ADIKAVI NANNAYA UNIVERSITY: RAJMAHENDRAVARAM
Single Major B.Sc Chemistry (w.e.f:2023-24A.B)

II - SEMESTER

Course Code 3: GENERAL AND INORGANIC CHEMISTRY

Credits: 03

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

1. Understand the structure of atom and the arrangement of elements in the periodic table.
2. Understand the nature and properties of ionic compounds.
3. Identify the structure of a given inorganic compound.
4. Explain the existence of special types of compounds through weak chemical forces.
5. Define acids and bases and predict the nature of salts.

Syllabus:

Unit I: Atomic Structure and Periodic table (9 h)

Electronic configuration: Bohr theory, duel nature of electrons, Heisenberg uncertainty principle, the Schrodinger equation, significance of wave functions, normalization of wave function, radial and angular wave functions, Pauli's exclusion principle, Hund's rule, sequence of energy levels (Aufbau principle).

Periodicity: periodic law and arrangement of elements in the periodic table, IUPAC nomenclature and group number, horizontal, vertical, and diagonal relationships in the periodic table. 1.3 General properties of atoms: size of atoms and ions-atomic radii, ionic radii, covalent radii; trend in ionic radii, ionization potential, electron affinity; electronegativity - Pauling, Mulliken-Jaffe, Allred-Rochow definitions; oxidation states and variable valency; isoelectronic relationship; inert-pair effect;

UNIT 2: Ionic bond (9 h)

Properties of ionic compounds, factors favouring the formation of ionic compounds-ionization potential, electron affinity, and electronegativity. Lattice energy: definition, factors affecting lattice energy, Born-Haber cycle-enthalpy of formation of ionic compound and stability. Stability of ionic compounds in terms of $\Delta H_f$and U_o. Solubility and thermal stability of ionic compounds. Covalent character in ionic compounds-polarization and Fajan's rules; effects of polarization-solubility, melting points, and thermal stability of typical ionic compounds.

UNIT 3: The Covalent Bond (9 h)

Valance Bond theory-arrangement of electrons in molecules, hybridization of atomic orbitals and geometry of molecules-$BeCl_2$, BF_3, CH_4, PCl_5, SF_6– VSEPR model-effect of bonding and nonbonding electrons on the structure of molecules, effect of electronegativity,
isoelectronic principle, illustration of structures by VESPR model-NH_3, H_2O, SF_4, ICl^-,^{4} ICl^-^{2}, XeF_4, XeF_6
Molecular orbital theory -LCAO method, construction of M.O. diagrams for homo-nuclear and hetero-nuclear diatomic molecules (N_2, O_2, CO and NO)

UNIT 4: Metallic and Weak Bonds (9 h)

The Metallic bond: metallic properties, free electron theory, Valence Bond Theory, band theory of metals. Explanation of conductors, semiconductors and insulators.

Weak bonds: hydrogen bonding-intra- and intermolecular hydrogen bonding, influence on the physical properties of molecules, comparison of hydrogen bond strength and properties of hydrogen bonded N, O and F compounds; associated molecules-ethanol and acetic acid; Vanderwaals forces, ion dipole-dipole interactions.

UNIT 5: Acids and Bases (9 h)

Theories of acids and bases: Arrhenius theory, Bronsted-Lowry theory, Lewis theory, the solvent system, Nonaqueous solvents: classification-protonic and aprotic solvents, liquid ammonia as solvent-solutions of alkali and alkaline earth metals in ammonia.

Types of chemical reactions: acid-base, oxidation-reduction, calculation of oxidation number. Definition of pH, pK_a, pK_b. Types of salts, Salt hydrolysis. Pearson's concept, HSAB principle & its importance, bonding in Hard-Hard andSoft-Soft combinations.

