

CHE-152-P: Chemistry Practical-II

Course type: Major (Practical)

No. of Credits: 2

Course Outcomes

After the completion of this course, student will be able to-

CO-1: learn vital lab techniques: colorimetry, kinetics, organic purification, investigative inorganic experiments, and Avogadro applications.

CO-2: apply theoretical principles to design and conduct experiments, analyze data, and draw conclusions.

CO-3: cultivate critical thinking skills to ensure the reliability and accuracy of experimental results.

CO-4: communicate scientific findings through laboratory reports, utilizing proper scientific formatting, terminology, and data analysis techniques.

CO-5: evaluate experimental outcomes to draw insightful conclusions.

CO-6: develop problem-solving skills.

Course Content

Set I: Physical and Analytical Chemistry (Any four)

1. Determination of unknown concentration of KMnO_4 by Colorimetry.
2. Estimation of Cu^{++} ion by using EDTA Colorimetrically.
3. Determination of Heat of Neutralization of Strong Acid & Strong Base.
4. Study the kinetics of acid hydrolysis of methyl acetate with hydrochloric acid.
5. Compare the strengths of HCl and H_2SO_4 by studying kinetics of hydrolysis of methyl acetate
6. Study of kinetics of decomposition of H_2O_2 (Clock Reaction)

Set II: Organic Chemistry

A. Organic Purification Techniques (Any two)

1. Purification of organic compounds by-
 - i) Crystallization (from water and alcohol)
 - ii) Sublimation
 - iii) Simple distillation
 - iv) Steam distillation

C. Analysis of Organic Compound (Any two)

1. Detection of elements (N, S, Cl, Br, I) in the organic compounds

Set III: Inorganic Chemistry

A. Investigative Experiments in Inorganic Chemistry (Any two)

1. Study stoichiometry of reaction between KMnO_4 and FeSO_4 by titration method hence determination of number of electrons involved in the reaction and equivalent weight of oxidizing agent - KMnO_4 .
2. Determination of dissociable H^+ ions (basicity) of boric acid hence determination of its equivalent weight by acid base titration. Explain observed basicity of the boric acid.
3. Estimation of number of water of crystallization in Mohr's salt by titrating with KMnO_4 .

B. Table work (Compulsory)

1. Polar plots of s and p orbitals

C. Chemistry with Computers (Any one)

2. Study of molecular properties of some molecules using open access computational Chemistry package Avogadro and give the explanations for observed properties.
3. Draw the structure of using Avogadro. Record their bond length and dipole moment of these molecules and explain observed trend in periodicity of these two properties of in halide group elements.
4. Draw the structure of H_2O , H_2S , H_2Se and H_2Te molecules using Avogadro. Optimize structure. Record their bond length, bond Angle and dipole moment of these molecules. Explain observed trend in periodicity of these three properties of in halide group elements.
5. Draw the structure of CH_4 , NH_3 , H_2O , molecules using Avogadro. Optimize structure. Record their bond length, bond Angle and dipole moment of these molecules. Explain observed bond angles.

References:

1. Svehla, G. Vogel's Qualitative Inorganic Analysis, Pearson Education, 2012.
2. Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson, 2009.
3. Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., Text book of Practical Organic Chemistry, Prentice-Hall, 5th edition, 1996.
4. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry Orient-Longman, 1960
5. Khosla, B. D.; Garg, V. C. & Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi (2011).
6. R.K. Gupta and O.P. Gupta, Practical Chemistry.

7. Daniel C. Harris, Quantitative Chemical Analysis.
8. O.P. Tandon, Practical Chemistry.
9. N.K. Verma and S.C. Kheterpal, Comprehensive Practical Chemistry
10. K.C. Jain, Advanced Practical Chemistry.
11. <https://avogadro.cc/>
