Chemistry 1094 Spring 2017 Test 1

Wednesday, February 1, 2017 Time: 1 hour 50 minutes

Name: _____ Student #: _____

*This test consists of **eight** pages of questions, a periodic table, and a sheet containing the names, masses, and symbols of the elements. Please ensure that you have a complete test and, if you do not, obtain one from me **immediately**. There are **49.5** marks available. Good luck!*

1) **[8 marks]** Perform the following mathematical operations. Express the result to the correct number of significant figures. No numbers in this question are exact.

   a) $(4.0 \times 10^{3} + 1.00 \times 10^{-2})(5.75 \times 10^{-3} + 2.113 \times 10^{-2})$

   b) $\frac{2.1+0.016}{9.9-1.115}$

   c) $\frac{2.128\ x\ 9.61-10.315}{4.96-\frac{2.61}{0.523}}$

   d) $\frac{\frac{2.68}{4.446}-\frac{4.12}{6.778}}{\frac{3.1}{1.05}-\frac{1.01}{0.55}}$

2) **[4 marks]** Perform the following conversions. Your answers do not need to be expressed to the correct number of significant figures.

a) 4.68 km to nm

b) 5.12 feet to cm, if 1 inch is 2.54 cm exactly

c) 98.6°F to °C

d) 212°F to K

3) **[4 marks]** A Boeing 767-200 aircraft requires 22,300 kg of fuel to fly safely from Montreal to Edmonton.

a) Suppose a 767 being prepared for that flight started out with 7682 litres of fuel on board. How many more litres of fuel would the plane require for the flight from Montreal to Edmonton? The density of jet fuel is 0.803 g/mL.

b) The distance between the Montreal and Edmonton airports is 2972 km (by air). Assuming a 767-200 uses 4.83 kg of fuel per km flown, how many litres of fuel will remain in a 767-200 after it has flown from Montreal to Edmonton, assuming that it started out with the 22,300 kg it needed to make the journey safely?

4) **[6 marks]** A container is completely filled with ethanol (density 0.789 g/mL). The container and ethanol have a combined mass of 1000.00 grams. A rock of mass 650.00 grams is then added to the container, causing some of the ethanol to spill out (the volume of ethanol spilled is exactly equal to the volume of the rock). The container, rock, and leftover ethanol are then reweighed, and found to have a mass of 1571.10 grams.

a) What is the density of the rock? Give your answer in g/mL (g/cm^3).

b) Convert your answer to kg/dm^3.

5) **[2 marks]** Classify the following as **E**lements, **C**ompounds, **He**terogeneous **M**ixtures, or **Ho**mogeneous **M**ixtures. Circle your choice:

Air	E	C	HeM	HoM
Water	E	C	HeM	HoM
Earth (soil)	E	C	HeM	HoM
Iron	E	C	HeM	HoM

6) **[2 marks]** Classify the following as **C**hemical **C**hanges or **P**hysical **C**hanges to the indicated matter. Circle your choice:

Burning ethanol	CC	PC
Boiling ethanol	CC	PC
Removing ice cubes from water	CC	PC
Converting water to elemental hydrogen and oxygen	CC	PC

7) **[1 mark]** In one experiment, 15.0 grams of hydrogen was mixed with 15.0 grams of oxygen, and the mixture ignited. All the oxygen was used up, leaving some hydrogen left over and 16.9 grams of water. How many grams of hydrogen remained?

8) **[1 mark]** A 1.00-gram sample of the compound acetylene is 7.74 percent hydrogen by mass. A 10.00-gram sample of acetylene will be:

a) 0.774 percent hydrogen by mass
b) 7.74 percent hydrogen by mass
c) 77.4 percent hydrogen by mass
d) There is not enough information to answer this question

9) **[2 marks]** Suppose you took 2 grams of N_2 and converted it into NH_3, and 3 grams of N_2 and converted it into N_2H_4. Calculate the ratio $\frac{mass\ of\ H\ in\ NH_3}{mass\ of\ H\ in\ N_2H_4}$.

10) **[2.5 marks]** Classify the following elements as **G**ases, **L**iquids, **S**olid **N**on-metals, **S**olid **S**emi-metals, or **S**olid **M**etals. Circle your choice. You may assume all elements are at room temperature.

arsenic	G	L	SN	SS	SM
chlorine	G	L	SN	SS	SM
lead	G	L	SN	SS	SM
mercury	G	L	SN	SS	SM
sulphur	G	L	SN	SS	SM

11) **[2 marks]** Circle the correct form for each element as it occurs naturally and at room temperature:

chlorine	Cl	Cl_2	Cl_4	Cl_8
iron	Fe	Fe_2	Fe_4	Fe_8
phosphorus	P	P_2	P_4	P_8
sulphur	S	S_2	S_4	S_8

12) **[5 marks total]** The weighted average mass of a chromium (Cr) atom is 51.9961 Da.

a) **[3 marks]** Complete the following table for chromium:

Nuclide Symbol	Isotope Mass (Da)	Percent Abundance
	49.9460	4.345
	52.9407	9.501
	53.9389	2.365

b) **[1 mark]** How many protons will there be in the heaviest isotope of chromium?

c) **[1 mark]** How many electrons will there be in the lightest isotope of a neutral atom of chromium?

13) **[10 marks]** Complete the following table:

Formula	Name
NaI	
	sodium nitride
Fe_3P_2	
	gold(III) sulphide
$Ca_3(PO_3)_2$	
	aluminum perchlorate
$NiSO_3 \cdot 3H_2O$	
	chromium(III) carbonate tetrahydrate
$HBrO_4$	
	sulphuric acid