List of Reference Books:

1. J. D. Lee, Concise Inorganic Chemistry, 5th ed., Blackwell Science, London, 1996.
2. . B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, Shoban Lal Nagin Chand and Co., 1996.
3. D. F. Shriver and P. W. Atkins, Inorganic Chemistry, 3rd ed., W. H. Freeman and Co, London,

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II - SEMESTER

Course Code 3: GENERAL AND INORGANIC CHEMISTRY

Credits: 01

Practical- I Qualitative Analysis of SIMPLE SALT

Qualitative inorganic analysis (Minimum of Six simple salts should be analysed) 50 M

Course outcomes:

At the end of the course, the student will be able to;

1. Understand the basic concepts of qualitative analysis of inorganic simple salt.
2. Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
3. Apply the concepts of common ion effect, solubility product and concepts related to qualitative analysis

Laboratory course syllabus:
Analysis of SIMPLESALT 50 M

Analysis of simple salt containing ONE anion and ONE cation from the following:
Anions: Carbonate, Sulphate, Chloride, Bromide, Acetate, Nitrate, Borate,
Phosphate. Cations: Lead, Copper, Iron, Aluminium, Zinc, Nickel, Manganese,
Calcium, Strontium, Barium, Magnesium and Ammonium.

Co-curricular activities and Assessment Methods

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

Reference books:

1. Vogel's Quanlitative Inorganic Analysis, Seventh edition, Pearson.

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II - SEMESTER

Course Code 4: INORGANIC CHEMISTRY- I

Credits: 03

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 concepts of d-block elements
3. Distinguish lanthanides and actinides.
4. Describe the importance of radioactivity.

Syllabus:

UNIT –I Chemistry of p-block elements – I 9 h

Group 13: Preparation & structure of Diborane, Borazine and $(BN)_x$ Group14: Preparation, classification and uses of silicones and Silanes. Group 15: Preparation & structure of Phosphonitrilic Chloride $P_3N_3Cl_6$

Unit II Chemistry of p-block elements – II 9 h

Group 16: Classification of Oxides, structures of oxides and Oxoacids of Sulphur Group 17: Preparation and Structures of Interhalogen compounds. Pseudohalogens,

UNIT-III Chemistry of d-block elements: 9 h

Characteristics of d-block elements with special reference to electronic configuration, variable valence, colour, magnetic properties, catalytic properties and ability to form complexes. Stability of various oxidation states of 3d series-Latimer diagrams.

UNIT-IV Chemistry of f-block elements: 9 h

Chemistry of lanthanides - electronic configuration, oxidation states, lanthanide contraction, consequences of lanthanide contraction, colour, magnetic properties.

Separation of lathanides by ion exchange method.

Chemistry of actinides - electronic configuration, oxidation states, actinide contraction, comparison of lanthanides and actinides.

Unit – V Radioactivity 9 h

Definition, Isotopes, n/p ratio, binding energy, types of radioactivity, Soddy-Fajan's displacement law,Law of Radioactivity, Radioactive decay series, Nuclear Reactions-fission and fusion, Applications of radioactivity.

List of Reference books:

1. Basic Inorganic Chemistry by Cotton and Wilkinson
2. Advance Inorganic chemistry vol-I by Satya Prakash
3. Inorganic chemistry by Puri and Sharma
4. Concise Inorganic Chemistry by J D Lee
5. Nuclear Chemistry by Maheshwar Sharon, 2009

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II -SEMESTER

Course Code 4: INORGANIC CHEMISTRY- I

Credits: 01

Course outcomes:

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

1. Understand the basic concepts of inorganic preparations.
2. Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
3. Apply the properties of various elements for the preparation of inorganic compounds.

Syllabus:

Preparation of Inorganic compounds:

4. Crystallization of compounds and determination of melting point.
5. Preparation of Cuprous chloride.
6. Preparation of Potash Alum.
7. Preparation of Chrome Alum.
8. Preparation of Ferrous oxalate
9. Preparation of Ferrous ammonium sulphate.

