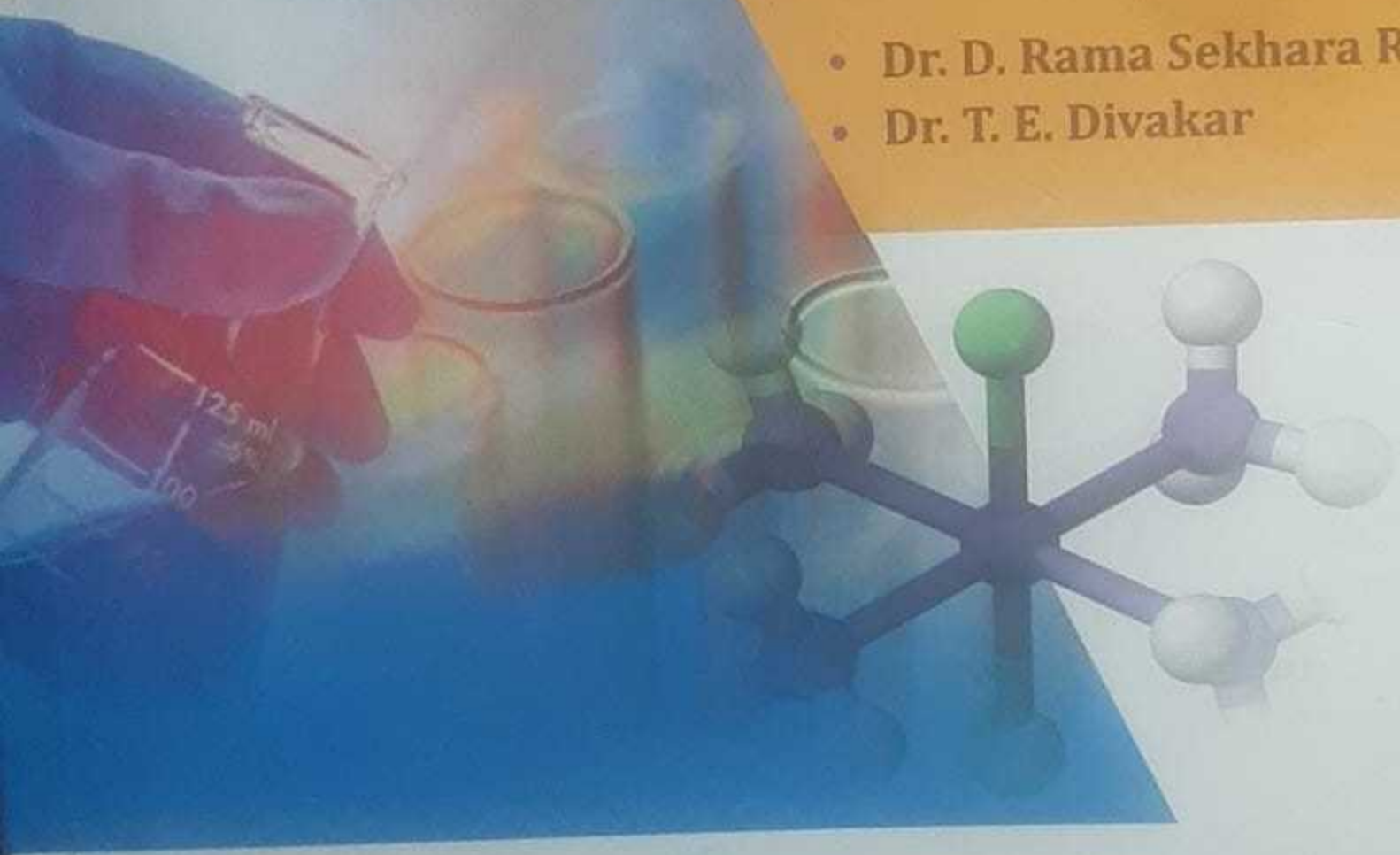
Revised as per the Syllabus of APSCHE effective from 2020-21

INORGANIC AND PHYSICAL CHEMISTRY

B.Sc., Chemistry

1st Year / 1st Semester

- Dr. D. Rama Sekhara Reddy
- Dr. T. E. Divakar



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Preface

The present edition of the book is written strictly according to new latest revised syllabus prescribed for A.P. Universities by APSCHE. The book is written in a simple and lucid style.

