



KADI SARVA VISHWAVIDYALAYA

**KADI SARVA
VISHWAVIDYALAYA,
GANDHINAGAR**



**B.Sc. Curriculum as Per NEP
Chemistry Course for Semester 2**

W.E.F. June 2023



KADI SARVA VISHWAVIDYALAYA

Chemistry Major Course -1

CHM211-1C FUNDAMENTALS OF CHEMISTRY-II

LEARNING OUTCOMES:

- In this course, student will understand the concept of the transition, lanthanide and actinide elements including their various properties.
- Student will acquire knowledge regarding the structure, mechanism and various concept of reactivity, acid –base concept.
- They will develop a comprehensive understanding of the chemical properties of inorganic-organic compounds, as well as gain insights into the behavior of chemical concepts and kinetics.

| Subject Code | Subject Title | Teaching Scheme | | Credits | Examination Scheme | | | Total Marks |
|------------------|------------------------------|---------------------|------------------------|---------|--------------------|----------|----------|-------------|
| | | | | | Max Marks | | | |
| | | Theory hrs Per Week | Practical hrs Per Week | | Hrs. | Mid Term | End Term | |
| <u>CHM211-1C</u> | Fundamentals of Chemistry-II | 4 | 0 | 4 | 2.5 | 50 | 50 | 100 |

Contents

| | | |
|--|---------------------------|------------------------|
| Unit 1: Chemistry of elements | Teaching Hours: 15 | (Weightage 25%) |
| <ul style="list-style-type: none">• d-block elements- Electronic Configuration. Oxidation state, Periodic properties, Basic properties• Lanthanides and Actinides -Electronic Configuration. Oxidation state, Contraction, Separation methods | | |
| Unit 2: Electrophilic Aromatic Substitution | Teaching Hours: 15 | (Weightage 25%) |
| <ul style="list-style-type: none">• Introduction, Effect of substituent groups, Determination of orientation and relative reactivity, Classification of substituent groups, Orientation and synthesis, Mechanism of nitration, Sulfonation, Friedel-Craft alkylation and halogenations, Orientation in mono and disubstituted benzenes, Electrophilic aromatic substitution (Two steps), Theory of reactivity, Theory of orientation, Electron release via resonance | | |
| Unit 3: Acid Base concept | Teaching Hours: 15 | (Weightage 25%) |
| <ul style="list-style-type: none">• Proton Acids-Bases theory, Lewis Acids-Bases theory, Scale of acidity-basicity, Factors effecting acidity and basicity of organic compounds, Effect of hybridization, Steric effects, Effects by hydrogen bonding• Hard and Soft Acids and Bases(HSAB)- Classification of Acid and Bases as hard and soft. Pearson's HSAB concept, Acid base strength vs hardness and softness, Relation of electronegativity with hardness and softness. | | |



KADI SARVA VISHWAVIDYALAYA

Unit 4: Chemical kinetics

Teaching Hours: 15

(Weightage 25%)

- Rate of reaction, Order of reaction, Molecularity, Pseudo order reaction, • Rate equation for zero, first and second order reaction. ($a=b$), ($a \neq b$) • Characteristics of second order reaction. • Rate equation for third order reaction ($a=b=c$) • Characteristics of third order reaction. • Numerical

Reference books:

1. 'Concise Inorganic Chemistry' J.D.Lee, 5th edn.
2. Text book of Organic Chemistry, ArunBahal, S.Chand.
3. Principal of Physical Chemistry by Puri, Sharma, Pathania.
4. Analytical Chemistry, Garry D.Christain.



KADI SARVA VISHWAVIDYALAYA

Chemistry Major Course -2

CHM212-1C CHEMISTRY PRACTICALS-II

LEARNING OUTCOMES:

- They will acquire knowledge regarding the structural orientation of organic molecules and various tests of their respective functional groups.
- Furthermore, students will develop a comprehensive understanding of the properties of organic compounds and their derivatives.
- Throughout this course, students will have practical understanding of chemical kinetics and some physicochemical properties.

| Subject Code | Subject Title | Teaching Scheme | | Credits | Examination Scheme | | | Total Marks |
|------------------|--------------------------------|------------------------|----------|----------|--------------------|-----------|------------|-------------|
| | | Practical hrs Per Week | Hrs. | | Max Marks | | | |
| | | | | | Mid Term | End Term | | |
| CHM212-1C | Chemistry Practicals-II | 8 | 4 | 5 | 50 | 50 | 100 | |

UNIT-I Practical (Organic), Any Ten Teaching Hours: 60

- Identification of an organic compound through the functional group analysis, Determination of melting point and boiling point, Preparation of suitable derivative.
- List of compounds
Acids: Benzoic acid, Cinnamic acid, Phthalic acid, Oxalic acid, Succinic acid.
- Phenols: α -Naphthol, β -Naphthol.
- Bases: p-Toluidine, Diphenylamine, Aniline.
- Neutrals: Naphthalene, Anthracene, Acetamide, Benzamide, Acetanilide, m-Dinitrobenzene, Urea, Thiourea, Toluene, Acetone, Benzaldehyde, Methyl acetate, Ethyl acetate, Ethanol, 1-Propanol, Glycerol, Chloroform, Carbon tetrachloride, Chlorobenzene, Nitrobenzene.

