Chemistry 140 Name(s):

Exercise 3: Atoms, molecules, isotopes and ions

1. a. Given that the mass of the neutron is 1.674954×10^{-27} kg, the mass of a proton is $1.6726430 \times 10^{-27}$ kg and the mass of an electron is $9.1093897 \times 10^{-31}$ kg, what is the **mass** (in kg) of a single carbon-12 atom?

b. What is the **mass** (in amu) of a single carbon-12 atom?

c. Therefore what is the **conversion factor** between amu and kg (i.e. how many kg is one amu--from this answer you should see why the isotope mass is close to the true mass in amu)?

2. a. Write the **chemical symbol** for an isotope that has 8 protons, 10 neutrons and 8 electrons.

b. Describe the **subatomic structure** (i.e., give the number of protons, neutrons and electrons) of ^{27}Al.

3. **Name** the following binary compounds:

a. KBr

b. Na_2S

c. Na_2SO_4

d. $BeCl_2$

e. Fe_2O_3

4. Give the **chemical formula** of the following binary compounds (make sure the resulting molecule is electrically neutral!):

a. Calcium fluoride

b. Potassium permanganate

c. Cobalt (II) carbonate (and you thought capitalization wasn't important!)

d. Lithium nitride

e. Tungsten (IV) oxide

5. Manganese can exist as a 2+ and 3+ metal ion. If we add manganese ions to a solution containing nitrate (NO_3^-) and oxalate ($C_2O_4^{2-}$) ions, what **possible compounds** may result?

6. **Name** the following compounds in the proper chemical fashion:

a. $CaSO_3$

b. H_2SO_3 (aq)

c. $SnSO_3$

d. $(NH_4)_2SO_3$

e. SO_3

7. Write the complete **chemical formula** for the following compounds:

a. Hydrobromic acid

b. Hydrogen bromide

c. Perbromic acid (hint: make an analogy with the chlorine oxyacid series)

d. Bromic acid

e. Oxygen dibromide

8. a. How many iron atoms does a sample of iron weighing 55.85 grams contain?

b. How much will 1.506×10^{23} atoms of iron weigh (in grams)?

c. The iron ringstand used in lab weighs 0.5000 kg; how many atoms does it have?