

# CALCULATING CONCENTRATION

Calculating the concentration/number of moles and volume using the formula:

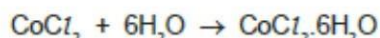
Concentration = No. of moles  $\div$  Volume

Unit: mole/dm<sup>3</sup>

Example:

[O/N/2010-P31-Q8b]

- (b) 6.0 g of cobalt(II) carbonate was added to 40 cm<sup>3</sup> of hydrochloric acid, concentration 2.0 mol/dm<sup>3</sup>. Calculate the maximum yield of cobalt(II) chloride-6-water and show that the cobalt(II) carbonate was in excess.



Maximum yield

Number of moles of HCl used = .....

Number of moles of CoCl<sub>2</sub> formed = .....

Number of moles of CoCl<sub>2</sub>·6H<sub>2</sub>O formed = .....

Solution:

**Ideal Mole ratio:[Equation 1]**

CaCO<sub>3</sub> : HCl : CoCl<sub>2</sub> : CO<sub>2</sub> : H<sub>2</sub>O  
1 : 2 : 1 : 1 : 1- Ideal mole ratio

0.040 : 0.080 : 0.040 : 0.040 : 0.040-Experimental mole ratio

Moles of HCl = Concentration of HCl  $\times$  Volume of HCl  
= 2  $\times$  0.040 = 0.080

Comparing with the ideal mole ratio ;

Moles of CoCl<sub>2</sub> formed = 0.5  $\times$  moles of HCl  
= 0.5  $\times$  0.080 = 0.040

Also;

**Ideal Mole ratio:[Equation 1]**

CoCl<sub>2</sub> : H<sub>2</sub>O : CoCl<sub>2</sub>·6 H<sub>2</sub>O  
1 : 6 : 1

0.040 : 0.24 : 0.040-Experimental mole ratio

Hence;

Moles of CoCl<sub>2</sub>·6 H<sub>2</sub>O formed = Moles of CoCl<sub>2</sub> used = 0.040

Note: The underlined mole ratio is the data we obtain after calculations.

Concentration can be measured in g/dm<sup>3</sup> or mo/dm<sup>3</sup>