GOVT. COLLEGE (AUTONOMOUS), RAJAHMUNDRY
B.Sc. CHEMISTRY (HONOURS) COURSE
SYLLABUS FROM THE ACADEMIC YEAR 2019-20
SEMESTER I PAPER-IA

CHEMISTRY - C I: INORGANIC CHEMISTRY-I 60 Hours

Atomic Structure (14 hrs)

Recapitulation of Bohr's theory, its limitations and atomic spectrum of hydrogen atom, photoelectric effect, Compton Effect. Wave mechanics: Planck's quantum theory, de Broglie equation, Heisenberg's Uncertainty Principle and its significance.

Derivation of Schrödinger's wave equation, significance of ψ and ψ^2, Quantum numbers and their significance. Normalized and orthogonal wave functions. Sign of wave functions. Shapes of *s*,*p*, *d* and *f* orbitals.

Pauli's Exclusion Principle, Hund's rule of maximum multiplicity, aufbau principle and its limitations. Electronic configurations of the elements and some exceptional electronic configurations.

Periodicity of Elements (16 hrs)

Brief discussion of the following properties of the elements, with reference to *s* & *p*-block and the trends shown:

(a) Effective nuclear charge, shielding or screening effect, Slater rules, variation of effective nuclear charge in periodic table.

(b) Atomic and ionic radii

(c) Ionization enthalpy, Successive ionization enthalpies and factors affecting ionization enthalpy and trends in groups and periods.

(d) Electron gain enthalpy and trends in groups and periods.

(e) Electronegativity, Pauling's/ Allred Rochow's scales. Variation of electronegativity with bond order, partial charge, hybridization, group electronegativity.

Chemical Bonding-I (14 hrs)

(i) *I onic bond:* General characteristics, types of ions, size effects, radius ratio rule and its

limitations. Packing of ions in crystals.Lattice energy, Born-Landé equation without derivation and importance of Kapustinskii expression for lattice energy. Born-Haber cycle and its application, Solvation energy.

(ii) *Covalent bond:* Valence shell electron pair repulsion theory (VSEPR), lone pairs and bond pairs of electrons: H2O, NH3, PCl3, PCl5, SF6, ClF_3, $I3^-$, BrF_2^+, PCl_6^-, ICl_2^-**,** ICl_4^- and SO_4^{2-}, Effect of Multiple bonds. Lewis structure, Formal charge, Resonance and resonance energy, Valence Bond theory (Heitler-London approach), Concept of hybridization with $BeCl_2$, BF_3, CH_4, PCl_5, ClF_3, BrF_5, XeF_2, equivalent and non-equivalent hybrid orbitals.

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Chemical Bonding-II (16 hrs)

Molecular orbital theory. Molecular orbital diagrams of diatomic and simple polyatomic molecules N2, O2, C2, B2, F2, CO, NO, and their ions; HCl (idea of s-p mixing and orbital interaction to be given).

Polarizing power and polarizability. Fajan's rules and consequences of polarization, Ionic character in covalent compounds.

Bond moment and dipole moment. Percentage ionic character from dipole moment and electronegativity difference.

(iii) Metallic Bond: Qualitative idea of valence bond, Free-electron theory and band theories. Semiconductors and insulators, defects in solids.

(iv) Weak Chemical Forces: Van der Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interaction. Hydrogen bonding and its applications. Effects of weak chemical forces, melting and boiling points, solubility, energetics of dissolution process.

Reference Books:

• Lee, J.D. Concise Inorganic Chemistry, Pearson Education 2010
• Huheey, J.E., Keiter, E.A., Keiter, R. L., Medhi, O.K. Inorganic Chemistry, Principles of Structure and Reactivity, Pearson Education 2006.
• Douglas, B.E. and Mc Daniel, D.H., Concepts & Models of Inorganic Chemistry, Oxford, 1970
• Shriver, D.D. & P. Atkins, *Inorganic Chemistry 2nd Ed.*, Oxford University Press, 1994.
• Day, M.C. and Selbin, J. Theoretical Inorganic Chemistry, ACS Publications 1962.

GOVERNMENT COLLEGE (A), RAJAHMUNDRY.

I B.Sc. CHEMISTRY (Hons) SEMESTER -I

MODEL QUESTION PAPER FROM 2019-20 ONWARDS

PAPER-IA: INORGANIC CHEMISTRY

TIME: 21/2hr. MARKS: 50 M

PART -A

Answer ALL the Questions 4x7 = 28 M

1. Derive Schrodinger's wave equation.Explain significance of ψ and ψ^2?

(OR)

What are the postulates of Bohr's theory? Discuss the importance of this model to Explain atomic spectrum of hydrogen atom?

