

COURSE LEARNING OBJECTIVES:

Upon completion of Chemistry 251, you should be able to...

Draw radial density distribution function of orbitals, predicting possible and favored oxidation states of elements, writing quantum numbers, and electron configurations of elements, ions and especially that of transition metal ions.

Predict general trends in size of atoms and ions, 1st and successive ionization energies, electron affinities, magnetic properties, and physical properties of elements.

Draw Molecular orbital diagrams of homonuclear diatomic molecules and predict bond orders and magnetic properties. Using VSEPR theory you should be able to predict, electron pair and molecular geometries, hybridization, polarity, and Lewis structures and should be able to calculate formal charges, formal oxidation states and bond orders.

Using band theory, Explain the difference between a conductor, different types of semi-conductors, and insulators, know the different types of packing among metals, and calculate the number of structural units per unit cell. Know the different types of alloys.

Identify the factors affecting the polarization of ionic bonds, know the different types of ionic lattices and find the coordination numbers, empirical formula from a crystal lattice.

Name coordination compounds, draw and identify the types of isomers, and using the crystal field theory to draw the splitting of d orbitals of different geometries, identify weak/strong field ligands, and low/high spin complexes.

Identify and know general and interesting properties and chemistry of d block elements and their compounds, f-block elements, and important industrial and biological applications of these elements and compounds.

Balance redox reactions by electron transfer methods, draw and determine potentials from Latimer Diagrams, Frost Diagrams, Pourbaix diagrams, and Ellingham Diagrams.

Construct Born-Haber cycles of ionic and covalent compounds, know examples of hot/cold packs, and whether these reactions are enthalpy/entropy driven.

CHAPTER	TOPIC
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| 1. | The Electronic Structure of the Atom. |
| 2. | The Structure of the Periodic Table |
| 3. | Covalent Bonding and Molecular Spectroscopy |
| 4. | Metallic Bonding and alloys |

EXAM I (Chapters 1-4)

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| 5. | Ionic Bonding and Solid-State Structures |
| 19. | Transition Metal Complexes |

EXAM II (Chapters 5 & 19)

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| 20, 21. | 3d, 4d, 5d Transition Metals |
| 22. | Group 12 Elements |
| 24. | The Rare Earth and Actinide Elements |
| | Bio Inorganic Chemistry |

EXAM III (Chapters 20,21,22,24 & Bioinorganic)

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| 6. | Inorganic Thermodynamics |
| 7. | Solvent Systems and Acid base Behavior. |
| 8. | Oxidation and Reduction |
| 10-17 | The Main Group Elements |

EXAM IV (Chapters 6-8)

FINAL EXAM(COMPREHENSIVE): THURSDAY MAY 08, 8 - 10 am.

GRADING SYSTEM:

4 Mid-term Exams 400 pts