

SHREE H.N. SHUKLA GROUP OF COLLEGES

(AFFILIATED TO SAURASHTRA UNIVERSITY & GTU)



2-vaishali nagar, Near
Amrapali railway
crossing,
Raiya road, Rajkot-
360001. Ph.No.-
(0281)2440478, 2472590

3-vaishali nagar, Near
Amrapali railway
crossing,
Raiya road, Rajkot-
360001. Ph.No.-
(0281)2471645

Behind marketing yard,
Near Lalpari lake,
Between Amargadh-
Bhichri, Rajkot-360002.
Ph.No.-90990 63150

M.Sc. SEMESTER-II

C-205: PRACTICAL

INORGANIC CHEMISTRY

1. Inorganic Qualitative Analysis

Analysis of a mixture containing six radicals including one less common metal ion: W, Tl, Ti, Mo, Se, Zr, Th, Ce, V and Li.

Minimum 15 mixtures containing inorganic salts like CuSO_4 , KBr , TiO_2 , KI , Na_2CrO_4 , CaCO_3 , $\text{Zr}(\text{NO}_3)_3$, NaNO_3 , ZnS , Na_2SO_4 , SeO_2 , NaCl , K_2SO_4 , $(\text{NH}_4)_2\text{SO}_4$, $(\text{NH}_4)_2\text{MoO}_4$, BaCl_2 , ZnCO_3 , $\text{Al}_2(\text{SO}_4)_3$, V_2O_5 , ZnS , $\text{Ni}(\text{NO}_3)_2$, KNO_2 , $\text{Th}(\text{NO}_3)_3$, KCl , CdCO_3 , CuCl_2 , LiCO_3 , K_2SO_4 , AlPO_4 , H_3BO_3 , $(\text{NH}_4)_2\text{SO}_4$, CeSO_4 , CdCl_2 , $\text{Th}(\text{NO}_3)_3$, NaNO_3 , ZnCO_3 , AlPO_4 , LiCO_3 , $\text{Pb}(\text{NO}_3)_2$, NaNO_2 , $\text{Zr}(\text{NO}_3)_3$, Na_2WO_4 , MnSO_4 , NaHSO_3 , SeO_2 , K_2CrO_4 , FeSO_4 , $(\text{NH}_4)_2\text{SO}_4$, $(\text{NH}_4)_2\text{MoO}_4$, Na_3AsO_3 , Na_3AsO_4 , $(\text{NH}_4)_2\text{SO}_4$, K_2SO_4 , CeSO_4 , As_2O_3 , NH_4Cl , NiSO_4 , LiCO_3 , MgCO_3 , NaNO_2 , $\text{Mg}_3(\text{PO}_4)_2$, V_2O_5 , H_3BO_3 , SrCO_3 , $\text{Th}(\text{NO}_3)_3$, Na_3AsO_3 , Na_3AsO_4 , BaCO_3 and LiCO_3 .

2. Inorganic Preparation Binuclear and Mono Nuclear Metal Complexes

Preparation of selected inorganic metal complexes and their estimation by volumetric/gravimetric/colorimetric techniques to determine the percentage purity of the complexes prepared.

- Tetrammine cupric sulphate $[\text{Cu}(\text{NH}_3)_4]\text{SO}_4 \cdot \text{H}_2\text{O}$.
- Tri (thiourea) cuprous sulphate $[\text{Cu}(\text{NH}_2\text{CSNH}_2)_3]_2\text{SO}_4 \cdot 2\text{H}_2\text{O}$.
- Tri (thiourea) cuprous chloride $[\text{Cu}(\text{NH}_2\text{CSNH}_2)_3]\text{Cl}$.
- Hexa ammine nickel(II) chloride $[\text{Ni}(\text{NH}_3)_6]\text{Cl}_2$.
- Hexathiourea-plumbus nitrate $[\text{Pb}(\text{NH}_2\text{CSNH}_2)_6](\text{NO}_3)_2$.
- Potassium trioxalato chromate $\text{K}_3[\text{Cr}(\text{C}_2\text{O}_4)_3]$.
- Potassium trioxalato aluminate $\text{K}_3[\text{Al}(\text{C}_2\text{O}_4)_3]$.
- sodium trioxalato ferrate(III) $\text{Na}_3[\text{Fe}(\text{C}_2\text{O}_4)_3] \cdot 9\text{H}_2\text{O}$.
- Hexamminecobalt(III) chloride $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$.
- Pentathioureadicuprous nitrate $[\text{Cu}(\text{NH}_2\text{CSNH}_2)_5](\text{NO}_3)_2$.
- Iron(III) acetylacetonate $\text{Fe}(\text{acac})_3 / \text{Fe}(\text{C}_5\text{H}_7\text{O}_2)_3$

3. Quantitative Analysis

Estimation of the metal complexes by different techniques to determine the percentage purity quantitatively of the complexes.

- Cu-EDTA (Volumetrically) and Cu-KCNS(Gravimetrically).
- Ni- EDTA (Volumetrically) Ni- DMG (Gravimetrically.)
- Co- EDTA (Volumetrically).
- Cr- EDTA-Pb(NO)₂ (Volumetrically, Back Titration).
- Al- EDTA -ZnSO₄ (Volumetrically, Back Titration).
- Oxalate -KMnO₄(Volumetrically).

