Titration calculations for pleasure and profit

Moles over voles stuff

1. Calculate the amount of hydrochloric acid in 25cm^3 of 0.100M HC1.
2. Calculate the amount of sodium hydroxide in 250cm^3 of 0.2M NaOH.
3. Calculate the M_r of sodium hydroxide and the M_r of sodium carbonate, Na_2CO_3.
4. a) What mass of sodium hydroxide must be dissolved in 250cm^3 of water to make a 0.5M solution?
   b) What amount of sodium hydroxide is there in 25cm^3 of this solution?
5. a) What mass of sodium carbonate must be dissolved in 250cm^3 of water to make a 0.25M solution?
   b) What amount of sodium carbonate is there in 50cm^3 of this solution?

Equation stuff

6. Balance these equations:

   a) $HC1 + NaOH \rightarrow NaCl + H_2O$

   b) $HC1 + Na_2C0_3 \rightarrow NaCl + CO_2 + H_2O$

   c) $H_2SO_4 + NaOH \rightarrow Na_2SO_4 + H_2O$

   d) $H_2SO_4 + Na_2CO_3 \rightarrow Na_2SO_4 + CO_2 + H_2O$

Beautiful burette stuff

Show your working out, and show your answers to the appropriate number of significant figures.

7. 25.00cm^3 of 0.100M NaOH is needed to titrate 25.00cm^3 of a solution of hydrochloric acid. Calculate the concentration of the acid.
8. 23.15cm^3 of 0.125M NaOH is needed to titrate 25.00cm^3 of a solution of hydrochloric acid. Calculate the concentration of the acid.
9. 25.00cm^3 of 0.200M NaOH is needed to titrate 25.00cm^3 of a solution of sulphuric acid. Calculate the concentration of the acid.
10. 3.45g of an unknown acid, HX is dissolved in 250cm^3 of water in a standard flask. 25cm^3 of this solution was pipetted into a conical flask. 24.00cm^3 of 0.400M NaOH was needed to titrate it.

    a) What is the amount of sodium hydroxide in 24.00cm^3 of 0.400M sodium hydroxide?

    b) Taking into account the stoichiometry between HX and sodium hydroxide, what the amount of HX in the 25cm^3 aliquot?

    c) What is the total amount of HX in the original 250cm^3 solution?

    d) Using your answer to part (c), and the mass given in the question, calculate the M_r of HX.

    e) If X is a halogen, what is the most likely identity of HX?

    f) Estimate the maximum errors in the using each piece of apparatus and the total apparatus error. How confident are you that you have correctly identified HX?