UNIT-II Practical (Physical) Teaching Hours: 60

- **Chemical Kinetics Experiments**
- To study the kinetics of the reaction of decomposition of H_2O_2 catalyzed by iodine ion (Clock reaction)
- Effect of concentration and temperature on the rate of reaction between Sodium Thiosulphate and Hydrochloric acid.
- Reaction between Potassium Iodate, (KIO_3) and Sodium Sulphite: (Na_2SO_3) using starch solution as an indicator (clock reaction).



KADI SARVA VISHWAVIDYALAYA

- **Viscosity (Any two)**
- To determine the viscosity of different mixtures of liquid A and B and determine the percentage composition of unknown mixture by graphical method
- Stalagmometry
- To determine the surface tension and compare cleaning-efficiency of two samples of a detergent or soap with stalagmometer

- **Surface Chemistry (Any Two)**
- To prepare colloidal solution (sol) of starch and gum .
- To prepare ferric hydroxide, $[\text{Fe}(\text{OH})_3]$ sol. And aluminium hydroxide, $[\text{Al}(\text{OH})_3]$ sol.
- To study the effectiveness of different common oils (castor oil, cotton seed oil, coconut oil, kerosene oil, mustard oil) in forming emulsions.
- To compare the effectiveness of a number of emulsifying agents in forming emulsions.

Reference books:

[1] Vogel AI, Furniss BS. Vogel's textbook of practical organic chemistry. 5th ed. London: Longman Scientific & Technical; 1989.

[2] Principle of Physical Chemistry by Puri, Sharma, Pathania.



KADI SARVA VISHWAVIDYALAYA

Chemistry Minor Course- Semester II

CHE207-1C BASICS OF CHEMISTRY-II

LEARNING OUTCOMES:

- In this course, student will understand the concept of the transition, lanthanide and actinide elements including their various properties.
- Student will acquire knowledge regarding the structure, mechanism and various concept of reactivity, orientation, and electron resonance.
- Furthermore, students will develop a comprehensive understanding of the behavior of organic compounds preparation with their derivatives.

| Subject Code | Subject Title | Teaching Scheme | | Credits | Examination Scheme | | | Total Marks |
|------------------|------------------------|---------------------|------------------------|---------|--------------------|-----------|----------|-------------|
| | | Theory hrs Per Week | Practical hrs Per Week | | Hrs. | Max Marks | | |
| | | | | | | Mid Term | End Term | |
| <u>CHE207-1C</u> | Basics of Chemistry-II | 2 | 4 | 4 | 2.5 | 50 | 50 | 100 |

Unit 1: Chemistry of Elements

Teaching Hours: 15

- **d-block elements**- Electronic Configuration. Oxidation state, periodic properties, Basic properties
- **Lanthanides and Actinides** -Electronic Configuration. Oxidation state, Contraction, Separation methods

Unit 2: Electrophilic Aromatic Substitution

Teaching Hours: 15

- Introduction, Effect of substituent groups, Determination of orientation and relative reactivity, Classification of substituent groups, Orientation and synthesis, Mechanism of nitration, Sulfonation, Friedel-Craft alkylation and halogenations, Orientation in mono and disubstituted benzenes, Electrophilic aromatic substitution (Two steps), Theory of reactivity, Theory of orientation, Electron release via resonance

UNIT 3: Practical (Organic), Any Ten

Teaching Hours: 60

- Identification of an organic compound through the functional group analysis, Determination of melting point and boiling point, Preparation of suitable derivative.
- List of compounds
Acids: Benzoic acid, Cinnamic acid, Phthalic acid, Oxalic acid, Succinic acid.
- Phenols: α -Naphthol, β -Naphthol.



KADI SARVA VISHWAVIDYALAYA

- Bases: p-Toludine, Diphenylamine, Aniline.
- Neutrals: Naphthalene, Anthracene, Acetamide, Benzamide, Acetanilide, m-Dinitrobenzene, Urea, Thiourea, Toluene, Acetone, Benzaldehyde, Methyl acetate, Ethyl acetate, Ethanol, 1-Propanol, Glycerol, Chloroform, Carbon tetrachloride, Chlorobenzene, Nitrobenzene.

