

On the Midterm Exam you must be able to:

Chapter 1

- Name 6 different branches of chemistry
- Explain what chemistry is
- Explain the difference between extensive and intensive properties (and give examples)
- Use physical properties to describe and identify a substance
- Name all states of matter and changes of states
- Classify pure substances, mixtures, homogeneous mixtures, heterogeneous mixtures, compounds and elements
- Identify certain families on the periodic table (metals, nonmetals, metalloids)

Chapter 2

- Describe the purpose of the scientific method
- Distinguish between qualitative and quantitative observations
- Describe differences between hypotheses, theories and models.
- Distinguish between a quantity, a unit and a measurement standard.
- Name and use SI units for length, mass, time, volume and density
- Distinguish between mass and weight
- Convert units using dimensional analysis
- Convert between scientific and standard notations
- Convert between Celsius and Kelvin temperatures
- Use density to solve problems
- Use significant figures

Chapter 3

- Name the three major subatomic particles, their charges, and where each is located.
- History of atomic structure (Dalton, Thomson, Rutherford, Bohr)
- Identify certain families on the periodic table (alkali, alkaline earth, halogen, noble gas)
- Explain the laws of conservation of mass, definite proportions and multiple proportions
- Explain the relationship between these laws and Dalton's atomic theory
- Explain what isotopes are
- Use isotope notation
- Define atomic number, mass number and how they apply to isotopes
- Given the identity of a nuclide, determine its numbers of protons, neutrons and electrons
- Define mole, Avogadro's number and molar mass and state how all three are related
- Use the relationship between mass, moles, and number of atoms to solve problems
- Convert between mass and moles of compounds

- Calculate the average atomic mass when abundance of isotopes is given

Chapter 4 (ONLY PRE AP):

- Compare and contrast Bohr's model and the quantum model of the atom
- Describe Heisenberg uncertainty principle
- Relate the number of sublevels corresponding to each of an atom's main energy levels, number of orbitals per sublevel, and the number of orbitals per main level.
- List the total number of electrons needed to fully occupy each main energy level
- State the Aufbau principle, the Pauli exclusion principle, and Hund's rule.
- Describe electron configurations for the atoms of any elements using orbital notation, electron-configuration notation, and noble-gas notation.

Chapter 5 (ONLY PRE AP):

- Explain the roles of Mendeleev and Moseley in the development of the periodic table.
- Describe the modern periodic table
- Explain how the periodic law can be used to predict the physical and chemical properties of elements
- Describe relationship between electrons in sublevels and the length of each period of the periodic table
- Locate and name the four blocks of the periodic table. Explain the reasons for these names.
- Describe the locations in the periodic table and the general properties of the alkali metals, the alkaline-earth metals, the halogens, and the noble gases.
- Define atomic and ionic radii, ionization energy, electron affinity, and electronegativity
- Compare the periodic trends of atomic and ionic radii, ionization energy, electron affinity, and electronegativity, and state the reasons for these trends.
- Define valence electrons, and state how many are present of each main-group elements.

Chapter 6:

- Explain why most atoms form chemical bonds
- Differentiate between ionic, metallic and covalent bond
- Classify bonding type according to the electronegativity differences (nonpolar, polar or ionic)
- Define molecule and molecular formula
- State the octet rule
- List the basic steps used in writing Lewis structures
- Explain how to determine Lewis structures for molecules containing single bonds, multiple bonds, or both.

- Compare and contrast chemical formula for a molecular compound with one for an ionic compound
- List and compare distinctive properties of ionic compounds and molecular compounds
- Describe electron-sea model of metallic bonding, and explain why metals are good electrical conductors
- Know that metal surfaces are shiny
- Explain why metals are malleable and ductile but ionic compounds are not

Chapter 7:

- Determine the formula of an ionic compound formed between two given ions.
- Name an ionic compound given its formula
- Using prefixes, name a binary molecular compound for its formula
- Write the formula of a binary molecular compound given its name
- Calculate the formula mass or molar mass of any given compounds
- Use molar mass to convert between mass in grams and amount of moles of a chemical compounds
- Calculate the percentage composition of a given chemical compounds
- Define empirical formula and explain how the term applies to ionic and molecular compounds
- Determine an empirical formula from either a percentage or a mass composition
- Explain the relationship between the empirical formula and the molecular formula of a given compound
- Determine a molecular formula from an empirical formula

Chapter 8

- Identify decomposition, combination, single and double replacement reactions, and combustion reactions
- Balance chemical equations
- Solve stoichiometry problems
- Solve limiting reactant problems
- Solve percent yield problems