Station 1

Match the unit with its description:

____1. amount of substance   A.   amu or u

____2. density   B.   g

____3. mass   C.   g/mL

____4. molar mass   D.   g/mole

____5. molecular mass   E.   L

____6. volume   F.   mole

1. Chemical reactions between metals and non-metals primarily involve:
    a. Sharing of electrons
    b. Transfer of electrons
    c. Interactions between protons
    d. Interactions between protons and electrons

2. All of the following have noble gas configurations **except**:
    a. Cl^-
    b. N^{3-}
    c. Mg^{2+}
    d. P^{3+}

3. The following is a list of the usual charge found on the ions of a series of elements: Y^-, W^{2+}, Z^{2-}, V^{3+} and X^{3-}. State which elements are most likely to be metals.
    a. W and V.
    b. V and X.
    c. X, Y and Z.
    d. None are metals

4. How many **valence electrons** does a nitrogen atom have?
    a. 3
    b. 5
    c. 7
    d. 14

5. Which of the following is a group of ONLY non-metals?
    a. Li, Na, K, Rb
    b. H, He, Li, Be
    c. F, Cl, Br, I
    d. B, Al, Sc, Y

6. Which is the largest alkali metal in the periodic table?
    a. Li
    b. Rb
    c. Be
    d. Cs

7. Identify the atom that has the largest value for electronegativity.
    a. He
    b. F
    c. Si
    d. Na

Station 2

1. Write chemical formulas for the compounds:

    a. sodium chloride   _____   e.   magnesium fluoride   _____

    b. ammonium sulfate _____   f.   lead(II) phosphate   _____

    c. potassium nitrate   _____   g.   dinitrogen pentoxide _____

    d. calcium hydroxide _____   h.   sulphur trioxide   _____

2. Name the following:

    a. CO _____

    b. CO_2 _____

    c. Na_2SO_4 _____

    d. H_2O_2 _____

    e. $(NH_4)_2CO_3$ _____

3. Choose the correct formula for perphosphoric acid:
    a. $H_3PO_4(aq)$
    b. $H_2PO_4(aq)$
    c. $H_3PO_5(aq)$
    d. $H_2PO_5(aq)$

4. Choose the correct formula for iron(III) nitrate:
    a. FeN
    b. $Fe(NO_3)_3$
    c. Fe_3NO_3
    d. Fe_3N

5. Under specific conditions, magnesium and nitrogen are bonded together.

    a. State the formula of the compound: _____

    b. Name the compound: _____

    c. State the type of bond formed: _____

    d. Carbon and oxygen form a different type of bond. Explain how these two types of bonding are different.

Station 3

1. Calculate the molar masses of the following:

   a. H_2O b. $CaCO_3$ c. $(NH_4)_3PO_4$ d. $Al(OH)_3$
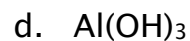
2. Perform the following calculations. Show your work.

   a. Calculate the mass of 0.500 mol of CO.

   b. How many moles of KOH are present in a 25.0 g sample of the substance?

3. Liquid water is produced when hydrogen gas and oxygen gas combine.

   a.   List the reactant(s) in this reaction _____

   b.   List the product(s)   _____

   c.   Write a balanced equation for the reaction, including physical states

4. Ammonium sulphate, $(NH_4)_2SO_4$ is an important synthetic fertilizer. What is the molar mass of ammonium sulphate?
   a. 70 g/mol
   b. 92 g/mol
   c. 114 g/mol
   d. 132 g/mol

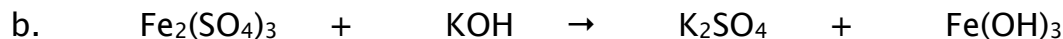5. If 1.91 moles of a substance has a mass of 260 g, then the substance may be:
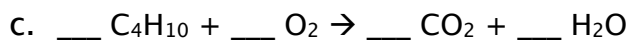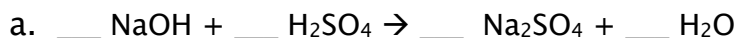   a. $CuSO_4$
   b. $CaHPO_5$
   c. $CaSO_4$
   d. CuCl

