

Exam 1 Topics to Review (Tro Chpts 1-6)

Chpt 1. The Chemical World

1. Know scientific process, and identify a statement as observation, law, or theory.

Chpt 2. Measurement and Problem Solving

2. Convert between scientific notation and standard notation.
3. Significant Figures
 - a. Report measurements to correct number of sig figs and with units.
 - b. Identify/count significant figures in measurements.
 - c. Report results of calculations to correct number of significant figures.
 - d. Know rules for rounding off.
4. Do unit conversions through dimensional analysis.
5. Understand and solve density problems, using $D = m/V$.
6. Interpret chemical formula: the number of atoms of each element.

Memorize

1. Relationship of prefix multipliers kilo, centi, milli, micro, nano to base unit.
2. $1 \text{ mL} = 1 \text{ cm}^3$

Chpt 3. Matter and Energy

7. Understand the three physical states: solid, liquid, gas.
8. Distinguish between physical and chemical properties; distinguish between physical and chemical changes.
9. Identify given matter as element, compound, or mixture (homogeneous or heterogeneous), given descriptions or particle-view pictures.
10. Convert between different units of energy (J, cal, Cal), given equivalence statements for them.
11. Classify processes as endothermic or exothermic.
12. Do heat capacity calculations: calculate for heat, specific heat capacity, or temperature change using the equation $q = m \times C \times \Delta T$.

Memorize

$$q = m \times C \times \Delta T$$

Chpt 4. Atoms and Elements

1. Understand the basic principles of Dalton's Atomic Theory.
2. Understand the nuclear atom model:
 - a. Protons, neutrons, electrons: their locations, charges, relative masses
3. Write and interpret isotope symbols for atoms.
 - a. Understand definitions of atomic number, mass number.
 - b. Find number of protons, neutrons, and electrons from isotope symbol, or vice versa.
4. Understand atomic mass and atomic mass unit.
5. Isotopes:
 - a. Know definition of isotope.
 - b. Calculate atomic mass of an element based on isotopic abundance and isotopic masses.
6. Ions
 - a. Understand ions: cations, anions
 - b. Write and interpret isotope symbols for ion.
 - c. Predict charges of ions made by different elements based on their locations on the periodic table.
 - d. Understand that in reactions, metal elements tend to lose electrons to make cations, and nonmetal elements tend to gain electrons to make anions.

7. Periodic Table of Elements

- a. Know locations of: Periods, groups, main group elements vs. transition elements, metals vs. nonmetals vs. metalloids, alkali metals, alkaline earth metals, halogens, noble gases
- b. Know general properties of metals, nonmetals, and metalloids.

Chpt 5. Molecules and Compounds

1. Interpret chemical formulas: They show the numbers of atoms of different elements in a compound.
2. Calculate formulas masses of compounds from their chemical formulas. [unit: amu]
3. Distinguish between ionic compound and molecular compound based on chemical formula and type of bonding.
Metal + nonmetal → ionic compound (ionic bond)
Nonmetal + nonmetal → molecular compound (covalent bond)
4. Distinguish between molecular element and molecular compound.
5. Chemical nomenclature
 - a. Identify compound as molecular or ionic, then apply proper rules for naming and writing formulas for the compound.
 - b. Recognize variable-charge ions (mostly transition metals).
 - c. Know common acids and their formulas.

Memorize (See chemical nomenclature handout.)
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| <ol style="list-style-type: none">1. Charges of common fixed-charge ions2. Common polyatomic ions3. Names of common acids |
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Chpt 6. Chemical Composition

6. Know that a mole (mol) is a unit of measure that is equivalent to 6.022×10^{23} (Avogadro's number) of anything.
7. Know how to calculate molar mass of elements and compounds. [unit: g/mol]
8. Convert among moles, mass, and number of particles (atoms or molecules).
 - a. Use 6.022×10^{23} particles/mole to convert between number of particles and mole.
 - b. Use molar mass (g/mol) to convert between moles and grams.
 - c. Use both conversion factors (in a and b above) to convert between number of particles and grams.
9. Calculate mole, mass, or number of atoms of an **element** in a given amount of **compound**.
10. Do mass percent composition (mass of element relative to mass of compound) problems:
 - a. Given information about masses of elements and/or compounds in a sample of compound
 - b. Given chemical formula of a compound