Co-curricular activities and Assessment Methods

10. Continuous Evaluation: Monitoring the progress of student's learning
11. Class Tests, Worksheets and Quizzes
12. Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality
13. SEMESTER -End Examination: critical indicator of student's learning and teaching methods adopted by teachers throughout the

Reference books:

1. Vogel's Quanlitative Inorganic Analysis, Seventh edition, Pearson.

ADIKAVI NANNAYA UNIVERSITY: RAJMAHENDRAVARAM
Single Major B.Sc Chemistry (w.e.f:2023-24A.B)

Single Major
Model Question Paper
SEMESTER-II
B.Sc Chemistry

Paper: 4- General & Inorganic Chemistry

Time:3hrs *MAX MARKS: 70 M*

SECTION-A

Answer any 5 questions. Each question carries 4 marks **5 x 4 = 20M**

1. Explain Heisenberg uncertainty principle and Hund's rule.
2. Write a note on stability of ionic compounds.
3. Explain structures of SF_4, NH_3 using VSEPR theory.
4. Write about inter and intra molecular hydrogen bond.
5. Write about protic and aprotic solvents.
6. Explain geometry of CH_4 & SF_6 using Valence Bond theory.
7. Explain significance of wave functions.
8. Define pH, pK_a, pK_b.

SECTION-B

Answer all the questions, Each question carries 10 marks. **5 x 10 = 50M**

9. a. Write about (i) Bohr Theory. (ii) Paulis exclusion principle.

(or)

b. Explain general properties of atoms (i) atomic radii & ionic radii
(ii) ionization potential (iii) electronegativity.

10. a. What are properties of ionic compounds. Explain any three factors favouring the formation of ionic compounds.

(or)

b. Write about (i) Born –Haber Cycle (ii) Fajan's rules

11. a. Write advantage of MO theory over VBT. Construct the MO diagrams for O_2 and CO molecules.

(or)

b. Explain Valence bond theory and concept of hybridization by taking any two examples.

12. a. Write about Band theory of metals. Explain about conductors, semiconductors and insulators.

(or)

b. Explain free electron theory. Explain metallic properties.

13. a. Explain Bronsted Lowry theory and Lewis acid base theory.

(or)

b. Define Pearson's concept. Explain HSAB Principle and its importance in bonding.

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Single Major
Model Question Paper
SEMESTER-II
B.Sc Chemistry

Paper: 4- Inorganic Chemistry-I

Time:3hrs *MAX MARKS: 70 M*

SECTION-A

Answer any 5 questions. Each question carries 4 marks **5 x 4 = 20M**

1. What are silicones. Write their classification.
2. What are Pseudohalogens. Give examples.
3. Write about variable valence of d-block elements
4. Write about magnetic properties of lanthanides.
5. Write note on isotopes and n/p ratio.
6. Explain the structure of borazine.
7. Compare Lanthanides and Actinides.
8. Write a note on oxoacids of sulphur.

SECTION-B

Answer ALL the questions, Each question carries 10 marks. **5 x 10 = 50M**

9. a. Explain the preparation and Structure of diborane.

(or)

b. Explain the preparation and structure of phosphonitrilic chloride.

10. a. Explain classification of oxides. Draw structures of any two oxides of sulphur.

(or)

b. What are interhalogen compounds. Write their preparation. Explain structure of AX_5 & AX_7 interhalogen compounds.

11. a. Write the electronic configuration of 3d – series elements.

(or)

b. Explain Colour & catalytic properties of d-block elements.

12. a. What is Lanthanide Contraction. Explain the consequences of Lanthanide Contraction.

(or)

b. (i) Write about separation of lanthanides by ion exchange method.
(ii) Write about oxidation states exhibited by actinides.

13.a. Write an essay on Nuclear Fission and Nuclear Fusion reactions.

(or)

b. Write about (i) Soddy- Fajans law (ii) Applications of radioactivity.