**GUJARAT UNIVERSITY**
**B. Sc. SEMESTER II**
**CHEMISTRY**
**EFFECTIVE FROM – JUNE 2023**
**ACCORDING TO NEP – 2020**

## Course Structure with respect to credit, hours and marks

| Course Type | Course | Credit | Work Hours/ week | Exam hours | Marks | | Total Mark |
|---|---|---|---|---|---|---|---|
| | | | | | Internal | External | |
| Inter Disciplinary [Multi-disciplinary] Courses | IDC-CHE 124T Chemistry in Physical Science | 2 | 2 | 1 | 25 | 25 | 50 |
| | IDC-CHE 124P | 2 | 4 | 3 | 25 | 25 | 50 |

*** IDC- CHE 124P = CHEMISTRY PRACTICAL**
**N.B.: Each practical batch should have 10 students**
**No. of students per batch during practical exam. = 10**

# IDC- CHE 124T
# CHEMISTRY IN PHYSICAL SCIENCES

## Learning Objectives:

- To understand the development of chemistry as Indian knowledge and as philosophy in the ancient India.
- To develop the basic knowledge and conceptual ideas regarding the structure of atoms.
- To understand the basic concepts of Radioactivity and its principle.
- To study the stability of nucleus and factors affecting on the stability of nucleus.
- To understand the radioactive reactions and radioactive energy.

## Learning outcomes:

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

- Learn the history of Indian Chemistry, ancient Indian knowledge and philosophy of chemistry.
- Learn significance of the Indian knowledge with modern scientific perspectives.
- Learn the application of nuclear energy and nuclear reactions.
- Know half-life, Average life.
- Learn Nuclear reactions, Nuclear Fission and fusion reactions, Artificial radioactivity.

## B.Sc. SEMESTER II
## IDC – CHE 124T
## CHEMISTRY IN PHYSICAL SCIENCES

### UNIT I: History of Chemistry in Ancient India: Indic Knowledge System [25 Marks] [15 Hours]

Pre-Harappan Period, Post-Harappan Period, Chemistry in Indus Vally Civilisation, Chemistry in Vedic Period, The Constitution and properties of Matter: Atomic theory, Combination of Atom, Atomic theory Of Jainas.

### UNIT II: Nuclear Chemistry [25 Marks] [15 Hours]

Radioactivity, Types of radiations, Detection and Measurement of radioactivity, Types of radioactive decay, Fajans-Soddy group displacement law, Radioactive disintegration series, Rate of radioactive decay, Units of radioactivity, Half-life, Calculation of half-life and sample left after time T, Average life, nuclear reactions, Nuclear Fission and fusion reactions, Artificial radioactivity, Energy released in nuclear reactions (Einstein's equation relating mass and energy), Mass defect, nuclear binding energy and its calculation, Neutron-Proton ratio and nuclear stability, nuclear reactor, nuclear power plant.

## REFERENCE BOOKS


1.'**Elements of Physical Chemistry**' by Peter Atkins & Julio De Paula, 5/E, Indian Edition, Oxford University Press.
2. '**Physical Chemistry**' by P. W. Atkins, 7/E, 2002, Indian Edition Oxford University Press.
3. '**Physical Chemistry**' by W. J. Moore, 6/E, 1996, MacGraw Hill Publication.
4. '**Principle of Physical Chemistry'** by Puri, Sharma & Pathania, 41/E, Vishal Publishers.
5. '**Essentials of Physical Chemistry'** by Bahl & Tuli, 22/E, S. Chand publication, New Delhi.
6. '**Advanced Physical Chemistry**' by Gurdeep Raj, 19/E, Goel Publishing House Meerut
7. **'History of Chemistry in Ancient and Medieval India'** by P. Ray, Pages 1-48.

## IDC – CHE 124P

## Learning Objectives:

- To know iodimetry and iodometry titrations.
- To study oxidizing and reducing agents in titrations.
- To understand calibration and application of pH- meter.

## Learning outcomes:

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

- Understand difference between iodimetry and iodometry titrations.
- Operate and calibrate pH – meter.
- Understand the theory and applications of titrations.

## IDC – CHE 124P
## CHEMISTRY LAB – CIII LAB

**[50 marks]**
**[60 Hours]**

Basic awareness to lab instruments, reagents, indicators & lab. technics.

### (I) Volumetric Titrations
Preparation of solutions of different Normality, Molarity, %V/V, %W/V, %W/W.

### (II) Acid base titrations
1. $Na_2CO_3$ → 0.1N HCl
2. Estimation of carbonate and bicarbonate together → 0.1N HCl

### (III) Redox titration
Preparation of standard solutions of $KMnO_4$
1. Std. $KMnO_4$ → Oxalic acid

### (IV) Complexometric Titration
Preparation of standard solutions of EDTA.
1. $Zn^{++}$ → Std. EDTA

### (V) Iodimetry Titration
Preparation of standard solutions of $Na_2S_2O_3.5H_2O$.
1. Iodine → Std. Sodium thiosulphate

## (VI) Iodometry Titration

Preparation of standard solutions of $Na_2S_2O_3.5H_2O$.

1. $CuSO_4.5H_2O$ → Std. $Na_2S_2O_3.5H_2O$.
2. $K_2Cr_2O_7$ → Std. $Na_2S_2O_3.5H_2O$.

## Demonstration

## Concept of pH, buffer solution, electrodes

1. Demonstration of pH – meter and measurement of pH of o.1N HCl solution.
2. Preparation of an acidic buffer ($CH_3COONa$ - $CH_3COOH$, pH = 5) and its pH measurement.
3. Preparation of a basic buffer ($NH_4Cl$ - $NH_4OH$, pH = 10) and its pH measurement.

## Viva-Voce questions

## REFERENCE BOOKS


1. **'Analytical Chemistry'** by Dhruba Charan Dash, 2011, 2th Ed., PHI Learning Private Ltd, New Delhi.
2. **'Analytical Chemistry' by Gary D. Christian,** 1986**,** 4th Ed., John Wiley & Sons.
3. '**Advanced Practical Inorganic Chemistry'** by Gurdeep Raj, 9th Ed., Goel Publishing House, Meerut.
4. **'Advanced University Practical Chemistry'** by P. C. Kamboj, Vishal Publishing Co., Jallandhar – Delhi.