Honors Chemistry Summer Study Guide

Success in an honors chemistry class depends on a number of things. One of those things is a strong background in science and math basics. This summer study guide is <u>not</u> an assignment you are required to complete and submit. Rather, it is a self evaluation tool.
You will be taking a test on one of the first days of your fall semester on these basic skills. Be sure you are ready.

Topics and example questions:

- **Scientific notation - concept and calculations**

1. Express the following numbers in scientific notation.

a). 810,000 g

b). 0.000634 g

c). 60,000,000 g

2. Multiply and round the answer using the correct number of significant digits and write the answer in scientific notation.

a). (5,108 m)(4.2107 m) =

b). (1.67×10^{-2} km)(8.5×10^{-6} km) =

- **Significant digits - concept and calculations**

Examples
Determine the answer for each of the following. Be sure to use the correct number of significant figures.

a) 27.34 + 13.124 + 6.90 =

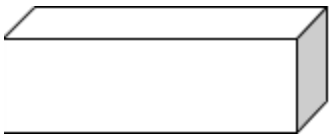
b) 2.8023 - 4.762 =

c) 0.32 x 14.50 x 120 =

d) 24.1 / 0.005 =

- **Density - concept and calculations**

1. A rectangular solid of unknown density is 5 meters long, 2 meters high and 4 meters wide. The mass of this solid is 300 grams. Given this information for this homogeneous (alike throughout) material, calculate its density.



2. A rock occupies a volume of 20 cm^3 and has a mass of 54 grams. Find the density of this rock.

3. A rock has a density of 4 g/ml and a mass of 16 grams. What is the volume this rock occupies?

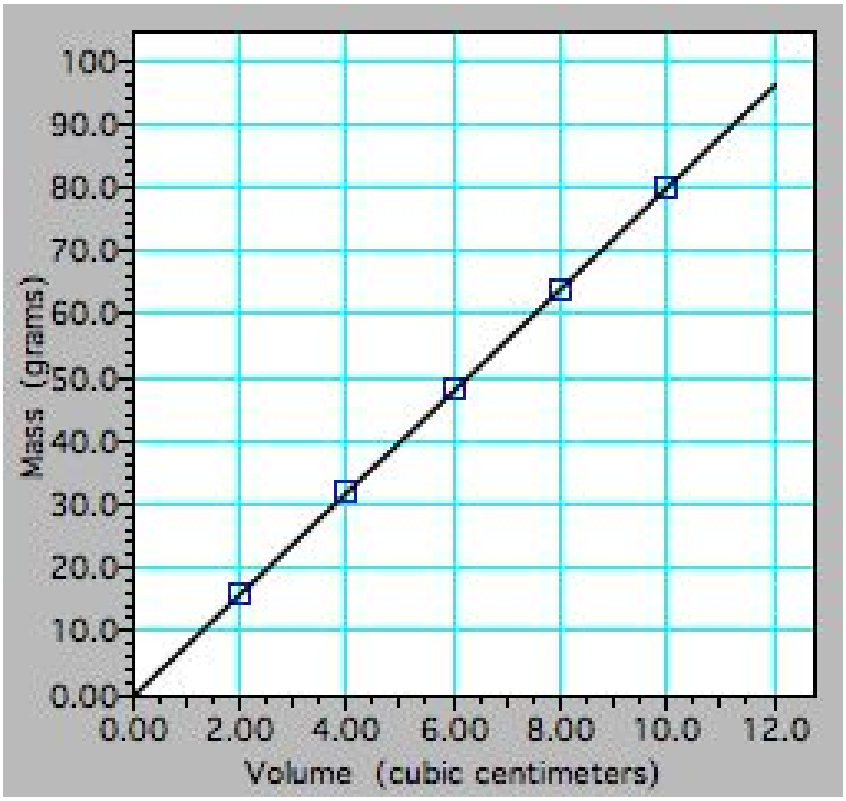
4. An unknown substance from planet X has a density of 10 g/ml. It occupies a volume of 80 ml. What is the mass of this unknown substance?

- **Graphing - concept, execution, interpretation**

1. Differentiate between independent and dependent variables.

2. Be able to calculate a slope.

3. Be able to explain the relationship between the independent and dependent variable based on the slope.



1. What is the density of this material?

2. What would be the volume of a 200 g sample of this material?

3. What would be the mass at 10.0 cm^3?

4. Write a sentence to explain the relationship between mass and volume.

- **SI / metric units - calculations and conversion with dimensional analysis**

Use Dimensional Analysis to solve the following problems. Show all work and include units with every number.

1.) Convert 36 weeks into days.

2.) Convert 80.0 grams into pounds.

3.) Convert 25.0 milliliters into liters.

4.) Convert 10 kilograms into pounds.

- 5.) Convert 5.0 years into seconds.

- **Word problems and algebraic formula manipulation**

For examples see the Density Problems and Gas Law Calculations

- **Atomic theory and subatomic particles**

Isotope name	atomic #	mass #	# of protons	# of neutrons	# of electrons
Potassium-37					
Oxygen-17					
uranium-235					
uranium-238					
boron-10					
boron-11					

Development of the atomic theory:
Be familiar with the following scientist, their major contribution to the atomic theory, and the name of the science experiment used to discover their major contribution to the atomic theory.

For Example: Louis de Broglie hypothesized that particles could have wavelike properties. His experiment was called the de Broglie Wavelength.

John Dalton
Ernest Rutherford
J.J. Thomson
Niels Bohr
James Chadwick

- **Ions and ionic compounds**

Use a periodic table and determine the charge each of the following atoms will have when they become ions then write the symbol for each ion:

1. Sodium
2. Calcium
3. Oxygen
4. Nitrogen
5. Chlorine
6. Aluminum

Write the name and formula for the ionic compounds formed from the following pairs of elements:

Elements	Compound name	Compound formula
Magnesium and Fluorine		
Sodium and Oxygen		
Potassium and Chlorine		
Aluminum and Sulfur		
Lithium and Nitrogen		

- **Temperature scales**

Convert 36*C into Kelvin.
K = *C + 273.15

Using this formula, K = 36 + 273.15 = 309.15 K

1) 75 *C = _____ K
2) 18 *C = _____ K
3) 44 *C = _____ K
4) 68 *C = _____ K

o C = K - 273.15

5) 292 K = _____ C
6) 316 K = _____ C
7) 353 K = _____ C
8) 307 K = _____ C
9) 360 K = _____ C

- **Phases of matter and kinetic energy relationships**

List and describe the three main phases of matter, include information on shape, volume, and motion of the particles.

List the six phase changes of matter and determine if energy is absorbed or released in each

- **Matter - pure substances vs mixtures**

Define and give an example of each of the following:

1. Element
2. Compound
3. Homogeneous mixture (solution)
4. Heterogeneous mixture (colloids and suspensions)

- **Basic Gas Laws (Boyle's, Charles', Gay-Lussac's)**

Always convert temperatures to Kelvin - see above for examples

1. A balloon is filled with 35.0 L of helium in the morning when the temperature is 20.00 C. By noon the temperature has risen to 45.00 C. What is the new volume of the balloon?

2. $CaCO_3$ decomposes at 12000 C to form CO_2 gas and CaO. If 25 L of CO_2 are collected at 12000 C, what will the volume of this gas be after it cools to 250 C?

3. There are 135 L of gas in a container at a temperature of 2600 C. If the gas was cooled until the volume decreased to 75 L, what would the temperature of the gas be?

4. 6.0 L of gas in a piston at a pressure of 1.0 atm are compressed until the volume is 3.5 L. What is the new pressure inside the piston?