Science 10 Honours Concentration

1. Calculate the molar concentration of the following solutions.
   a. 0.26 mol of HCl in 1.0 L of solution
   b. 2.8 mol of HNO_3 in 4.0 L of solution
   c. 0.0700 mol of NH_4Cl in 50.0 mL of solution
   d. 1.50 g of $CoBr_2 \cdot 6H_2O$ in 600.0 mL of solution
   e. 25.0 g of NaCl in 250.0 mL of solution
   f. 10.0 g of $Cr(NO_3)_3 \cdot 9H_2O$ in 325 mL of solution

2. How many moles of $AlCl_3$ are contained in 350.0 mL of 0.250 M $AlCl_3$?

3. What volume of 2.40 M HCl can be made from 100.0 g of HCl?

4. How many moles of $Sr(NO_3)_2$ are contained in 55.0 mL of 1.30×10^{-3} M $Sr(NO_3)_2$?

5. The density of water at 4°C is 1.000 kg/L. What is the molar concentration of H_2O in pure water at 4°C? (Hint: how many moles of H_2O are contained in 1 L?)

6. What volume of 0.250 M HCl is required to completely neutralize 25.0 mL of 0.318 M NaOH? (Hint: you need a balanced reaction and yes, you **do** know how to write this neutralization reaction)

7. 19.8 mL of H_3PO_4 with an unknown molarity reacts with 25.0 mL of 0.500 M KOH, according to the reaction: $H_3PO_4 + 2KOH \rightarrow K_2HPO_4 + 2\,H_2O$
   What is the molarity of the H_3PO_4?

8. What volume of 0.200 M KOH is required to react with 125 mL of 0.250 M H_3PO_4 in order to produce a solution of K_2HPO_4?

1a. [HCl] = 0.26 M b. $[HNO_3]$ = 0.70 M c. $[NH_4Cl]$ = 1.40 M
d. $[CoBr_2 \cdot 6H_2O]$ = 0.00765 M e. [NaCl] = 1.71 M f. $[Cr(NO_3)_3 \cdot 9H_2O]$ = 0.0769 M

2. 0.0875 mol $AlCl_3$

3. 1.14 L HCl

4. 0.0000715 mol $Sr(NO_3)_2$

5. 55.6 M H_2O

6. 0.0318 L HCl

7. 0.315 M H_3PO_4

8. 0.313 L KOH

Science 10 Honours Percentage Yield

1. The roasting of siderite ore, $FeCO_3$, produces iron (III) oxide:
   $4\ FeCO_3 + O_2 \rightarrow 2\ Fe_2O_3 + 4\ CO_2$
   A 35.0 g sample of $FeCO_3$ produces 22.5 g of Fe_2O_3. What is the percentage yield of the reaction?

2. The reaction $SiO_2 + 4\ HF \rightarrow SiF_4 + 2\ H_2O$ produces 2.50 g of H_2O when 12.20 g of SiO_2 is treated with an excess of HF.
   a. What mass of SiF_4 is formed?
   b. What mass of SiO_2 is left unreacted?
   c. What is the percentage yield of SiF_4?

3. When 5.000 kg of malachite ore containing 4.30% of malachite, $Cu_2(OH)_2CO_3$, is heated, the product is copper (II) oxide: $Cu_2(OH)_2CO_3 \rightarrow CO_2 + 2\ CuO + H_2O$
   If the reaction has an 84.0% yield, how many grams of CuO are produced?

4. A mine produces a silver ore named argentite, AgS. The ore is smelted according to the overall reaction $Ag_2S + C + 2\ O_2 \rightarrow 2\ Ag + CO_2 + SO_2$
   A sample of pure Ag_2S has a mass of 152.6 g. When smelted, the sample produces 117.4 g of pure Ag. What is the percentage yield of the smelting process?

1. 93.4%

2a. 7.23 g SiF_4
 b. 8.03 g SiO_2
 c. 34.3%

3. 130 g CuO

4. 88.4%

"Mr. Osborne, may I be excused? My brain is full."

Science 10 Honours Limiting Reactant

1. What mass of CS_2 is produced when 17.5 g of C are reacted with 39.5 g of SO_2 according to the equation $C + SO_2 \rightarrow CS_2 + CO$? (hint: is it balanced?)
   What mass of the excess reactant will be left over?

2. What mass of NO is produced when 87.0 g of Cu are reacted with 225 g of HNO_3 according to the equation $3\ Cu + 8\ HNO_3 \rightarrow 3\ Cu(NO_3)_2 + 2\ NO + 4\ H_2O$?
   What mass of the excess reactant will be left over?

3. What mass of P_4 is produced when 41.5 g of $Ca_3(PO_4)_2$, 26.5 g of SiO_2, and 7.80 g of C are reacted according to the equation:
   $2\ Ca_3(PO_4)_2 + 6\ SiO_2 + 10\ C \rightarrow P_4 + 6\ CaSiO_3 + 10\ CO$
   How many grams of each excess reactant will remain unreacted?

4. What mass of Br_2 is produced when 25.0 g of $K_2Cr_2O_7$, 55.0 g of KBr, and 60.6 g of H_2SO_4 are reacted according to the equation:
   $K_2Cr_2O_7 + 6\ KBr + 7\ H_2SO_4 \rightarrow 4\ K_2SO_4 + Cr_2(SO_4)_3 + 3\ Br_2 + 7\ H_2O$

5. If 0.250 g of $Ba(OH)_2$ is mixed with 15.0 mL of 0.125 M HBr, what mass of $BaBr_2$ can be formed? $Ba(OH)_2 + 2\ HBr \rightarrow BaBr_2 + 2\ H_2O$

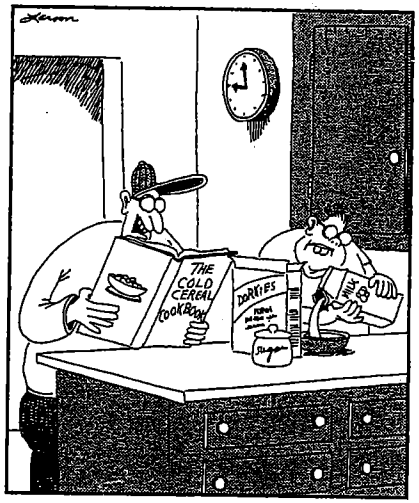
1. $5\ C + 2\ SO_2 \rightarrow CS_2 + 4\ CO$
   22.2 g of CS_2 produced
   2.10 g of SO_2 is excess

2. 26.8 g of NO 2.0 g of Cu is excess

3. 8.06 g of P_4 is produced 1.20 g of $Ca_3(PO_4)_2$ and 3.10 g of SiO_2 is excess

4. 36.9 g of Br_2 is produced

5. 0.278 g of $BaBr_2$ is produced



"Oh, wait! Wait, Cory! ...
Add the cereal *first* and *then* the milk!"