

Exam 1 Study Guide

September 15, 2023

This is a checklist based on the lecture and textbook materials. It is not expected to be an all encompassing study guide and provides a guideline for your studies.

Chapter 1: Science and measurement

- Classification - pure substance and mixture
- Different states of matter and its properties - solid, liquid, and gas
- Examples of extensive and intensive properties
- Physical vs chemical changes
- Scientific method, theory, and laws
- Conservation of Energy
- Conservation of Mass
- Scientific notation e.g. $164.23 = 1.6423 \times 10^2$

Significant figures

- What do significant figures imply?
- Difference between accuracy and precision
- Leading, sandwiched, and trailing zeroes
- Rounding rules for multiplying, division, addition and subtraction
- Unit conversion and **memorize SI prefixes (Giga-, Mega, Kilo, Deci-, Centi-, etc.)**
- Dimensional analysis e.g. density (g/mL), volume (m^3 to cm^3)

Chapter 2: Atoms and the Periodic Table

- Dalton's Atomic Theory
- Law of definite proportions
- What are atoms made of?

- Millikan's oil-drop experiment

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- Cathode-ray tube experiment
- Plum Pudding Model

- Isotopes, atomic number, and mass number
- Determine the atomic masses from isotopes

Periodic Table

- How is the periodic table organized?
- What are protons, electrons and neutrons?
- Understand properties of alkali metals, alkaline earth metals, halogens and noble gases

Chapter 3: Compounds and the Mole

- What does subscripts mean in chemical formula? What are the units?
- Classifying/recognizing ionic and covalent compounds
- Familiarize with the periodic table symbols and **memorize polyatomic ions**
- Naming rules for ionic and covalent compounds and acids
- What is the quantity used to convert between moles and mass?
- Familiarize how to convert amu to g/mol from the periodic table
- Calculate the molar masses of compounds. How is this used to convert g to mol and vice versa?
- Calculate % composition
- Understand the steps to determine empirical and molecular formula.

Chapter 4: Chemical reactions and aqueous solutions

- What does the chemical equation tell you? Analogy to a cookbook
- How to write a chemical equation? What is needed?
- Meaning of coefficients in the chemical equation; what is the unit?
- Balancing chemical equations - tips for balancing combustion reactions
- Recognize and determine the different types of chemical reactions:
 - Combination (synthesis)
 - Decomposition

- Single-replacement
 - Double-replacement (two types)
 - Oxidation-reduction (redox)
- Understand difference between electrolytes and nonelectrolytes
- What and how many ions are formed from each ionic compound?
- **Memorize the solubility rules** - extremely helpful for determining the precipitation reaction
- Complete ionic and net ionic equations
- Determining the spectator ions
- Predicting products of combustion and acid/base reactions
- **Memorize oxidation states** and how to determine them