2. How do the following properties change in group and period? Explain with example 1.Ionization energy 2. Electron gain enthalpy 3. Atomic radius

OR

Define IE_1 and IE_2. Why is $IE_2 > IE_1$for a given atom? Discuss factors that affect ionisation potential of of an element.

3. What is lattice energy? Write about Born-Haber cycle. Calculate lattice energy of NaCl crystal from the following data by the use of born habit cycle.
   Sublimation energy (S) = 10 8.7 kj mol^-
   Dissociation energy for Cl_2 = 22.59 kj mol^-
   Ionization energy of Na (g) = 489.5 kj mol^-
   Electron affinity for Cl (g) = - 351.4 kj mol^-
   Heat of formation of NaCl (ΔH_f) = - 414.2 kj mol^-

OR

How do you explain the geometry of the molecules CH_4, PCl_5 on the basis of valence bond theory?

4. What is LCAO method? Explain the molecular orbital diagrams of molecules a) O_2 b) N_2.Calculate the respective bond order. Write magnetic nature of N_2 and O_2 molecules?

OR

What is polarising power and polarizability? State Fajan's rules and write applications of Fajan's rules?

PART – B

Answer any **FOUR** Questions **4x4= 16 M**

5. Describe different types of defects in crystals.
6. Write a note about photoelectric effect.
7. Explain Slater rules?
8. Explain structure of NH3 on VSEPR?
9. Write rules for writing Lewis structure?
10. Write Quantum Numbers and their significance.
11. Mention factors affecting Ionization enthalphy.

12. What are semiconductors and insulators? Give one example for each.

PART – B

Answer all Questions 3**x2= 6 M**

13. What is compton affect?
14. What is solvation energy?
15. Differentiate Polarizing power and Polarizability.

GOVERNMENT COLLEGE (A), RAJAHMUNDRY.

B.Sc. FIRST YEAR CHEMISTRY SEMESTER -I

MODEL QUESTION PAPER BLUE PRINT

FROM 2019-20 ONWARDS

PAPER-IA: INORGANIC CHEMISTRY

PART -A 4x7 = 28 M

Answer ALL the Questions

1. A (OR) B from Unit- I
2. A (OR) B from Unit- II
3. A (OR) B from Unit -III
4. A (OR) B from Unit- IV

PART – B

4x4 = 16 M

Answer any FOUR Questions

5. **Unit- I**
6. **Unit- I**
7. **Unit- II**
8. **Unit- II**
9. **Unit- III**
10. **Unit- III**
11. **Unit- IV**
12. **Unit- IV**

PART – C

3x2 = 06 M

Answer all Questions

1. Unit- I
2. Unit- III
3. Unit- IV

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GOVERNMENT COLLEGE (A), RAJAHMUNDRY.

I B.Sc. CHEMISTRY (HONOURS) SEMESTER -I

MODEL QUESTION PAPER BLUE PRINT

FROM 2019-20 ONWARDS

PAPER - IA

(INORGANIC CHEMISTRY)

S.No.	Chapter	Essay questions (07 M) Knowledge/ skill	Short answer questions (04 M) understanding	Very Short Answer Questions (2 M) application
1	Unit-I	01	02	01
2	Unit-II	01	02	-
3	Unit-III	01	02	01
4	Unit-IV	01	02	01
	Total number of questions	04	08	03

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SYLLABUS FOR PRACTICAL
SEMESTER-I PRACTICAL-IA

TITRIMETRIC ANALYSIS

Practical C – I Lab: 45 Lectures
(A) Titrimetric Analysis

(i) Calibration and use of apparatus

(ii) Preparation of solutions of titrants of different Molarity/Normality

(B) Acid-Base Titrations

Principles of acid-base titrations to be discussed.

(i) Estimation of sodium carbonate using standardized HCl.

(ii) Estimation of carbonate and hydroxide present together in a mixture.

(iii) Estimation of carbonate and bicarbonate present together in a mixture.

(iv) Estimation of free alkali present in different soaps/detergents

LABORATORY COURSE -IA

PRACTICAL - 1A : VOLUMETRIC ANALYSIS
(at the end of Semester I)

Max. Marks: 50 Marks **Time:** 3 hrs.

SCHEME OF VALUATION:

For Record - 10 Marks

For Practical - 40 Marks

Splitting of Practical Marks:

i) Procedure in first 10 min.: 5 Marks

ii) Formula with units: 5 Marks

iii) Neat tabulation: 5 Marks

iv) correct calculation **:** 5 Marks

Error < 10% : 20 Marks

Error 10-15 %: 15 Marks

Error > 15 %: 10 Marks (Minimum Marks)