Every effort has been made to make the book free from errors or omissions. In spite of this, some errors may creep in. Neither the publisher nor the author or the seller will be responsible for any damage or loss of action to anyone, of any kind, in any manner, therefrom. However, any mistake, error or discrepancy noted may be brought to our notice which shall be taken care of in the next edition.

We hope the present edition will be highly appreciated and prove its worth. However, we invite suggestions from teachers as well as students for the improvement of the book.

Dr. D. Rama Sekhara Reddy

Dr. T.E. Divakar

Syllabus

SEMESTER – I

COURSE I – (INORGANIC AND PHYSICAL CHEMISTRY) SYLLABUS 60 HRS (4 HOURS/WEEK)

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

1. Understand the basic concepts of p-block elements.
2. Explain the difference between solid, liquid and gases in terms of intermolecular interactions.
3. Apply the concepts of gas equations, pH and electrolytes while studying other chemistry courses.

INORGANIC CHEMISTRY (24 HOURS)

UNIT – I: CHEMISTRY OF p-BLOCK ELEMENTS (8 HOURS)

Group 13: Preparation and structure of Diborane and Borazine.

Group 14: Preparation, classification and uses of Silicones.

Group 15: Preparation and structure of Phosphonitrilic halides $\{(PNCl_2)_n$ where n = 3, 4.

Group 16: Oxides and Oxoacids of Sulphur (structures only).

Group 17: Pseudo halogens, Structures of Interhalogen compounds.

UNIT – II:

1. Chemistry of d-block Elements (6 Hours):

Characteristics of d-block elements with special reference to electronic configuration, variable valence, magnetic properties, catalytic properties and ability to form complexes. Stability of various oxidation states.

2. Chemistry of f-block Elements (6 HOURS):

Chemistry of lanthanides – electronic structure, oxidation states, lanthanide contraction, consequences of lanthanide contraction, magnetic properties. Chemistry of actinides – electronic configuration, oxidation states, actinide contraction, comparison of lanthanides and actinides.

3. Theories of Bonding in Metals (4 HOURS):

Valence bond theory and Free electron theory, explanation of thermal and electrical conductivity of metals based on these theories, Band theory – formation of bands, explanation of conductors, semiconductors and insulators.

PHYSICAL CHEMISTRY (36 HOURS)

UNIT – III: SOLID STATE (10 HOURS)

Symmetry in crystals. Law of constancy of interfacial angles. The law of rationality of indices. The law of symmetry. Miller indices, Definition of lattice point, space lattice, unit cell. Bravais lattices and crystal systems. X-ray diffraction and crystal structure. Bragg's law. Powder method. Defects in crystals. Stoichiometric and non-stoichiometric defects.

UNIT – IV:

1. Gaseous State (6 Hours):

Van der Waal's equation of state. Andrew's isotherms of carbon dioxide, continuity of the state. Critical phenomena. Relationship between critical constants and Van der Waal's constants. Law of corresponding states. Joule-Thomson effect. Inversion temperature.

2. Liquid State (4 Hours):

Liquid crystals, mesomorphic state. Differences between liquid crystal and solid/liquid. Classification of liquid crystals into Smectic and Nematic. Application of liquid crystals as LCD devices.

UNIT – V: SOLUTIONS, IONIC EQUILIBRIUM AND DILUTE SOLUTIONS

1. Solutions (6 Hours):

Azeotropes-HCl-H_2O system and ethanol-water system. Partially miscible liquids – phenol-water system. Critical solution temperature (CST), Effect of impurity on consulate temperature. Immiscible liquids and steam distillation. Nernst distribution law. Calculation of the partition coefficient. Applications of distribution law.

2. Ionic Equilibrium (3 Hours):

Ionic product, common ion effect, solubility and solubility product. Calculations based on solubility product.

3. Dilute Solutions (7 Hours):

Colligative properties – RLVP, Osmotic pressure, Elevation in boiling point and depression in freezing point. Experimental methods for the determination of the molar mass of a non-volatile solute using osmotic pressure. Abnormal colligative properties. Van't Hoff factor.

CO-CURRICULAR ACTIVITIES AND ASSESSMENT METHODS:

1. Continuous Evaluation: Monitoring the progress of student's learning.
2. Class Tests, Worksheets and Quizzes.
3. Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality.
4. Semester-end Examination: A critical indicator of student's learning and teaching methods adopted by teachers throughout the semester.

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