

**P. R. GOVERNMENT COLLEGE, KAKINADA**  
**SYLLABUS FOR SEMESTER – I (CHEMISTRY)**  
**Paper I (Inorganic & Physical chemistry) 60 hrs.**  
**(4h/w)**

**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 h**

**UNIT –I**

**Chemistry of p-block elements** **8h**

**Group 13:** Preparation & structure of Diborane, Borazine

**Group 14:** Preparation, classification and uses of silicones

**Group 15:** Preparation & structures of Phosphonitrilic halides  $\{(\text{PNCl}_2)_n \text{ where } n=3,4\}$

**Group 16:** Oxoacids of Sulphur (structures only)

**Group 17:** Pseudo halogens, Structures of Interhalogen compounds.

**Additional Input:** Oxides of Sulphur (structures only)

**UNIT-II**

**1. Chemistry of d-block elements:** **6h**

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:** **4h**

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

**Theories of bonding in metals:** **6h**

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.

**Additional Input:** Chemistry of actinides - electronic configuration, oxidation states, actinide contraction, comparison of lanthanides and actinides.

## PHYSICAL CHEMISTRY

36h

### UNIT-III

#### Solid state

10h

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.

**Additional Input:** Defects in crystals. Stoichiometric and non-stoichiometric defects.

### UNIT-IV

#### 1. Gaseous state

6h

van der Waal's equation of state. Andrew's isotherms of carbon dioxide, continuity of state. Critical phenomena. Relationship between critical constants and vander Waal's constants. Joule-Thomson effect. Inversion temperature.

#### 2. Liquid state

4h

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.

**Additional Input:** Law of corresponding states.

### UNIT-V

#### Solutions, Ionic equilibrium & dilute solutions

#### 1. Solutions

6h

Azeotropes- HCl- H<sub>2</sub>O system and ethanol-water system. Partially miscible liquids-phenol-water system. Critical solution temperature (CST), Nernst distribution law. Calculation of the partition coefficient. Applications of distribution law.

#### 2. Ionic equilibrium

3h

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

#### 3. Dilute solutions

7h

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

**Additional Input:** Effect of impurity on consolute temperature. Immiscible liquids and steam distillation. Experimental methods for the determination of Elevation in boiling point and depression in freezing point.

### Co-curricular activities and Assessment Methods

1. Continuous Evaluation: Monitoring the progress of students learning
2. Class Tests, Work sheet sand Quizzes
3. Presentations ,Projects and Assignments and Group Discussions:  
Enhances criticalthinking skills and personality
4. Semester- end Examination: critical indicator of student's learning  
and teachingmethods adopted by teachers throughout the  
semester.

### List of Reference Books

1. Principles of physical chemistry by Prutton and Marron
2. Solid State Chemistry and its applications by Anthony R. West
3. Text book of physical chemistry by K L Kapoor
4. Text book of physical chemistry by S Glasstone
5. Advanced physical chemistry by Bahl and Tuli
6. Inorganic Chemistry by J.E.Huheey
7. Basic Inorganic Chemistry by Cotton and Wilkinson
8. A textbook of qualitative inorganic analysis by A.I. Vogel
9. Atkins,P.W.&Paula,J.deAtkin'sPhysicalChemistryEd.,OxfordUniversityPress 10thEd(2014).
10. Mortimer, R. G.PhysicalChemistry3rdEd. Elsevier: NOIDA,UP(2009).
11. Barrow, G.M. Physical Chemistry

**P. R. GOVERNMENT COLLEGE, KAKINADA**  
**SYLLABUS FOR SEMESTER – I (CHEMISTRY)**  
**Paper I (Inorganic & Organic Chemistry)**  
**Weightage to content**

S. No.	Course Content	Essay Questions (10M)	Short Answer Questions (5M)	Total No. Of Questions from each Unit	Total No. of Marks allotted to each Unit
	<b>Inorganic Chemistry</b>				
1	Unit - I	1	2	3	20
2	Unit - II	2	1	3	25
	<b>Physical Chemistry</b>				
3	Unit - III	1	1	2	15
4	Unit - IV	1	2	3	20
5	Unit -V	1	2	3	20
	<b>TOTAL</b>	<b>6</b>	<b>8</b>	<b>14</b>	<b>100</b>

