]

Q.3(a) Phenolphthalein is a suitable indicator for the titration of NaOH with HCl, but not with CH_3COOH. Why? Draw the titration curve of weak acid vs strong base and strong acid vs weak base when acid is added from the burette. [5]

Q.3(b) Complexometric titration with EDTA is in general carried out using NH_4OH/NH_4Cl buffer. Why? Explain the role of Zimmerman–Reinhardt' reagent in redox titration. [5]

Q.4(a) Discuss the chemistry of determination of Sm-Co alloy composition by TGA in oxidizing atmosphere. [5]

Q.4(b) What is 'thermal lag'? How to avoid it? TGA of nitrates are difficult to perform. Comment. [5]

Q.5(a) Define equivalent and molar conductance. What is Kohlrausch law of independent migration of ions? Determine the equivalent and molar conductance at infinite dilution for $Ca_3(PO_4)_2$. [λ_{eq}^{∞} (Ca^{2+}) = 59.5 S cm^2 eq^{-1}; λ_{eq}^{∞} (PO_4^{3-}) = 69 S cm^2 eq^{-1}]. [5]

Q.5(b) How Mohr salt can be estimated with potassium dichromate potentiometrically? Draw the corresponding titration curve and write the corresponding Nernst equation. [5]

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