AQA AS/A-level Year 1 Chemistry exam practice answers

**2 Amount of substance**

**1 (a)** amount of Mg = 9.20/24.3 = 0.379 mol [1]

**(b)** amount of MgF2 = 0.379 mol [1]

**(c)** mass of MgF2 = 0.379 × 62.3 = 23.6 g [1]

**(d)** amount of MgF2 = 50.0/62.3 = 0.803 mol [1]

amount of Mg = 0.803 mol [1]

mass of Mg = 0.803 × 24.3 = 19.5 g [1]

**2** **(a)** amount of NaOH = (25.0/1000) × 0.500 = 0.0125 mol [1]

**(b)** amount of HCl = 0.0125 mol [1]

**(c)** concentration of HCl = (1000/14.50) × 0.0125 = 0.862 mol dm−3 [1]

**3** Indium Oxygen Hydrogen

Amounts 69.2/114.8 29.0 [1]/16.0 1.8/1.0

0.603 1.81 1.80 [1] all mol values correct

Ratio 1 3 3

Empirical formula is InO3H3 [1]

**4 (a)** amount of HCl used = (16.6/1000) × 0.150 = 2.49 × 10−3 mol [1]

**(b)** amount of moles of M2CO3 = (2.49 × 10−3)/2 = 1.245 × 10−3 mol [1]

**(c)** amount in 250 cm3 = (1.245 × 10−3 × 250)/25 = 1.245 × 10−2 mol [1]

**(d)** *M*r = 1.72/1.245 × 10−2 = 138.2 [1]

**(e)** *A*r of M = (138.2 − 12 − 48)/2 = 39.1 [1]

**5** Stage 1: appreciation that the acid must be in excess and calculation of amount of solid that permits this [1]

Statement that there must be an excess of acid [1]

moles of acid = (50.0 × 0.200)/1000 = 1.00 × 10−2 mol [1]

2 mol of acid react with 1 mol of calcium hydroxide, so moles of solid weighed out must be less than half the moles of acid = 0.5 × 1.00 × 10−2 = 5.00 × 10−3 mol [1]

mass of solid must be < 5.00 × 10−3 × 74.1 = < 0.371 g [1]

Stage 2: Experimental method — measure out 50 cm3 of acid using a pipette and add the weighed amount of solid in a conical flask [1]

Titrate against 0.100 (or 0.200) mol dm−3 NaOH added from a burette and record the volume (*v*) when an added indicator changes colour [1]

Stage 3: How to calculate *M*r from the experimental data

moles of hydroxide = (5.00 × 10−3) − (*v* × concentration of NaOH)/1000 = *z*

molar mass of *z* = mass of solid/moles of *z* (from previous answer) [1]

**6** A [1]

**7** B [1]