Station 4

Balance the following equations:

a.   Zn +   HCl   → $ZnCl_2$ + H_2

b. $Fe_2(SO_4)_3$ +   KOH   → K_2SO_4 + $Fe(OH)_3$

c.   Fe + O_2 → Fe_2O_3

2. Balance the following reactions and state the type of reaction.

a. ___ NaOH + ___ H_2SO_4 → ___ Na_2SO_4 + ___ H_2O

b. ___ $KClO_3$ → ___ KCl + ___ O_2

c. ___ C_4H_{10} + ___ O_2 → ___ CO_2 + ___ H_2O

3. Predict the products of the following reactions:

a. Na_3PO_4 +   HCl   →   _____

b.   Mg + H_2CO_3 →   _____

4. Write a net ionic equation for: Cu(s) + 2 $AgNO_3$(aq) → $Cu(NO_3)_2$ (aq) + 2 Ag(s)

5. When balanced, the mole ratio for calcium hydroxide reacting with aluminum sulphate the following reaction is: $Ca(OH)_2$(aq) + $Al_2(SO_4)_3$(aq) → $CaSO_4$(s) + $Al(OH)_3$(s)
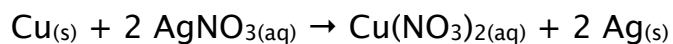   a. 1:1
   b. 2:1
   c. 2:3
   d. 3:1

Station 5

1. In a reaction between sulfur and oxygen, 80.0 g of sulfur dioxide is formed. What mass of sulfur was burned?
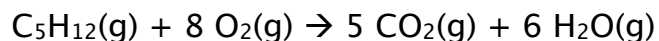
$$S + O_2 \rightarrow SO_2$$
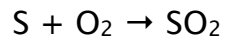
2. What mass of silver is precipitated (formed) when 40.0 g of copper reacts with an excess of silver nitrate in solution, according to the following equation:

$$Cu_{(s)} + 2\ AgNO_{3(aq)} \rightarrow Cu(NO_3)_{2(aq)} + 2\ Ag_{(s)}$$

Station 6

1. In a combustion reaction, 72.15 g of pentane, $C_5H_{12}(g)$, reacts with 300.0 g of oxygen according to the equation below:

$$C_5H_{12}(g) + 8\ O_2(g) \rightarrow 5\ CO_2(g) + 6\ H_2O(g)$$

   a. Identify the limiting reactant.

   b. Calculate the moles of excess reactant remaining at the end of the experiment.

   c. Using what you have of the limiting reactant, calculate the mass of carbon dioxide produced.

Station 7

1. Concentration of solutions.
   a. Find the molar concentration of chloride ions in a 400.0 mL solution containing 79.25 g of $SrCl_2$.

   b. A 675 mL sample of 1.85 mol/L sodium chlorate solution is diluted by adding 325 mL of water. Find the concentration of the diluted solution. [2]

2. What volume of 14.00 mol/L stock solution is needed to make 1.75 L of 8.35 mol/L solution?
   a. 293 mL
   b. 2.93 L
   c. 104 mL
   d. 1.04 L

3. If 67.2 g of copper(II) chloride is dissolved in enough water to make 250 mL of solution, what is the molar concentration of the solution?
   a. 2.5 mol/L
   b. 2.0 mol/L
   c. 1.0 mol/L
   d. 0.50 mol/L

4. A student mixes 15.0 mL of 0.250 mol/L aqueous sodium hydroxide with 20.0 mL of 0.400 mol/L aqueous aluminum nitrate.

   a. Write the balanced chemical equation.

   b. Determine the limiting reagent.

   c. Using what you have of the limiting reagent, determine the MASS of the precipitate formed.

Station 8

1. Some antacid products contain aluminium hydroxide, $Al(OH)_3$, to neutralize excess stomach acid. What volume of a 0.10 mol/L stomach acid, HCl, can be neutralized by 912 mg of aluminium hydroxide. The reaction is shown:

$$3 \text{ HCl} + Al(OH)_3 \rightarrow AlCl_3 + 3 \text{ H}_2O$$