**LABORATORY COURSE –I**

**30hrs (2 h / w)**

**Practical-I Analysis of SALT MIXTURE**

(At the end of Semester-I)

**Qualitative inorganic analysis (Minimum of Six mixtures 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 mixture
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

**Analysis of SALT MIXTURE 50 M**

Analysis of mixture salt containing two anions and two cations (From two different groups) from the following:

**Anions:** Carbonate, Sulphate, Chloride, Bromide, Acetate, Nitrate, Borate, Phosphate.

**Cations:** Lead, Copper, Iron, Aluminium, Zinc, Nickel, Manganese, Calcium, Strontium, Barium, Potassium and Ammonium.

**P. R. GOVERNMENT COLLEGE, KAKINADA**  
**MODEL PAPER FOR SEMESTER – I (CHEMISTRY)**  
**Paper I (Inorganic & Organic Chemistry)**

**Duration: 2hrs.**

**Max. Marks: 50**

**PART- A**

4 X 5 = 20 Marks

Answer any Four of the following questions. Each carries FIVE marks

1. Question from Unit –I
2. Question from Unit –I
3. Question from Unit –II
4. Question from Unit – III
5. Question from Unit –IV
6. Question from Unit – IV
7. Question from Unit – V
8. Question from Unit – V

**PART- B**

3 X 10 = 30 Marks

Answer any THREE questions. Each carries TEN marks

9. Question from Unit –I
10. Question from Unit –II
11. Question from Unit –II
12. Question from Unit – III
13. Question from Unit – IV
14. Question from Unit – V

**P. R. GOVERNMENT COLLEGE, KAKINADA**  
**SEMESTER-I**  
**CHEMISTRY Course-I: INORGANIC & PHYSICAL CHEMISTRY**

**Question bank**

**Unit – I**

**ESSAY QUESTIONS**

1. Explain Classification, Preparations & uses of Silicones
2. Explain Preparation and Structure of Diborane.
3. What are Pseudo halogens? Explain the Structures of  $AX_3$  &  $AX_5$  types of interhalogen compounds.

**SHORT ANSWER QUESTIONS**

1. Explain the preparation and structure of Borazine
2. Explain the structures of Phosphonitrilic compounds.
3. Write any three structures of sulphur oxy acids.

**Unit – II**

**ESSAY QUESTIONS**

1. Explain magnetic and catalytic properties of d-block elements.
2. What is Lanthanide Contraction? Explain the Consequences of Lanthanide Contraction?
3. Explain Band theory of Conductors, Semi-conductors and Insulators.

**SHORT ANSWER QUESTIONS**

1. Why do d- block elements show variable oxidation states? Explain with examples.
2. Explain free electron theory of metals.
3. Explain Valence bond theory of metals.

**Unit – III**

**ESSAY QUESTIONS**

1. Derive Bragg's Law. Explain the determination of structure of a crystal by powder method?
2. Explain symmetry elements in crystals.

**SHORT ANSWER QUESTIONS**

1. Write a short note on Law of constancy of interfacial angles, law of rationality of indices and the law of symmetry.
2. Write short note on Bravais lattices and crystal systems.
3. Define lattice point, space lattice and unit cell?

**Unit – IV**

**ESSAY QUESTIONS**

1. Derive the relationship between Critical constants & Van der Waal's constants
2. Why do real gases deviate from ideal gas behavior? Derive Vander Waal's equation of state?
3. State and explain Joule- Thomson effect.

**SHORT ANSWER QUESTIONS**

1. What are liquid Crystals? Explain.
2. Explain applications of liquid crystals as LCD devices?
3. What is Inversion Temperature? Give Examples.

## Unit – V

### **ESSAY QUESTIONS**

1. What is Osmotic Pressure? Determine the molar weight of a non-volatile solute using osmotic pressure?
2. What is Critical Solution temperature? Explain Critical solution temperature for Phenol – water system.

### **SHORT ANSWER QUESTIONS**

1. State and write the applications of Nernst distribution Law?
2. Define colligative properties. Write different types of colligative properties.
3. Explain briefly Common ion effect & Solubility product?