**DGD Exercises #1 – Chapter 1**

32) The Canadian Recommended Dietary Allowances (RDA) of several vitamins for an adult female follow. In each case, calculate how many molecules are in the Canadian RDA.

a) 75 mg vitamin C (C$_6$H$_8$O$_6$)

b) 400 mg folic acid (C$_{19}$H$_{19}$N$_7$O$_6$)

c) 0.7 mg vitamin A (C$_{20}$H$_{30}$O)

d) 15 mg vitamin E (C$_{29}$H$_{50}$O$_2$)

36) An oral contraceptive contains 0.035 mg of ethynyl estradiol in each pill. The formula of this compound is C$_{20}$H$_{24}$O$_2$. How many moles of ethynyl estradiol are there in one pill. How many molecules is this? How many carbon atoms are in a 0.035 mg sample of ethynyl estradiol? What mass of carbon is this?

45) Balance the following chemical equations.

a) NH$_4$NO$_3$ → N$_2$O + H$_2$O

b) P$_4$O$_{10}$ + H$_2$O → H$_3$PO$_4$

c) HIO$_3$ → I$_2$O$_5$ + H$_2$O

d) As + Cl$_2$ → AsCl$_3$

46) Balance the following chemical equations.

a) N$_2$O$_5$ + H$_2$O → HNO$_3$

b) KClO$_3$ → KCl + O$_2$

c) Fe + O$_2$ + H$_2$O → Fe(OH)$_2$

d) P$_4$ + Cl$_2$ → PCl$_3$

54) Balance the following chemical equations.

a) P$_4$ + Na → Na$_3$P

b) Na$_3$P + H$_2$O → PH$_3$ + NaOH

c) PH$_3$ + O$_2$ → P$_4$O$_{10}$ + H$_2$O

d) P$_4$O$_{10}$ + H$_2$O → H$_3$PO$_4$

57) Iodine can be prepared by bubbling chlorine gas through an aqueous solution of sodium iodide:

$$2 \text{NaI}_{(aq)} + \text{Cl}_2(g) \rightarrow \text{I}_2(s) + 2 \text{NaCl}_{(aq)}$$

What mass (in g) of NaI is required to produce 1.50 kg of I$_2$?
60) One starting material for the preparation of nylon is adipic acid. Adipic acid is produced from the oxidation of cyclohexane:

$$\text{2 cyclohexane} + \text{5 O}_2 \rightarrow \text{2 adipic acid} + \text{2 H}_2\text{O}$$

cyclohexane \(\text{C}_6\text{H}_{12}\)  
adipic acid \(\text{C}_6\text{H}_{10}\text{O}_4\)

If 375 kg of cyclohexane reacts with an unlimited supply of oxygen, how much adipic acid (in kg) can be formed?

64) When HgO is heated, it decomposes into elemental mercury and molecular oxygen gas. If 60.0 g of Hg is from 80.0 g of the oxide, what is the percent yield of the reaction?

68) If the oxidation reaction described in 60 is 76.5% efficient, what mass of cyclohexane is required to produce 3.50 kg of adipic acid?