CHEMISTRY
CHAPTER 4 – WORKSHEET G

1. Find the empirical formula for the following compounds:
a) 26.0 g of a cobalt chloride which produces 11.96 g of cobalt
b) 9.89 g of a chromium sulphide which produces 6.42 g of sulphur
c) 25.8 mg of an oxygen chloride which forms 17.8 mg of chloride gas

2. Find the molecular formula of the following compound if:
a) empirical formula is CH_2 and molar mass is 70 g/mole
b) empirical formula is CH_2O and M.W. is 180 g/mole
c) empirical formula is CH_2 and 0.20 moles weighs 25.2 g

3. Find the percent composition of the following compounds:
a) CuO
b) Cu_2O
c) $Ca(NO_3)_2$
d) NH_4NO_2
e) Cobalt III chlorate
f) nitrogen monoxide
g) nitrogen dioxide
h) dinitrogen pentoxide

4. Find the empirical formula for the following compounds:
a) 70.0% iron and 30.0% oxygen
b) 72.4% iron and 27.6% oxygen
c) 54.5% carbon, 9.1%hydrogen and 36.4% oxygen

5. Find the molecular formula of the following compounds:
a) it has 30.4% N and 69.6% O with a M.W. of 92 g/mole
b) it has 24.2% carbon, 4.0% hydrogen and 71.7% chloride with a molar mass of 99 g/mole

ANSWERS

1.a) $CoCl_2$
b) CrS_3
c) OCl

2.a) C_5H_{10}
b) $C_6H_{12}O_6$
c) C_9H_{18}

4.a) Fe_2O_3
b) Fe_3O_4
c) C_2H_4O

5.a) N_2O_4
b) $C_2H_4Cl_2$

PERCENTAGE COMPOSITION PROBLEMS

1. The following chemical compounds are commonly used as sources of nitrogen in fertilizers. Calculate the % nitrogen by mass in each compound.
   (a) ammonium nitrate
   (b) ammonia
   (c) urea $(NH_2)_2CO$
   (d) ammonium dihydrogen phosphate
2. Calcium phosphate is a main constituent of human teeth and bones. The average human skeleton has a mass of 15kg. Calculate:
   (a) The mass of calcium in the average human skeleton
   (b) The percentage phosphate by mass in the average human skeleton
3. Calculate the percentage carbon by mass in each of the following fuels:
   (a) methane (natural gas) CH_4
   (b) propane (as in gas barbeques) C_3H_8
   (c) ethyl alcohol (as in gasohol) C_2H_5OH
   (d) octane (a main ingredient in gasoline) C_8H_{18}
   (e) acetylene (used for welding) C_2H_2
   (f) paraffin (as in candle wax) $C_{30}H_{62}$
   (g) butane (as in lighter fluid) C_4H_{10}
4. Which of the following fertilizer chemicals has the higher % phosphorus by mass?
   (a) "ammophos" $NH_4H_2PO_4$
   (b) triple superphosphate $Ca(H_2PO_4)_2$
5. Which of the following antibiotics has the higher % nitrogen by mass?
   (a) sulphanilamide $C_6H_8N_2O_2S$
   (b) chloromycetin $C_{11}H_{12}N_2O_5Cl_2$
   (c) pennicillin $C_{11}H_{15}N_2O_4S$
6. Aspirin, chemical name acetylsalicylic acis (ASA) is a common pain killer and fever-reducing agent. The molecular formula is $C_9H_8O_4$. Calculate the % carbon by mass in aspirin.

ANSWERS

1(a) 35% (b) 82.4% (c) 46.7% (d) 12.2% 2(a) 5.8kg (b) 61.3% 3(a) 75% (b) 81.8% (c) 52.2% (d) 84.2% (e) 92.3% (f) 85.3% (g) 82.8% 4(a) 27% (b) 26.5% 5(a) 16.3% (b) 8.67% (c) 10.3% 6 60%