Shiksha Mandal's

Bajaj College of Science, Wardha

(An Autonomous Institution)

Department of Chemistry

Proposed Syllabus for B.Sc. Honors with Chemistry as Major

VOCATIONAL SKILL COURSE (VSC)

Semester III Course in Chemistry

Syllabus under Autonomy

(Discussed in BOS Meeting of 10-October-2023 and approved in BOS Meeting of 28-March-2024 to be implemented from Academic Session 2024-25)

Shiksha Mandal's
Bajaj College of Science, Wardha
(An Autonomous Institution)

VOCATIONAL SKILL COURSE (VSC)

UCH232P– Industrial Chemistry

[60 hrs] **[Credits 2]**

Course Description

The main purpose of this course is to make students aware of importance of chemistry in various industrial processes. Industrial chemistry basically deals with the development, optimisation and monitoring of various chemical processes used in industry for transforming raw materials etc., into useful commercial products for society. The analytical and synthetic aspects of the industrial processes are emphasized in this course. The main focus is given on water analysis and its treatment along with some sample analysis and preparation of some important compounds. Industrial chemistry as an applied science plays a vital role in diverse areas that influence human society.

Course Objective

1. To introduce the learners about importance of water in industrial processes.
2. To train the learners for analysis of given water samples.
3. To train them to analyse given samples to find the content of chlorine and calcium in them.
4. To understand determination of saponification and acid values of given oil samples.
5. To learn to prepare some important compounds.

Course Outcome

At the end of this course, the student will be able to:

1. Comprehend analysis of given water samples.
2. Analyse given samples to find the content of chlorine and calcium in them.
3. Determine saponification and acid values of given oil samples.

Syllabus

A. Water Analysis

1) Determination of hardness of water sample by E.D.T.A. method.
2) Experiment on water treatment by using ion exchange resins.
3) Determination of dissolved oxygen present in given water sample by Iodometric method (Winkler‟s Method).
4) Determination of Chemical Oxygen demand (COD) in given water sample.
5) Determination of Biological Oxygen demand (BOD) in given water sample.
6) To determine acidity of water sample.
7) To determine alkalinity of water sample.
8) Determination of chloride content in water sample by precipitation titration method.

B. Sample Analysis

1) To determine the percentage of available Chlorine in bleaching powder.
2) To determine calcium content in chalk powder as calcium oxalate by permanganometry.
3) Determination of saponification value of an oil sample.
4) Determination of acid value of an oil sample.

Reference Books

1) E. Stocchi: Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK.
2) R.M. Felder, R.W. Rousseau: Elementary Principles of Chemical Processes, Wiley Publishers, New Delhi.
3) J. A. Kent: Riegel’s Handbook of Industrial Chemistry, CBS Publishers, New Delhi.
4) S. S. Dara: A Textbook of Engineering Chemistry, S. Chand & Company Ltd. New Delhi.
5) A. K. De, Environmental Chemistry: New Age International Pvt, Ltd, New Delhi.
6) S. M. Khopkar, Environmental Pollution Analysis: Wiley Eastern Ltd, New Delhi.

Shiksha Mandal's

Bajaj College of Science, Wardha

(An Autonomous Institution)

Department of Chemistry

Proposed Syllabus for B.Sc. Honors with Chemistry as Major / Minor

SKILL ENHANCEMENT COURSE (SEC)

Semester III Courses in Chemistry

Syllabus under Autonomy

(Discussed in BOS Meeting 10-October-2023 and approved in BOS Meeting 28-March-2024 to be implemented from Academic Session 2024-25)

Shiksha Mandal's
Bajaj College of Science, Wardha
(An Autonomous Institution)

Skill Enhancement Course

Basic Analytical Skills - UCH233P

[60 hrs] **[Credits: 2]**

Course Details:

Analytical skills are required in all fields of experimental sciences, ranging from basic sciences to industrial or clinical applications. This course will enable students to acquire fundamental analytical skills for systematic identification and analysis of samples.

Course Objectives:

- To make students aware of the concepts of chemical analysis.
- To make them acquire few analytical skills analytical techniques, qualitative and quantitative analyses.

Course Learning Outcomes:

By the end of the course, the students will be able to:

- Perform chemical analysis of samples.
- Prepare buffer solutions and determine pH of different solutions.
- Do qualitative and quantitative analysis of samples.
- Identify biomolecules like carbohydrates, proteins, and fats.

Practical

1. Estimation of Ba^{2+} as $BaSO_4$ gravimetrically.
2. Estimation of Ni^{2+} as Ni-DMG gravimetrically.
3. To determine composition of Fe-SSA complex by Job's method.
4. To determine composition of Fe-SSA complex by Mole ratio method.
5. Measurement of pH of different acidic and basic solutions using pH meter.
6. Measurement of pH of solutions like aerated drinks, fruit juices, shampoos, and soaps.
7. Preparation and measurement of pH of following buffer solutions and comparison of the values with theoretical values: (a) Sodium acetate-acetic acid (b) Ammonium chloride-ammonium hydroxide.
8. Determination of carbohydrate by Molisch test.
9. Determination of carbohydrate (starch) by iodine test.

