

CH 151 LEARNING OUTCOMES

1. MATTER AND ENERGY

1. Describe several properties of solids, liquids and gases
2. Identify properties that are particularly useful in determining whether something is pure or impure.
3. Recognize evidence that would convince you that a substance is a compound, an element, or a mixture.
4. Differentiate between exothermic and endothermic changes.
5. Differentiate between potential energy and kinetic energy.

2. ATOMIC THEORY

1. Describe the nuclear model of the atom, based on the Rutherford scattering experiment.
2. Explain what isotopes of an element are and how they differ from each other.
3. Distinguish between groups and periods in a periodic table and identify them by number.
4. Determine the symbol and atomic mass of an element from the periodic table as well as identify the period and group in which the element is found.
5. Identify the symbol or name of an element given the name or symbol.

3. ELECTRON CONFIGURATION AND PERIODIC PROPERTIES

1. Describe the Bohr model of the hydrogen atom.
2. Describe the shape and number of orbitals in each sublevel.
3. Identify the restrictions on the electron population of an orbital.
4. Recognize the ground state electron configuration of a gaseous atom of any element up to atomic number 36.
5. Describe the Lewis (electron dot) symbol for an atom of any representative element.
6. Describe the following chemical families in the periodic table: noble gases, alkali metals, alkaline earths, and halogens.
7. Identify the metals, nonmetals and transition elements in the periodic table.

4. CHEMICAL BONDING

1. Identify the monatomic ions that are isoelectronic with a given noble gas atom
2. Distinguish between ionic and covalent bonds.
3. Distinguish between polar and nonpolar covalent bonds.
4. Describe the Lewis diagram for any molecule or polyatomic ion made up of representative elements.
5. Describe the bond angles in the following molecular geometries: linear; angular; trigonal planar; trigonal pyramid; tetrahedral.

5. CHEMICAL NOMENCLATURE

1. Determine the number of atoms of each element in the formula unit.
2. Determine the name (or formula) of any ion given its formula (or name).
3. Determine the name (or formula) of common polyatomic ions given its formula (or name).
4. Determine the name (or formula) of any ionic compound made up of common polyatomic ions given the formula (or name) of that compound.
5. Determine the formula of an ionic compound given the name of that compound.
6. Determine the formula (or name) of a hydrated compound given the name (or formula) of that compound

6. CHEMICAL FORMULA CALCULATIONS

1. Distinguish between atomic mass, molecular mass, and formula mass.
2. Define the mole and identify the number that corresponds to one mole.
3. Define mole mass.
4. Calculate the molar mass of any substance whose chemical formula is known.
5. Calculate the mass of any element in a sample if given the compound's formula.
6. Determine the percentage composition of any compound whose formula is known.
7. Determine the number of moles (or grams) given the number of grams (or moles) of a chemical species.
8. Determine the number of atoms or molecules given the mass or number of moles of a pure substance whose formula is known
9. Distinguish between a simplest (empirical) formula and a molecular formula.
10. Determine the empirical formula for a pure compound given data from which the ratio of relative masses of elements in a compound can be determined.
11. Determine the molecular formula given the molar mass of a compound and data from which its simplest (empirical) formula can be determined.

7. CHEMICAL REACTIONS AND EQUATIONS

1. Describe a chemical equation in terms of atoms, molecules, moles and/or formula units.
2. Determine the equation for a chemical reaction given the identity of a compound that is formed from two or more simpler substances.
3. Determine the equation for a chemical reaction given the identity of a compound that is decomposed into simpler substances, either compounds or elements.
4. Express the equation for the complete oxidation or burning of any compound containing only carbon, hydrogen and oxygen.
5. Determine the equation for a chemical reaction in a single replacement redox reaction.
6. Determine the equation for a chemical reaction given the reactants in a precipitation reaction.
7. Determine the equation for a chemical reaction given the reactants in a neutralization reaction