UNIVERSITY OF LADAKH

SYLLABUS

OF

THE FOUNDATION COURSE

OF

Physical and Chemical Science

(UNDER NEP – 2020)

(Implemented w. e. f Academic Session 2023-24)

UNIVERSITY OF LADAKH

SYLLABUS OF THE FOUNDATION/INTRODUCTORY COURSE IN PHYSICAL AND CHEMICAL SCIENCE

UNDER NATIONAL EDUCATION POLICY - 2020
(Session2023-2024)

Objectives: Section A of this course provides an understanding of basic concept of Physical quantities andtheir dimension. It also provides an understanding of Co-ordinate system. The Section B shall provide an understanding of Fundamental concept of an atom and its periodic properties. It also provides an understanding of bonding and molecular structure

Semester: I **Credits: 03 Theory**
Course Code: PCS-PC-101-C **Duration: 45 Hours**
Maximum marks: 75 **Minimum Marks: 27**
Course Title: Physical and Chemical Science

Unit-I 15 Hrs.

Section A: Physical Science

1.1 Unit and Dimension: Fundamental units, Derived units, Dimensional Formula, Dimensional analysis, Homogeneity of dimension.

1.2 Error analysis: Types, propagation of error, least count, accuracy and precision.
1.3. Fundamental forces in nature: Gravitational force, Electromagnetic force, nuclear force, Weak Force.
1.4 Scalar and Vector: Properties of Vector, Addition, Subtraction and multiplication of vector physical quantities.
1.5. Co-ordinate system: Cartesian coordinate system, Polar coordinate system, Spherical Coordinate system, cylindrical coordinate system (Position vector, Area vector, volume), relation between Cartesian and spherical, relation between Cartesian and cylindrical.

Section B: Chemical Science

Unit II: Elements: Classification and Periodic properties (15 Hr)

2.1 : Atomic Structure: Need of Classification of elements and modern periodic table; Concept of atom and atomic structure (basic idea).

2.2 : Rules for filling electrons in various orbitals; electronic configuration of elements (up to Z=30); valence electrons and valency;

2.3 : Anomalous configuration; Stability of half-filled and completely filled orbitals; Degeneracy of atomic orbitals.

2.4 : Quantum numbers. Shapes of *s*, *p* and *d* atomic orbitals; nodes.

Unit III: Chemical Bonding and Molecular Structure (15 Hr)

3.1 : Types of bonds: Ionic, Covalent and Coordinate bond. Lewis structures of molecules and ions (HCN, H_2O, SF_2, CO_2, OH^-, CO_3^{2-}, SO_4^{2-}, NO_3^-).

3.2 : VBT and VSEPR theory: Assumptions**;** Shapes of some inorganic molecules on the basis of

VSEPR theory and hybridization - (BeF_2, BF_3, CH_4, NH_3, H_2O, PCl_5, SF_4, ClF_3, SF_6).

3.3: Molecular Orbital Theory: Postulates; Energy level diagrams and Bond order of homonuclear diatomic molecules (N_2, O_2, F_2). Concept of sigma & Pi bond.

3.4: Resonance: Concept of resonance and resonating structures in various inorganic molecules.

Chemical Science References:

Essential/Recommended Readings:

- Puri Sharma Kallia: Principle of inorganic Chemistry
- Lee, J.D. Concise Inorganic Chemistry ELBS, 1991.
- Cotton, F.A., Wilkinson, G. & Gaus, P.L. Basic Inorganic Chemistry, 3rd ed., Wiley.
- R.L. Madan & G.D. Tuli: Advanced Inorganic Chemistry
- Gurdeep Raj: Advanced Inorganic Chemistry.

Suggestive Readings

- Douglas, B.E., McDaniel, D.H. & Alexander, J.J: Concepts and Models in Inorganic Chemistry, John Wiley & Sons.
- Huheey, J.E., Keiter, E.A., Keiter, R.L. & Medhi, O.K: Inorganic Chemistry: Principles of Structure and Reactivity, Pearson Education India, 2006.
- Donald Arthur Tarr and Gary L. Miessler: Inorganic Chemistry
- D.K. Chakrabarty: Inorganic Chemistry
- R. L. Dutta & G. S. De: Inorganic Chemistry

Physical Science References:

Essential/Recommended Readings

- Physics – Resnick, Halliday & Walker 9/e, 2010, Wiley
- Concept of Physics by H C Verma Vol. I
- An Introduction to Mechanics by D Klepner and R Kolenkow

Suggestive Readings

- University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
- Mechanics, D. S. Mathur

Laboratory Course

Physical and Chemical Science -I (PCS-PC-L-101)

Practical: 01 Credit **Duration: 30 Hr**

Maximum Marks: 25 **Minimum Marks: 09**

Physics Lab. Work

1. Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope.
2. Use of multimeter for measuring AC, DC, voltage, current, resistance.
3. To determine the Height of a Building using a Sextant.
4. Value of g by using simple pendulum.
5. Verification of parallelogram law of vectors.

Chemistry Lab. Work

1. Study of Safety Symbol of Chemicals.
2. Preparation of 0.1-0.001 M Standard Solution of $NaHCO_3$
3. Preparation of 0.1-0.001 N Standard Solution of Oxalic Acid.
4. Preparation of 0.1-0.001 N Standard Solution of $K_2Cr_2O_7$
5. Titration of acid and base.

