Chemistry 1810
Giant Practice Problem (Dr GRC)
All about aluminum

1. Aluminum is found in nature as only one isotope. Therefore how many neutrons does that isotope possess?

2. Draw the electron-dot structure for (a) the aluminum atom; and (b) the aluminum ion.

3. Aluminum chloride forms a hydrate. If 8.74 g of the hydrate are heated until all the water is removed, 4.83 g of anhydrous aluminum chloride remain. What is the formula of the hydrate? What will be its name?

4. Aluminum forms a bromide, which contains 89.9% bromine. Determine the empirical formula of the compound. Unusually for a compound of a metal, it exhibits covalent bonding. If the molar mass of the compound is 525 $g \cdot mol^{-1}$, what is its molecular formula?

5. (a) Write the formula of aluminum nitrate. Will it be water-soluble or not? Explain.

   (b) Write the formula of aluminum phosphate. Will it be water-soluble or not? Explain.

6. Aluminum metal reacts with silver nitrate solution.
   (a) What would the class of reaction be?
   (b) Why would you expect reaction to happen?
   (c) Write a molecular equation for the reaction.
   (d) Write a net ionic equation for the reaction.

7. Aluminum metal reacts with sulfuric acid:

   $$Al(s) + H_2SO_4(aq) \rightarrow Al_2(SO_4)_3(aq) + H_2(g)$$

   (a) Balance the chemical equation.
   (b) What would the class of reaction be?
   (c) What would the driving force of the reaction be?
   (d) If 9.85 g of aluminum is used:
      (i) What is the minimum volume of 1.50 $mol \cdot L^{-1}$ sulfuric acid needed for complete reaction?
      (ii) What volume of hydrogen gas will be produced at a temperature of 22ºC and a pressure of 102 kPa?
      (iii) If the aluminum sulfate solution is evaporated to dryness, what mass of the solid should be formed?