

Study Guide for CHEM 115 Chemistry Placement Exam

PART ONE: Atomic structure and isotopes (7 questions)

- Define atomic number and mass number
- Explain how subatomic particles are distributed in an atom
- Explain the role of subatomic particles in determining identity, mass and charge of an atom or ion
- Calculate the numbers of protons and neutrons in an isotope from mass number or full atomic symbol
- Determine the mass number and write full atomic symbol from numbers of protons and neutrons
- Calculate the number of electrons, protons, and neutrons in an atom or ion

PART TWO: Periodic table and periodic properties (9 questions)

- Locate the following on a periodic table of the elements: metals, semimetal, and nonmetals; halogens, alkali metals, alkaline earth metals, noble gases, transition metals, lanthanides, actinides, and main group elements
- Classify/identify an element as a metal, semimetal, or nonmetal based on properties or location in periodic table
- Use the periodic table to predict trends in atomic radii, electronegativity, metallic character, or similar chemical properties
- Associate elements with the group/family to which they belong and share similar chemical properties

PART THREE: Organization of matter, elements and compounds, electrons, predicting ions, and orbitals (9 questions)

- Describe the difference between or identify representations of: atoms and molecules, elements and compounds; diatomic and polyatomic molecules; homonuclear and heteronuclear molecules
- Know which elements in the periodic table exist as molecules in their elemental state and which as discrete atoms
- Predict the number of valence electrons an atom has based on location in periodic table
- Represent valence electrons in atoms with dots around the element symbol (Lewis Model)
- Predict the type of ion an element will form based on where it is in the periodic table
- Recognize the shape of atomic orbitals
- Predict the number of electrons that different orbitals and subshells can hold

PART FOUR: States of matter, physical changes and energy, chemical reactions and enthalpy, predicting chemical formulas from ions, nomenclature of ionic compounds (8 questions)

- Distinguish between physical and chemical changes
- Describe or recognize differences in the organization of matter in solid, liquid or gas phases
- Determine if heat is absorbed or released when different phase changes occur
- Define exothermic and endothermic reactions
- Predict if the temperature of the surrounding increases or decreases during exothermic and endothermic reactions
- Define ionic, covalent and metallic bonds
- Use electronegativity to determine if a bond is ionic or covalent
- Predict the formula of an ionic compound formed from two ions
- Identify the number of ions from a chemical formula
- Use rules of nomenclature to name ionic compounds given a formula and to write formulas given a name

PART FIVE: Significant figures, dimensional analysis, density, number of atoms in a chemical formula, molar mass, percent mass, moles of ions, and molarity (9 questions)

- Determine the correct number of significant figures in a measurement
- Perform conversions between different unit systems
- Calculate the density of a substance from mass and volume information
- Use a chemical formula to predict relative amounts of an element in the formula
- Calculate the molar mass given a chemical formula
- Calculate percent mass of an atom in a chemical formula
- Convert between grams and moles of a compound

PART SIX: Balancing chemical equations, stoichiometry, solutions and molar concentration (8 questions)

- Balance chemical equations
- Use mole ratios from chemical equations to calculate mole amounts of reactants and products
- Perform basic stoichiometric calculations using gram amounts of substances and a balanced chemical equation
- Calculate theoretical yield and percent yield
- Calculate molar concentration (molarity) for solutions made by dissolving a solid and by dilution
- Convert between moles and volume of solution using molar concentration