US 110 Exam 1. Jordan, Fall 2003

Name_____

By submitting this exam, I affirm that I have neither given nor received unauthorized aid on this assignment.

You must show all work for credit. Express each answer to the correct number of significant figures.

Useful information: 1 m = 1.094 yd, $°C = \frac{5}{9}(°F - 32)$ $°F = \frac{9}{5}(°C) + 32$, 1 in =2.54 cm, 1 kg = 2.2 lbs, 1 mL= 1 cm³, $\%yield = \frac{actual}{theoretical} x100\%$

(1)(2 points) Which statement concerning the structure of the atom is correct?

    (A)   Protons and neutrons have most of the mass and occupy most of the volume of the atom.

    (B)   Electrons have most of the mass and occupy most of the volume of the atom.

    (C)   Electrons have most of the mass but occupy very little of the volume of the atom.

    (D)   Protons and neutrons have most of the mass but occupy very little of the volume of the atom.

(2)(2 points) An atom of indium-115 (In) contains

    (A)   38 electrons, 38 protons, 52 neutrons.

    (B)   38 electrons, 38 protons, 115 neutrons.

    (C)   66 electrons, 66 protons, 49 neutrons.

    (D)   49 electrons, 49 protons, 66 neutrons.

(3)(6 points) What is the empirical formula for the substance with this analysis:

An oxysulfide of phosphorus was found to contain 39.2% phosphorus, 40.4% oxygen and 20.3% sulfur. Its simplest formula is

Atomic Molar Masses
P   31.0 g·mol–1
S   32.1 g·mol–1
O   16.0 g·mol–1

    (A) P_2O_4S (C) $P_4O_6S_2$
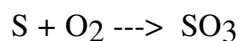
(B)   POS   (D) P_2O_5S

(4)(4 points) Conversions
(a) Convert 344 m^2 of carpet to ft^2

(b) What is 0 °F in °C?

(5)(2 points) Balance the following equation

$$S + O_2 \longrightarrow SO_3$$

(6)(2 points) Complete the equation by switching the cations and anions of the reagents, then balance the equation (metathesis reaction)

$Ca_3(PO_4)_2 + Ba(ClO)_2 \longrightarrow$

(7)(5 points) List 4 points of Dalton's Atomic theory including the one that was later found to be incorrect (and circle the one that was incorrect).

(8)(4 points) In movies, you often see thieves stuffing large bars of gold into backpacks. The density of gold is 19.31 g/mL. If a bar of gold has the dimensions of 20.0 cm x 15.0 cm x 10.00 cm, what is the mass of a bar of gold (in kg)?

(9) Whose experiment resulted in the modern view of the atom (with the small nucleus)? What was the experiment?

(10)(4 points) Classify the following as either element, compound, heterogeneous mixture, or homogeneous mixture.

(a) krypton

(b) ink in a ball point pen

(c) mashed potatoes(with lumps)

(d) rhenium

(11)(4 points) Rhenium only consists of two naturally occurring isotopes. If the following information represents the abundance and mass of the two isotopes, what is the average molecular weight that should go on the periodic table (this will not be the actual mass on the periodic table).

   mass = 185.955 amu, abundance = 37.40%

   mass = 188.959 amu, abundance = 62.60%

(12)(6 points) Acid rain destroys statues (made of $CaCO_3$) according to the following equation.

   $$CaCO_3 + 2HCl ----> CaCl_2 + CO_2 + H_2O$$
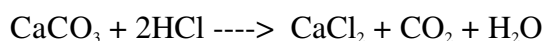
A 12.0 g sample of $CaCO_3$ is reacted with 0.200 moles of HCl.

(a) Which reagent is the limiting reagent?

(b) How much of the excess reagent remains (in moles)?

(c) If the amount of $CaCl_2$ that formed was 10.0 g, what is the % yield?

(13)(4 points) How would you prepare 100.0 mL of a 0.010 M solution of NaOH from a 0.235 M stock solution?

(14) Fill in the following table (4 points)

	Formula	Name
a	KClO	
b		sulfurous acid
c	PF_5	
d		copper (I) oxide

Extra Credit: (4 points)
In *An Outline of Science*:

(a) Caution is urged when evaluating information from new techniques. Faraday called such knowledge

(a) "trendy" knowledge (b) "doubtful" knowledge

(c) "cool" knowledge (d) "bad" knowledge

(b) A discussion of scientific symbols was presented. When a concept is used, but has not been exactly defined and/or observed, it is merely a symbol and not reality. As an example, for a long time the atom was merely a symbol (Dalton didn't exactly know what it was, but it was very useful). Then, the atom became a reality. Another common symbol was discussed which is now reality. What was it?