

As Per New Syllabus (CBCS Pattern and NEP 2020)
Shivaji University, Kolhapur
B.Sc. Part-II : Semester-III

PHYSICAL CHEMISTRY

(CHEMISTRY : DSC-3C : PAPER-V)

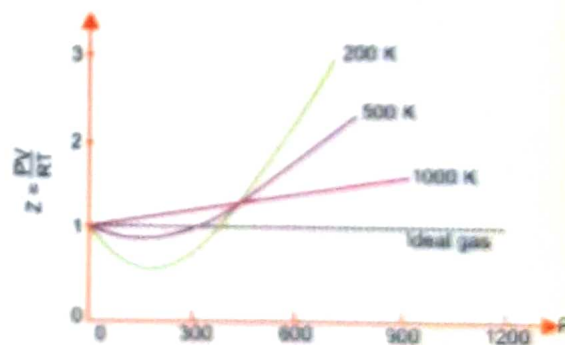
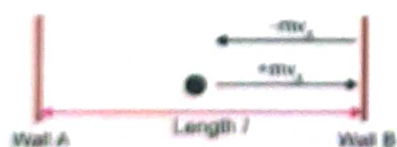
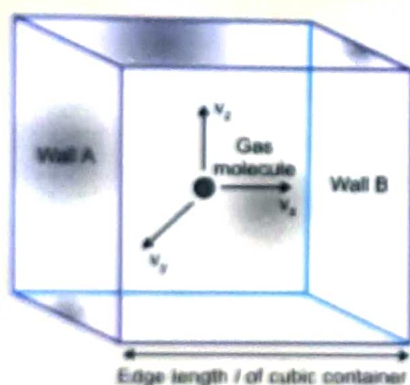
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A TEXT BOOK OF
PHYSICAL CHEMISTRY

(DSC-3C : Paper - V)

FOR

B.Sc. Part - II : Semester-III

As Per New Revised NEP - 2020 Pattern

Syllabus of Shivaji University, Kolhapur w.e.f. June 2023

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PREFACE

This book is basically intended for B.Sc.-II students for Semester-III Course of Shivaji University, Kolhapur. This book is written according to new NEP-2020 Pattern syllabus being implemented from June 2023 prescribed by Shivaji University, Kolhapur.

It is our great pleasure to present this book to the students and respected teachers in proper time. The subject matter is presented in simple and lucid language. This book covers all the chapters mentioned in the syllabus. The material is presented in a comprehensive way and the sequence of articles in each chapter helps the students to understand the subject with ease.

Different diagrams and illustrative description is provided to enhance the learning and understanding of the matter by students as well as to enable the teachers to explain the difficult concepts properly. The solved numerical examples, long answer type questions, short answer type questions including multiple type questions are given at the end of each chapter.

We are thankful to Nirali Prakashan, Pune for making us a part of their team of Authors. We thank Mr. Dineshbhai Furia and Mr. Jignesh Furia for publishing this book.

Last but not the least we are very much indebted to Mr. Virdhaval Shinde (Marketing Executive, Kolhapur District) and Mr. Ashok Nanavare (Marketing Executive, Sangli District) for their nice co-operation. We are very much thankful to Mr. Kiran Kamble (Proof Reading), Mrs. Shraddha Shedge (Graphic Design) and Mr. Malik Shaikh for a neat and error free D.T.P. of this book.

We hope that this book will be found useful by students and teachers. We will appreciate any suggestions for the improvement of the book.

Authors

SYLLABUS

B. Sc. Part II - DSC-3C : PHYSICAL CHEMISTRY PAPER-V

Theory: 30 Hours, Marks-40 (Credits: 02)

Unit 1: Electrolytic Conductivity

(6 Hours)

- 1.1 Introduction, Migration of ions.
- 1.2 Hittorf's rule, Transference number, Determination of transport number using Hittorf's method and moving boundary method, Factors affecting transport number: Nature of electrolyte, concentration, Temperature, Complex formation and Degree of hydration.
- 1.3 Kohlrausch law of independent migration of ions and its applications such as relations between ionic conductance, Ionic mobility and transport number, Determination of equivalent conductance at infinite dilution of weak electrolytes, Determination of degree of ionization of weak electrolyte, Solubility and solubility products of sparingly soluble salts.
- 1.4 Conductometric titrations (only acid-base titrations with mixture of strong and weak acid). Advantages of conductometric titrations.
- 1.5 Numerical Problems.

Unit 2: Thermodynamics

(6 Hours)

- 2.1 Introduction, Concept of Entropy: Definition, Mathematical expression, Unit.
- 2.2 Physical significance of Entropy.
- 2.3 Entropy changes for reversible and irreversible processes in isolated systems.
- 2.4 Entropy changes for an ideal gas as a function of V and T and as function of P and T.
- 2.5 Entropy change in mixing of gases.
- 2.6 Entropy change in phase transformations.
- 2.7 Third law of thermodynamics, Standard entropy, Application of third law of thermodynamics in determination of absolute entropy, Entropy changes in chemical reactions
- 2.8 Numerical Problems.

Unit 3: Chemical Kinetics

(4 Hours)

- 3.1 Introduction.
- 3.2 Third order reactions: Derivation of rate constant considering reaction with Equal initial concentration, Characteristics, and examples of third order reaction.
- 3.3 Determination of order of reaction by: (i) Integration method, (ii) Graphical method and (iii) Half-life method.
- 3.4 Effect of temperature on rate of reaction, Arrhenius equation. Concept of energy of activation.
- 3.5 Numerical Problems.

Unit 4: States of Matter

(8 Hours)

- 4.1 Introduction, States of matter and their properties.
 - (A) Gaseous state:
- 4.2 Postulates of Kinetic Theory of Gases and derivation of the kinetic gas equation.
- 4.3 Ideal and Non-ideal gases, Deviation of real gases from ideal behavior, Compressibility factor, Causes of deviation.
- 4.4 Van der Waals equation of state for real gases. Explanation of real gas behavior by Van der Waal's equation, Boyle temperature (derivation not required).
- 4.5 Critical Phenomena: PV-isotherms of real gases (Andrew's isotherms), Continuity of state, Critical constants and their calculation from Vander Waals equation.
- (B) Liquid state:
- 4.6 Liquid crystals: Difference between liquid crystal, Solid and liquid.
- 4.7 Classification, Structure of nematic, Smectic and Cholestric liquid crystal.
- 4.8 Thermography and seven segment cell.
- 4.9 Numerical Problems.

Unit 5: Surface Chemistry

(6 Hours)

- 5.1 Introduction, Adsorption as a surface phenomenon, Definition of adsorption, Adsorbent, Adsorbate. Characteristics of adsorption.
- 5.2 Factors affecting adsorption, Types of adsorption, Distinction between physical and chemical adsorption,
- 5.3 Adsorption isotherms: Freundlich adsorption isotherm, Langmuir adsorption isotherm. BET equation.
- 5.4 Applications of adsorption.

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