Name: _____   Period: _____   Date: _____

SEMESTER 1 EXAM STUDY GUIDE - CHEMISTRY

VOCABULARY TERMS: Each of the following is a term that you need to be able to define/describe/have an understanding of on the Semester 1 Exam. You may want to make flash cards or a study sheet to help you work with these terms.

- accuracy
- alkali metal
- alkaline earth metal
- anion
- atom
- atomic number
- Aufbau principle
- Avogadro's number
- cation
- chemical change
- chemical property
- chemical symbol
- chemistry
- compound
- control group
- conversion factor
- density
- dependent variable
- electron
- electron configuration
- element

- gas
- group/family
- halogen
- heterogeneous mixture
- homogeneous mixture
- Hund's rule
- independent variable
- intensive property
- ionic compound
- isotope
- law
- liquid
- mass number
- matter
- metal
- metalloid
- mixture
- molar mass
- molar volume
- mole
- neutron

- noble gas
- nonmetal
- nucleus
- orbital
- orbital filling diagram
- Pauli exclusion principle
- period
- physical change
- physical property
- principle quantum number
- precision
- product
- proton
- reactant
- scientific method
- scientific notation
- SI unit
- solid
- temperature
- theory
- valence electron

CONCEPT QUESTIONS: You should be able to answer/describe each of the following on order to gain a real understanding of the different concepts we have covered this first semester. You can expect to see a majority of the questions on the exam similar to the ones below.

UNIT 1: Intro to Chemistry

1. Give two examples of each intensive and extensive properties.

2. What is the difference between chemical and physical changes? Give two examples of each.

3. What is the difference between a heterogeneous and homogeneous mixture. Give two examples of each.

4. What four clues tell you that a chemical change is taking place?

5. What is the difference between an element and a compound?

6. What is the correct way to write the symbol for an element?

7. Give the chemical symbol for each of the following elements.
   a. Terbium   d. Lawrencium

   b. Hafnium   e. Beryllium

   c. Iodine   f. Sulfur

8. Describe the three common states of matter.

9. Describe the scientific method. Be sure to include control, independent variable, and dependent variable.

10. In 1928, Sir Alexander Fleming was studying Staphylococcus bacteria growing in culture dishes. He noticed that a type of mold called Penicillium was also growing in some of the dishes. A clear area existed around the mold because all the bacteria that had grown in this area died. Fleming thought that the mold must be producing a chemical that killed the bacteria. He decided to isolate this substance and test it to see if it would kill bacteria. Fleming transferred the mold to a liquid broth solution. This solution contained all the materials the mold needed to grow. After the mold grew, he removed it. He then grew two identical groups of bacteria. He then took the mold-infused broth and added it to of the groups of bacteria. Those bacteria died. Fleming then added a liquid broth that did not contain mold to the second group of bacteria. This group survived.

   a. Independent variable:

   b. Dependent variable:

   c. Experimental group:

   d. Control group:

   e. What would need to be kept constant in this experiment?

11. How does a law differ from a theory?

UNIT 2: Scientific Measurement

1. What are the two different parts that every measurement should contain?

2. How can measurements be both precise but inaccurate?

3. Why is the metric system useful? Arrange the following prefixes in decreasing order: µL, L. kL, ML, pL, cL, nL, mL, and dL.

UNIT 3: The Atom & The Mole

1. What was Ernest Rutherford's gold foil experiment? Why is it so famous?

2. Describe the three main subatomic particles and show their symbols. How do you find the number of each that an element contains?

3. How are isotopes of the same element alike? How are they different?

4. What are the four different types of orbitals, how many of each are there, and how many TOTAL electrons can each one hold?

5. Describe the three rules used to govern how the electron behaves in the atom.

6. Give a brief history of the development of the atomic model. Include Democritus, Dalton, Thomson, Rutherford, Bohr, and Heisenberg/Schrödinger.

UNIT 4: The Periodic Table
1. Give a brief history of the formation of the periodic table. Include Dobereiner, Mendeleev, and Moseley.

2. Where are the metals, nonmetals, and metalloids located on the periodic table? What are the properties of each?

3. Elements in Groups IA – VIIIA are given what general name? Why?

4. Where are the alkali metals, alkaline earth metals, and halogens located on the periodic table?

5. Where are the transition metals and inner transition metals located on the periodic table?

6. Which groups make up the s block? The p block? The d block? The f block?

7. Describe the common trends that can be found on the periodic table.

UNIT 5: Formulas & Naming
1. How are positive ions named? Negative ions?

