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

4 The periodic table

**1 (a) (i)** Oxidation numbers:

 0 +1 −1 **✓**

 Cl2(g) + 2NaOH(aq) → NaClO(aq) + NaCl(aq) + H2O(l)

 **(ii)** Disproportionation is defined as ‘a reaction in which an element undergoes simultaneous oxidation and reduction’. **✓**

 **(iii)** ClO− → Cl− + ½O2 *or* 2ClO− → 2Cl− + O2

 1 mark for correct products **✓**

 1 mark for balancing **✓**

 **(b) (i)** The seawater is removed by heating/evaporation. **✓**

 **(ii)** Cl2 + 2Br– → Br2 + 2Cl− **✓**

 **(c) (i)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Cl | : | C | : | H |
| (56.8/35.5) |  | (38.4/12) |  | 4.8 |
| 1.6 |  | 3.2 |  | 4.8 **✓** |
|  1.6/1.6 |  | 3.2/1.6 |  | 4.8/1.6 |

∴ ratio is 1 : 2 : 3 or ClC2H3 **✓**

An alternative way of doing the calculation is:

 *M*R of ClC2H3 is 35.5 + 24 + 3 = 62.5

 Amount of:

 Cl = (56.8 × 62.5)/100 = 35.5, therefore 1 Cl

 C = (38.4 × 62.5)100 = 24, therefore 2 C

 H = (4.8 × 62.5)/100 = 3, therefore 3 H

 ∴ ratio is 1 : 2 : 3 or ClC2H3 **✓✓**

  **(ii)**



 A C=C double bond automatically gets 1 mark. **✓**

 The rest of the sketch and the bond angle get the second mark. **✓**

**2 (a)** Ba + ½O2 → BaO

 **A** is barium oxide. **✓**

 Ba + 2H2O → Ba(OH)2 + H2

 Compound **B** is barium hydroxide and gas **C** is hydrogen. **✓✓**

 **(b) (i)** BaCO3(s) → BaO(s) + CO2(g) **✓**

 **(ii)** BaCO3 + 2HCl → BaCl2 + H2O + CO2 — there are no marks for the equation but it is essential when working out mole ratios.

 molar mass of BaCO3  = 137.3 + 12 + 48 = 197.3 g mol−1 **✓**

 moles of BaCO3 = 1.00/197.3 = 0.00506442372 mol **✓**

 (There is no need to quote the calculator answer — 0.005 would get the mark, *but* keep the number in the calculator for the rest of the calculation.)

 moles of HCl needed = 0.00506442372 × 2 = 0.010(13684744) mol **✓**

 volume of HCl = *n*/*c* = 0.01/0.05 = 0.2027369488 dm3 = 202.74 cm3 (203 cm3 would also be correct) **✓**

 (200 cm3 would be formed if you approximated during the calculation and you would lose 1 mark.)

 **(iii)** Molar mass of MgCO3 (100.3 g mol−1) is less than the molar mass of BaCO3 (197.3 g mol–1).

 Hence 1.00 g of MgCO3 contains almost twice as many moles as 1.00 g of BaCO3.**✓**

 Therefore more HCl will be needed for the extra moles of MgCO3. **✓**