

**CHEM 1405 Unit 1**

**Version 1**

**Spring 2010**

**Name** \_\_\_\_\_

**Part 1: Fill in the blanks with the letter of the appropriate word or phrase from the word list, for 3 points each and a total of 30%.**

- |               |  |
|---------------|--|
| a) certain    | 1. A type of observation that is designed to test a hypothesis is known as a(n) _____.   |
| b) centi-     | 2. A(n) _____ is a brief statement, often mathematical, that summarizes a large body of scientific evidence.   |
| c) chemical   | 3. The significant figures of a measurement consist of all of the digits measured directly from the scale plus one estimated digit, also called the _____ digit. |
| d) compound   | 4. _____ is the metric system prefix that indicates 1/1000 <sup>th</sup> of the base unit.   |
| e) deci-      | 5. A(n) _____ change is one that results in a change of identity for the substance that was tested.  |
| f) density    | 6. A(n) _____ is a sample of matter that has only one type of atom; it is as simple as matter can be.  |
| g) electrons  | 7. Magnesium metal melts at 650.0 °C is an example of a(n) _____ property of matter.   |
| h) element    | 8. The state of matter that has definite volume and definite shape is known as a(n) _____.   |
| i) experiment | 9. An atom forms an ion by losing or gaining one or more _____.  |
| j) gas        | 10. A set of elements with similar physical and chemical properties is called a(n) _____. They are arranged in a column on the periodic table.                   |
| k) group      |  |
| l) hypothesis |  |
| m) isotope    |  |
| n) kilo-      |  |
| o) law        |  |
| p) liquid     |  |
| q) mili-      |  |
| r) mixture    |  |
| s) neutrons   |  |
| t) period     |  |
| u) physical   |  |
| v) protons    |  |
| w) pure       |  |
| x) solid      |  |
| y) theory     |  |
| z) uncertain  |  |

**Part II. Short Answer. Work each of the following problems or answer each question in the space provided. You must show your work and round answers to the correct number of significant figures, unless otherwise specified. 5 points each for a total of 40%.**

1. The statement "if anything can go wrong, it will" is referred to as Murphy's Law. Clearly explain why it is called Murphy's Law instead of Murphey's Theory.
2. How many significant figures does each number have?



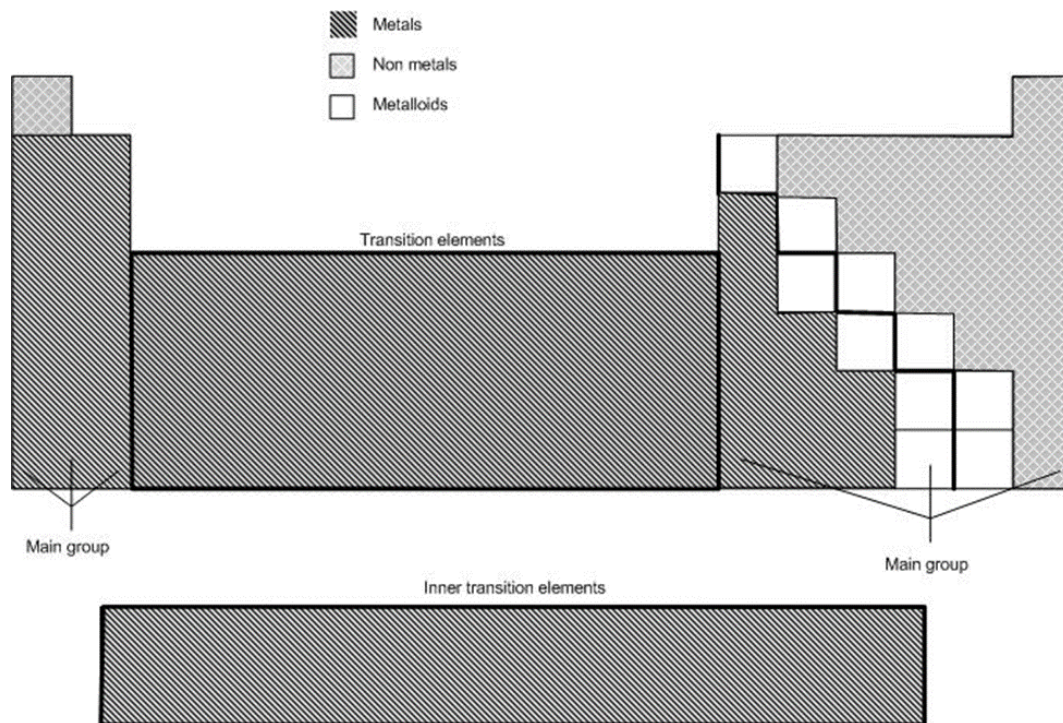
1. What are exact numbers? Explain the rounding rule we use for exact numbers. Show a sample calculation that includes an exact number, and explain how to round the result of the calculation according to the rules AND show how the result would be by applying the rule incorrectly.
2. A pickup truck engine has a displacement of 5.20 L. What is its displacement in cubic inches (in<sup>3</sup>)? You must show your work to receive credit. 1 inch = 2.54 cm.
3. Compare and contrast the terms 'mixture' and 'compound'. Note that your answer needs more depth than just defining the two terms. Your answer should be about a paragraph in length. The best answers will include examples, diagrams, and/or analogies.
4. The element nitrogen has two naturally occurring isotopes. Nitrogen-14 has an atomic mass of 14.003074 amu and an abundance of 99.632%. Nitrogen-15 has an atomic mass of 15.000108 amu and an abundance of 0.398%. What is the atomic weight of nitrogen? Round your final answer to 4 significant figures. Show your calculation or zero credit.

Answer Key:

**Part I:** i, o, z, q, c, h, u, x, g, k

**Part II:**

1. A scientific law is a summary of a large body of evidence used to predict an outcome. A theory is an explanation of a large body of scientific evidence used to explain phenomena. This statement is written as though it were a law because it summarizes. It can't be a theory because it does not attempt to explain why things go wrong.
2. a) 4; b) 2; c) 3
3. 1.88 mg
4. 13.80 g
5. evaporation is endothermic, combustion and decomposition are exothermic
6. A pure substance has only one type of matter in it. Distilled water is a pure substance, because all of the impurities have been removed. A homogeneous mixture has two or more substances blended so well that they look like one thing. Salt water is an example of a homogeneous mixture. It looks just as uniform as distilled water, but, if we drink it, we can tell the salt is there.
7.  ${}_{76}^{192}\text{Os}^{+4}$
- 8.



### Part III

1. Your answer should be written in complete sentences in paragraph form. I must include the definition of an exact number and an example. The key idea is that we round numbers to reflect the trustworthiness of the data used in the calculation. Because exact numbers are not data, their values were never rounded and they do not vary from situation to situation. They are completely trustworthy, much more so than any of the measurements. Therefore, they do not have any effect on where we round the result. Good examples to use for exact numbers are the metric system prefixes used as conversion factors since they look like they only have one significant figure.

2. 317 cc

3. Your answer should be written in complete sentences in a paragraph form. It must include definitions for the two terms, two or more similarities, and two or more fundamental differences. Key ideas are 1. a mixture is of variable composition, while a compound has definite composition; 2. properties of a mixture are similar to the properties of its components, while properties of a compound are different from those of its elements; and 3. the formation of a mixture is a physical process, while the formation of a compound is a chemical process. The best answers will use analogy, diagrams, and/or examples to clearly illustrate the key points.

4. 14.0 amu