10. Determination of protein by the Biuret test.
11. Estimation of Glucose.
12. To determine saponification value of an oil/fat.

Reference Books:

1. Quantitative analysis: Day and Underwood (Prentice-Hall of India)
2. Vogel's Textbook of Quantitative Inorganic Analysis-Bassett, Denney, Jeffery and Mendham (ELBS).
3. Analytical Chemistry: Gary D. Christian (Wiley India).
4. Instrumental Methods of Analysis: Willard, Merrit, Dean, Settle (CBS Publishers, Delhi, 1986).
5. Sample Pre-treatment and Separation: R. Anderson (John Wiley and Sons).
6. Stoichiometry: B.I.Bhatt and S.M. Vora, 2nd Edition (Tata Mc-Graw Hill publication)
7. Instrumental Methods of Chemical Analysis: Braun (Tata McGraw-Hill)

Shiksha Mandal's

Bajaj College of Science, Wardha

(An Autonomous Institution)

Department of Chemistry

Proposed Syllabus for B.Sc. Honors with Chemistry as Major/ Minor

SKILL ENHANCEMENT COURSE (SEC)

Semester IV Course in Chemistry

Syllabus under Autonomy

(Discussed in BOS Meeting of 10-October-2023 and approved in BOS Meeting of 28-March-2024 to be implemented from Academic Session 2024-25)

Shiksha Mandal's
Bajaj College of Science, Wardha
(An Autonomous Institution)

Skill Enhancement Course

UCH243P – General Instrumental Techniques

[60 hrs] **[Credits 2]**

Course description:

This course is the extension of General Analytical chemistry course introduced in First Semester. This course will provide a practical introduction and experience in the use of analytical instrumentation, and stress its increasing significance in 21st century research. Emphasis will be placed on sample preparation, instrumental operation/methods, and data interpretation.

Course Objectives

The Course is aimed at

- Introducing students to instrumental methods of analysis.
- Studying fundamental principles and applications of pH-metry.
- Knowing basics of conductometry and its applications.
- Understanding concept of Cell EMF and applications of potentiometry.
- Gaining knowledge of various classical methods of analysis.
- Studying fundamental principles and applications of colourimetry.

Course Learning Outcomes

At the end of this course, the student will be able to:

- Apply knowledge of basic principles of pH-metry, conductometry, potentiometry and spectrophotometry in sample analysis.
- Interpretation of data obtained from some important instruments and using the data to calculate important parameters of sample solution like concentration.

Contents: -

A. pH Metry

1) Calibration of pH meter
2) Determination of pH of diluted acids & bases
3) Determination of strength of strong acid by titrating against strong base using pH meter.

B. Conductometry

1) To determine the strength of the given strong acid conductometrically using standard alkali solution.
2) To determine the strength of the given weak acid conductometrically using standard alkali solution.
3) To determine the strength of strong acid and a week acid in a given mixture conductometrically by titrating it with standard alkali solution.
4) Determination of dissociation constant of weak acid by conductivity method.

C. Potentiometry

1) To determine the strength of the given strong acid (HCl) potentiometrically using standard alkali solution.
2) To determine the strength of the given weak acid (CH_3COOH) potentiometrically using standard alkali solution.
3) To titrate potentiometrically ferrous ammonium sulphate solution using potassium dichromate solution as titrate and calculate the redox potential of Fe^{2+}/Fe^{3+} system on hydrogen scale.

D. Spectrophotometry

1) To verify Beer–Lambert's law using $KMnO_4$ solution
2) Spectrophotometric determination of concentration of unknown $KMnO_4$ solution.
3) Colourimetric estimation of Cu (II) as a copper ammonia complex.

Reference Books:

1. Quantitative analysis: Day and Underwood (Prentice-Hall of India)
2. Vogel's Textbook of Quantitative Inorganic Analysis-Bassett, Denney, Jeffery and Mendham (ELBS).
3. D.A. Skoog, F.J. Holler, T.A. Nieman, Principles of Instrumental Analysis, Engage Earning India Edn
4. Analytical Chemistry: Gary D. Christian (Wiley India).
5. Instrumental Methods of Analysis: Willard, Merrit, Dean, Settle (CBS Publishers, Delhi, 1986).
6. Instrumental Methods of Analysis: G. Chatwal and S. Anand (Himalaya Publishing House)
7. Advance Analytical Chemistry: Meites and Thomas: (Mc Graw Hill)