Self-test Questions

Topic 1 (HL)

1 Sulfuric acid neutralises sodium hydroxide as follows:
$2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$
20.00 cm^3 of a sodium hydroxide solution require 35.00 cm^3 of a 0.110 mol dm^{-3} solution of sulfuric acid for neutralisation. What is the concentration of the sodium hydroxide solution?
A 0.193 mol dm^{-3}
B 0.126 mol dm^{-3}
C 0.385 mol dm^{-3}
D 0.0314 mol dm^{-3}

2 2.10 g of copper react with excess N_2O as follows:
$N_2O(g) + Cu(s) \rightarrow CuO(s) + N_2(g)$
What volume of nitrogen gas is produced, measured at 15°C and 1.10×10^5 Pa?
Relative atomic masses: O = 16.00, Na = 22.99, Cu = 63.55; R = 8.31 J K^{-1} mol^{-1}
A 7.19×10^{-4} m^3
B 7.41×10^{-4} m^3
C 3.74×10^{-5} m^3
D 1.58×10^{-3} m^3

3 0.250 g of magnesium react with 50.0 cm^3 of 0.600 mol dm^{-3} hydrochloric acid:
$Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$
What volume of hydrogen gas is produced, measured at STP?
Relative atomic masses: H = 1.01, Mg = 24.31, Cl = 35.45; Molar volume of an ideal gas at STP = 22.7 dm^3 mol^{-1}
A 341 cm^3
B 681 cm^3
C 0.453 cm^3
D 233 cm^3

4 What mass of $Na_2CO_3 \cdot 10H_2O$ is required to make 100.0 cm^3 of a 0.200 mol dm^{-3} solution?
Relative atomic masses: H = 1.01, C = 12.01, O = 16.00, Na = 22.99
A 57.2 g
B 21.2 g
C 5.72 g
D 2.12 g

5 An organic compound has a relative molecular mass of 192.28. The percentage composition by mass is C (74.97%), H (8.39%), O (16.64%). What is the molecular formula of the compound?
Relative atomic masses: H = 1.01, C = 12.01, O = 16.00
A C_6H_8O
B $C_8H_1O_2$
C $C_{11}H_{12}O_3$
D $C_{12}H_{16}O_2$

6 100.0 cm^3 of fluorine gas (at STP) are reacted with 1.00 g of sulfur:
$S(s) + 3F_2(g) \rightarrow SF_6(g)$
What volume of SF_6 is produced, measured at STP?
Relative atomic masses: F = 19.00, S = 32.07; Molar volume of an ideal gas at STP = 22.7 $dm^3\ mol^{-1}$
A 100 cm^3
B 33.3 cm^3
C 300 cm^3
D 708 cm^3

7 10.00 g of $Na_2S_2O_3 \cdot 5H_2O$ were dissolved in water and made up to a total volume of 250.0 cm^3. 25.00 cm^3 of this solution were transferred to another flask, and made up to a total volume of 50.00 cm^3. What is the concentration of this final solution?
Relative atomic masses: H = 1.01, O = 16.00, Na = 22.99, S = 32.07
A 0.1611 mol dm^{-3}
B 0.1265 mol dm^{-3}
C 0.08057 mol dm^{-3}
D 0.3223 mol dm^{-3}

8 Calcium carbonate reacts with hydrochloric acid according to the equation:
$CaCO_3 + 2HCl \rightarrow CaCl_2 + CO_2 + H_2O$
0.500 g of limestone (**impure** calcium carbonate) are put into 100.0 cm^3 of 2.00 mol dm^{-3} hydrochloric acid. 110 cm^3 of carbon dioxide are produced, measured at STP. What is the percentage $CaCO_3$ in the limestone?
Relative atomic masses: H = 1.01, C = 12.01, O = 16.00, Cl = 35.45, Ca = 40.08; Molar volume of an ideas gas at STP = 22.7 $dm^3\ mol^{-1}$
A 3.00%
B 4.85%
C 95.2%
D 97.0%

9 25.0 cm^3 of 0.200 mol dm^{-3} lead nitrate solution reacted with 20.0 cm^3 of 0.300 mol dm^{-3} potassium iodide solution:
$Pb(NO_3)_2(aq) + 2KI(aq) \rightarrow PbI_2(s) + 2KNO_3(aq)$
What mass of lead iodide was formed?
Relative atomic masses: N = 14.01, O = 16.00, K = 39.10, I = 126.90, Pb = 207.19
A 1.16 g
B 1.38 g
C 2.31 g
D 2.77 g

10 V_2O_5 may be obtained by heating NH_4VO_3:
$2NH_4VO_3(s) \rightarrow V_2O_5(s) + 2NH_3(g) + H_2O(l)$
If 2.53 kg of V_2O_5 were produced and this was a yield of 89.4%, how much NH_4VO_3 was heated?
Relative atomic masses: H = 1.01, N = 14.01, O = 16.00, V = 50.94
A 3.64 kg
B 3.25 kg
C 2.91 kg
D 1.82 kg