2. Can two positive or two negative ions make a compound? Explain.

3. What are Roman numerals used for?

4. What are prefixes used for in naming?

REVIEW PROBLEMS: Each of the problems below represents the problems you may see on the exam.

DENSITY

1. What is the density of a substance with volume of 10.0 cm^3 and a mass of 135.5 g? Assuming that this substance is an element, use the reference tables in your book to identify the substance.

2. A liquid with assume of 0.75 L has a mass of 0.095 kg. What is the density of the liquid in g/cm^3?

CONVERSIONS, SIGNIFICANT FIGURES, AND SCIENTIFIC NOTATION

1. A molecule of oxygen travels at a speed of 0.52 km/s. If there are 0.621 miles per kilometer, how fast in miles per hour is a molecule of oxygen traveling? Use the correct number of sig figs in your answer.

2. If iron has a density of 8.456 g/cm^3, what is its density in lb/ft^3? One kilogram is equal to 2.20 pounds and one centimeter is equal to 0.394 inches. Use the correct number of sig figs in your answer.

3. Express 45837262 in scientific notation.

4. Express 0.00000953 in scientific notation.

5. What is 1.76×10^3 in conventional form?

6. What is 4.7543×10^{-2} in conventional form?

TEMPERATURE
1. Convert each of the following temperatures into °C:
   a. 876K

   b. 1987K

   c. 98K

   d. 342K

CHARACTERISTICS OF AN ATOM
1. Complete the chart to the left.
   a.

   b.

   c.

   d.

   e.

   f.

   g.

   h.

   i.

   j.

   k.

   l.

Element	p^+	n^0	e^-	Charge	Mass Number	Atomic Number
In	(a)	(b)	(c)	+3	115	(d)
(e)	(f)	(g)	(h)	0	4	2
(i)	74	106	(j)	+2	(k)	(l)
(m)	(n)	(o)	10	(p)	23	11
Br	(q)	43	(r)	-1	(s)	(t)

   m.

   n.

   o.

   p.

   q.

   r.

   s.

   t.

ELECTRON CONFIGURATIONS

1. Write orbital filling diagrams for each of the following elements:
   a. Barium

   b. Xenon

   c. Vanadium

   d. Cerium

2. Write electron configurations for the following elements:
   a. Lithium

   b. Tin

   c. Osmium

   d. Berkelium

3. Write electron configurations using the noble gas core method for the following elements:
   a. Strontium

   b. Polonium

   c. Tungsten

   d. Protactinium

AVERAGE ATOMIC MASS

1. Use the following information to calculate the average atomic mass for each element:
    a. Titanium

Isotope	% Abundance	Atomic Mass
^{46}Ti	8.0	45.952629
^{47}Ti	7.3	46.951764
^{48}Ti	73.8	47.947947
^{49}Ti	5.5	48.947871
^{50}Ti	5.4	49.944792

    b. Gallium

Isotope	% Abundance	Atomic Mass
^{69}Ga	60.108	68.925580
^{71}Ga	39.892	70.924700

MOLE PROBLEMS

1. Find the molar mass of each of the following:
    a. Samarium

    b. AlP

    c. N_2O_5

    d. $Mg_3(PO_4)_2$

2. How many moles of tungsten are in 3.67×10^{34} atoms?

3. How many formula units of KBr are in 0.87 moles?

4. How many moles of platinum are in 1245 grams?

5. How many grams of $BaSO_4$ are in 0.73 moles?

6. How many moles of SO_2 are in 32.54 L?

7. How many L of CO_2 are in 5.34 moles?

NAMING COMPOUNDS
1. Write the correct formula for:
   a. Nitrogen monoxide

   b. Potassium phosphate

   c. Sulfur tetrachloride

   d. Magnesium oxide

   e. Tin (IV) iodide

   f. Lithium bromide

   g. Disulfur dichloride

   h. Calcium nitride

   i. Barium hydroxide

   j. Dinitrogen pentasulfide

   k. Gold (III) oxide

   l. Lead (II) chromate

2. Write the name for:
   a. KBr

   b. $FePO_4$

   c. ClO_2

   d. CuS

   e. $PbBr_4$

   f. As_4O_{10}

   g. AlN

   h. K_2SO_4

   i. PF_3

   j. Mn_2O_3

   k. Sn_3P_4