Recommended Readings:

- Advanced Practical Physics for students, B.L.Flint and H.T.Worsnop, 1971, Asia Publishing House.
- B.Sc Practical Physics by C.L. Arora.
- A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
- B.Sc. Practical Chemistry: NK Sinha
- Vogel's; A text book of Quantitative Chemical Analysis.
- Practical Chemistry: O.P. Pandey, D. N. Bajpai and S. Geri
- Analytical Chemistry, 6^{th} edition: Gary D. Christain

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Syllabus of the Foundation Course in Physical & Chemical Science as per NEP-2020 for Undergraduate Program.

Semester: II **Credits: 03 Theory**
Course Code: PCS-PC-201-C
Course Title: Physical and Chemical Science-II **Duration: 45 Hours**
Maximum marks: 75 **Minimum Marks: 27**

Objectives: Section A of this course provides an understanding of Semiconductors and Logic gates. It also provides an understanding of fluid dynamics. The Section B shall provide an understanding of Classification and Nomenclature of Organic Compounds. It further provides basic concept of reactive intermediates and electronic displacements.

Section A: Physical Science

Unit-I 15 Hrs.

1.1 Semiconductor and device: Semiconductor, Types of semiconductors, Intrinsic and extrinsic Semiconductor, Diodes, Zener diode, LED.

1.2 Logic Gate: OR, AND, NOT, NOR, NAND, XOR, Bolean Algebra and truth table.

Unit II 15 Hrs.

2.1: Static Fluid mechanics: Surface energy, surface tension and its application, capillary action, angle of contact.

2.2: Fluid Dynamics: Pascal's Law and its application, Viscosity, Stoke's law, terminal velocity, Streamline and turbulent flow, Critical velocity, Reynold's number, Bernoulli's Theorem and its application.

Section B: Chemical Science

Unit III: Fundamentals of Organic Chemistry- I 15 Hr

3.1: Hydrocarbon: Introduction, Classification and IUPAC nomenclature of Alkane, Alkene, Alkyne and Alicyclic Compounds (up to 7 carbons).

3.2: Alcohols (Aliphatic and aromatic) and Ethers (acyclic): Introduction, Classification and IUPAC Nomenclature.

3.3: Carbonyl compounds: Introduction and IUPAC nomenclature of aldehydes, ketone and carboxylic acid.

3.4 Electronic Displacements: Inductive Effect, Electrometric Effect, Resonance and Hyperconjugation.

3.5 Cleavage of Bonds: Homolysis and Heterolysis.

Concept of Nucleophiles and electrophiles with example.

3.6 Reactive Intermediates: Classification, structure and stability of Carbocations, Carbanions, free radicals, Carbenes and Nitrenes.

Chemical Science References:

Essential /Recommended Readings

- Graham Solomon, T.W., Fryhle, C.B. & Dnyder, S.A. Organic Chemistry, John Wiley & Sons (2014).
- Bahl, A. & Bahl, B.S: A text book of Organic Chemistry, S. Chand.
- Paula Yurkanis Bruice: Organic Chemistry; 7th edition, Pearson
- Jonathan Clayden, Nick Greeves & S. Warren: Organic Chemistry, 2nd edition
- R.K. Bansal: A text book of Organic Chemistry, 6th edition

Suggestive Readings:

- McMurry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning
- Finar, I.L. Organic Chemistry (Vol. I & II), E.L.B.S.
- Morrison, R.T. & Boyd, R.N. Organic Chemistry, Pearson, 2010.
- K. S. Tewari & N. K. Vishnoi: A text book of Organic Chemistry; 4th edition

Physical Science References:

Essential/Recommended Readings

1. Principle of Electronics by V K Mehta
2. Electronics devices by Flyod
3. Fluid Mechanics by R K Bansal

Suggestive readings:

- Concept of Physics Vol II by H C Verma.

Laboratory Course-II

Physical and Chemical Science-II (PCS-PC-L-201)

Practical: 01 Credit **Duration: 30 Hr**

Maximum Marks: 25 **Minimum Marks: 09**

Physics Lab. Work

1. To study the forward and reverse bias of PN junction.
2. Verify the truth table of Logic Gates (OR, AND and NOT).
3. To determine the surface tension by using capillary rise method.
4. To determine the terminal velocity of a ball for different liquid.

Chemistry Lab. Work

1. To Introduce Various Equipment and Glassware used in Laboratory works.
2. Identification of Aliphatic & Aromatic compounds by Ignition test.
3. Identification of functional groups of Organic Compounds- Alcohol; Phenol; Aldehyde; Ketone and Carboxylic acid.
4. Identification of organic Compound Through Melting point (Three)

Recommended/ Suggestive Readings

- Advanced Practical Physics for students, B.L.Flint and H.T.Worsnop, 1971, Asia Publishing House.
- B.Sc Practical Physics by C.L. Arora.
- A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
- Text book of Practical Organic Chemistry, Prentice-Hall,5th edition,1996
- Vogel's Text book of Practical Organic Chemistry; 5th edition.
- Advanced Practical Organic CHEMISTRY; N. K Vishnoi; 3rd Edition
- Practical Chemistry, O. P. Pandey, D. N. Bajpai & S. Giri; S Chand
- Practical Organic Chemistry; F. G. Mann & B. C. Saunders, 4th Edition.