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ORGANIC CHEMISTRY

1. Multistep Preparation

- m-Nitro aniline from nitrobenzene.
- Hydro quinone diacetate from hydroquinone.
- p-Methyl acetanilide from p-toluidine.
- p-,Bromo-aniline from aniline.
- 7-Hydroxycoumarin from resorcinol.
- Hippuric acid from glycine.
- Aspirin from salicylic acid
- Phthalamide from phthalic acid.
- Magneson-II (4,4' nitro benzene azo 1)naphthol) from p-nitroaniline.
- Benzimidazol from o-nitroaniline.
- Resacetophenone from resorcinol.

2. Qualitative Analysis of BI-functional Compounds:

- | | |
|-------------------------|------------------------------------|
| a. Anthranilic acid | i. Ethyl acetoacetate |
| b. p-Aminobenzoic acid | j. P-Dichlorobenzene |
| c. o-Chlorobenzoic acid | k. o/p-Cresol |
| d. m-Nitrobenzoic acid | l. o/m/p-Toluidine |
| e. o/m/p-Nitroaniline | m. Benzanilide |
| f. Bi-phenyl amine | n. Acetamide |
| g. N,N-Dimethyl aniline | o. α/β -Naphthole, etc. |
| h. Resorcinol | |

NOTE: Other bifunctional compounds may be asked in examination.

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PHYSICAL CHEMISTRY

Conductometry

1. To determine the concentration of HCl / CH₃COOH / Oxalic acid/ HCl + CH₃COOH+ CuSO₄/ Satd BA/ NH₄Cl/CH₃COONa/ mix of CH₃COONa + NH₄Cl.
2. To study the complexation of Ni⁺² with EDTA.
3. To determine the equivalent conductance and dissociation constant of a weak electrolyte and to verify Oswald's dilution law.
4. To determine the equivalent conductance of a strong electrolyte and hence to verify the Ostwald's equation.
5. To determine the degree of hydrolysis and hydrolysis constant NH₄Cl/ CH₃COONa.

pHmetry

6. To determine the dissociation constant of benzoic/acetic / lactic acid.
7. To determine the concentration and amount of acid in a mixture of hydrochloric acid and acetic acid.
8. To determine the concentration and dissociation constants of a dibasic acid (oxalic acid).
9. To determine the dissociation constant of acetic acid (Buffer).

Potentiometry

10. To determine the normality and dissociation constant of the given acid (satd. BA).
11. To determine the normality and dissociation constants of the given dibasic acid (oxalic acid).
12. To determine the normality of hydrochloric acid and acetic acid in the mixture.
13. To determine the standard redox potential and thermodynamic parameters of the Fe⁺² ion.
14. To determine the concentration of KCl and the solubility product of AgCl.
15. To determine the normality of each halide in the mixture of halides.
16. To determine the standard oxidation potential of the quin hydroneelectrode.

Spectrophotometry

17. To examine Lambert-Beer law in concentrated solution.
18. To study the rate of iodination.
19. To determine the composition of binary mixture containing potassium permanganate and potassium dichromate.

Ultrasonics

20. To determine the acoustical parameters of a given liquid.

Chemical kinetics

21. To determine the reaction velocity and reaction rate constant for the reaction between acetone and iodine.
22. To determine the heat and entropy of vaporization of a given liquid by kinetic approach.
23. To determine the kinetic parameters and temperature coefficient of reaction between KBrO₃ and KI.
24. To determine the kinetic parameters and the temperature coefficient of the reaction between K₂S₂O₈ and KI.

Thermodynamics

25. To determine the solubility and heat of solution of benzoic acid in toluene.
26. To determine the partial molar volume and the composition of unknown mixture of ethanol/methanol and water.

Partition function

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ANALYTICAL CHEMISTRY

1. Preparation and standardization of 0.1N HCl, 0.1N H₂SO₄ and 0.1N HNO₃, against 0.1N NaOH solution as well as other strength of solutions. Find mean, standard deviation and other statistical parameters.
2. Preparation and standardization of 0.1N and 0.5N solution of NaOH and standardized against potassium hydrogen phthalate and succinic acid. Find mean, standard deviation, t-test and F-test.
3. Preparation and standardization of 0.1N or 0.1M I₂ solution and standardized against standard thiosulphate solution and other standardization solutions.
4. To determine the amount of iodine in iodized salt.
5. To determine the amount of vitamin-C (ascorbic acid) in a given sample.
6. To determine the percentage of reducing sugars in Honey sample.
7. To determine the saponification value of an oil or fat sample.
8. To determine the percentage of tannin in tea leaves.
9. To determine the percentage of calcium gluconate in the given commercial sample by complexometric titration.
10. To determine the amount of aspirin in a given sample.
11. To determine the iodine value of an oil or fat.
12. To estimate the amines using bromate-bromides solution (Bromination) method.
13. To estimate the calcium and magnesium in the given mixture solution of both by EDTA complexometric method. (50ml of mixture solution of Ca⁺² and Mg⁺² (25ml Ca⁺² solution from CaCO₃ 10gm/L and 25ml Mg⁺² solution (MgCO₃ 8.4 gm/L) use minimum quantity of dil. HCl (1ml) for Ca⁺² and Mg⁺² solution).
14. To determine chloride and bromide ion by precipitation titration method.
15. To determine barium gravimetrically and copper by volumetrically in a given mixture.
16. To determine the total protein content and solid content in sample of milk. (Formaldehyde method).
17. To determine the percentage of phthalic anhydride and maleic anhydride and find mean, and standard deviation.
18. To determine amount of iron (III) in solution by photometric titration (static) with EDTA.
19. To determine the amount of Cu⁺² using DMG by spectrophotometric method.
20. To determine available chlorine in bleaching materials.

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M. Sc. SEMESTER-II

C-206: VIVA VOCE

Based on theory C-201 to C-204 and practicals