## BLOCK 01 TOPICS (CH 1-3)



The following is a list of important topics for students taking Chemistry 30A. Exams and assignments will focus on helping students achieve these goals. Additional topics may be added during the semester and not all will be tested for on any given exam or assignment. Students are encouraged to use this outline as a baseline for reviewing readings, preparing for exams, and determining if Chemistry 30A meets the student's personal objectives in studying chemistry.

## CH 1: SCIENCE

Knowledge:

- Define truth, certainty, justification, and knowledge.
- Explain how justification increases certainty.
- Explain why a justified certainty is more likely to be true knowledge.

Observation

Define observation and empirical.

- Describe how empirical demonstrations can be used to share observations.
- Differentiate between an experiment and a demonstration.
- Explain the value of empirical experimentation.

Scientific Method

- Define law, hypothesis, and theory.
- Differentiate between an observation and a hypothesis.
- Explain how observations become laws.
- Explain why hypothesis are offered.
- Explain how hypothesis become theories.
- Describe the value and limitations of theories.

Chemistry

- Define science, matter, and chemistry.
- State the first theory of chemistry.

## **CH 2: MEASUREMENT**

Measurement:

- Define a measurement and identify its parts.
- Understand the definitions of precision and accuracy.
- Record a measurement with the correct uncertainty (analog & digital).
- Identify the significant figures and the estimated digit in a measurement.

Unit Systems:

- Give an example of a unit standard for the dimensions of time, length, and mass.
- Differentiate between a standard based unit and a derived unit.
- Use the definition of density to relate density, volume, and mass.
- Give the SI unit & symbol for length, mass, time, temperature, and count.
- Give the name, factor, and symbol for the ten SI prefixes Giga to Femto.

Significance:

- Interpret the significance of zeroes in a recorded measurement.
- Express measurements in scientific notation.
- Identify the significant digits in a measurement.
- Identify and give examples of exact numbers.
- Know exact numbers have infinite significant digits.
- Determine the significant digits produced by multiplication/division operations.
- Determine the significant digits produced by addition/subtraction operations.
- Apply the correct order of operations for multiple operation calculations.

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Density:

Understand the concept of density.

Describe the relationship between density, volume, and mass.

Apply the technique of measuring by difference to volume, mass, and length.

Calculate the density of matter and solve problems using the density equation.

Conversion:

Provide the conversion factors between SI and imperial units for mass and length.

Give the conversion factors between measurements of time (sec, min, hr, day, yr).

Form a conversion factor from an equivalence.

Determine a mass, length, or volume by difference.

Use conversion factors to scale between units in the same system.

Use density as a factor to convert between measurements of mass and volume properties.

G Form conversion factors from relationships provided in word problems.

Proofs & Solutions:

Understand a scientific proof is a justification.

Use dimensional analysis to prove (justify) a relationship between properties.

Prove an equivalence using a conversion factor.

Provide a proof for an equivalence using multiple conversion factors.

Demonstrate the correct significant figures for an equivalence with dimensional analysis.

## CH 3A: MATTER

States:

C Recognize and give examples of the three primary states of matter.

C Recognize differences in properties of shape, volume, and compressibility in states of matter.

Describe differences in the structure, density, and cohesion of particles in states of matter.

Distinguish between states of matter by properties of state.

Properties:

Understand properties are distinctions between different matter.

Identify and give examples of properties that are extensive and intensive.

Differentiate between and give examples of chemical and physical properties.

Classifying Matter:

Identify matter as either pure or a mixture.

Use atomic theory to explain the differences between pure substances and mixtures.

Define pure matter, mixtures, phase, homogenous and heterogeneous matter.

Differentiate between and identify homogenous and heterogeneous samples of matter.

Give an example of a heterogenous sample of matter composed of a pure substance.

Differentiate between elemental and compound pure substances.

Changing Matter:

Give examples of and understand the difference between chemical and physical changes.

Recognize and give examples of processes that separate mixtures by their physical properties.

Explain the difference between forming a mixture and a chemical reaction (chemical change).

Describe three common observations that indicate a chemical reaction has occurred.

Explain how those three observations indicate a chemical change.

Use atomic theory to explain how new properties can result from a chemical reaction.