Reference books:

1. 'Concise Inorganic Chemistry' J.D.Lee, 5th edn.
2. Text book of Organic Chemistry, ArunBahal, S.Chand.
3. Principle of Physical Chemistry by Puri, Sharma, Pathania.
4. Analytical Chemistry, Garry D.Christain
5. Fundamentals of Analytical Chemistry D.A.Skoog, D.M. West & F.J. Holler
6. Principles of Analytical Chemistry J.H. Kennedy
7. Analytical Chemistry – Principles & Techniques L.G. Hargis



KADI SARVA VISHWAVIDYALAYA

Chemistry Multidisciplinary Course – Semester II

MDC218-1C INTRODUCTION TO CHEMISTRY-II

LEARNING OUTCOMES:

- Student will acquire knowledge regarding the structure, mechanism and various acid–base concept with theories.
- Students will develop a comprehensive understanding of Chemical kinetics and physiochemical properties.

| Subject Code | Subject Title | Teaching Scheme | | Credits | Examination Scheme | | | Total Marks |
|------------------|------------------------------|---------------------|------------------------|---------|--------------------|-----------|----------|-------------|
| | | Theory hrs Per Week | Practical hrs Per Week | | Hrs. | Max Marks | | |
| | | | | | | Mid Term | End Term | |
| <u>MDC218-1C</u> | Introduction to Chemistry-II | 2 | 4 | 4 | 2.5 | 50 | 50 | 100 |

Unit 1: Acid Base concept

Teaching Hours: 15

- Proton Acids-Bases theory, Lewis Acids-Bases theory, Scale of acidity-basicity, Factors effecting acidity and basicity of organic compounds, Effect of hybridization, Steric effects, Effects by hydrogen bonding
- Hard and Soft Acids and Bases(HSAB)- Classification of Acid and Bases as hard and soft. Pearson's HSAB concept, Acid base strength vs hardness and softness, Relation of electronegativity with hardness and softness.
-

Unit 2. Chemical kinetics

Teaching Hours: 15

- Rate of reaction, Order of reaction, Molecularity, pseudo order reaction, • Rate equation for zero, first and second order reaction. (a=b), (a≠b)• Characteristics of second order reaction. • Rate equation for third order reaction (a=b=c)• Characteristics of third order reaction. • Numerical

Unit 3: Practical Organic (Any Ten)

Teaching Hours: 60

- Identification of an organic compound through the functional group analysis, Determination of melting point and boiling point, Preparation of suitable derivative.
- List of compounds
Acids: Benzoic acid, Cinnamic acid, Phthalic acid, Oxalic acid, Succinic acid.
- Phenols: α -Naphthol, β -Naphthol.
- Bases: p-Toludine, Diphenylamine, Aniline.
- Neutrals: Naphthalene, Anthracene, Acetamide, Benzamide, Acetanilide, m-Dinitrobenzene, Urea, Thiourea, Toluene, Acetone, Benzaldehyde, Methyl acetate, Ethyl acetate, Ethanol, 1-Propanol, Glycerol, Chloroform, Carbon tetrachloride, Chlorobenzene, Nitrobenzene.



KADI SARVA VISHWAVIDYALAYA

Reference books:

- [1] Vogel AI, Furniss BS. Vogel's textbook of practical organic chemistry. 5th ed. London: Longman Scientific & Technical; 1989.
- [2] Principle of Physical Chemistry by Puri, Sharma, Pathania.



KADI SARVA VISHWAVIDYALAYA

Chemistry SEC (Skill Enhancement Course)– Semester II

SEC217-1C- CHEMISTRY INSTRUMENTATION AND LABORATORY SKILLS-II

LEARNING OUTCOMES:

- The objective of this course is to foster proficiency in fundamental knowledge of chemistry laboratories, laboratory equipment, preparation of solutions
- Application of physicochemical principles in laboratory experiments.

| Subject Code | Subject Title | Teaching Scheme | | Credits | Examination Scheme | | | Total Marks |
|--------------|--|---------------------|------------------------|---------|--------------------|-----------|----------|-------------|
| | | Theory hrs Per Week | Practical hrs Per Week | | Hrs. | Max Marks | | |
| | | | | | | Mid Term | End Term | |
| SEC217-1C | Chemistry Instrumentation and laboratory skills-II | 2 | 0 | 2 | 2 | 25 | 25 | 50 |

Unit 1: Separation and Purification Techniques (Weightage :50%)

Characterization, uses and selection of separation process, filtration techniques, filter paper, simple filtration, filtration through vacuum pump, distillation- types of distillation, simple distillation, fractional distillation, difference between simple and fractional distillation. Paper chromatography, Thin Layer Chromatography

Unit 2. Lab Testing and Quality Assurance (Weightage :50%)

Gravimetric methods, volumetric methods

Industry and sub-sectors, Standards for manufacturing in life-sciences, drug regulatory agencies, Quality control, Role of quality control chemist, Quality management systems, Productivity concept, Government regulations in industries like pharmaceuticals, food supplements, and cosmetics.

Reference books:

1. Vogel, Arthur I: A Test book of Quantitative Inorganic Analysis (Rev. by GH Jeffery and others) 5th Ed. The English Language Book Society of Longman
2. Willard, Hobert H. et. al: Instrumental Methods of Analysis, 7th Ed. Wardsworth Publishing Company, Belmont, California, USA, 1988.
3. Skoog D.A., West D.M., Holler, F.J., Crouch S.R., Fundamentals of Analytical Chemistry, 9th Edition, Cengage learning.
4. Quality control chemist participant manual prepared by LSSSDC in collaboration with NSDC India.
5. iso.org