Chemistry 2.1 **Worksheet 3** Name _____ MR/ YP

Question 1

Calculate the concentration of each of the following underlined solutions given that:

a) 25 mL of a solution of HNO_3 reacts exactly with 20.4 mL of 0.20 mol L^{-1} Na_2CO_3

0.20 molL^{-1} × 0.0204 L = 0.00408 mol of Na_2CO_3 ratio Na_2CO_3 : HNO_3 = 1 : 2

0.00408 mol × 2 = 0.00816 mol 0.00816 mol ÷ 0.025 L = 0.326 molL^{-1} is the concentration of HNO_3

b) 13.4 mL of a solution of KOH reacts exactly with 10 mL of 0.05 mol L^{-1} H_2SO_4

0.05 molL^{-1} × 0.01 L = 0.0005 mol of H_2SO_4 ratio H_2SO_4 : KOH = 1 : 2

0.0005 mol × 2 = 0.001 mol 0.001 mol ÷ 0.0134 L = 0.0746 molL^{-1} is the concentration of KOH

c) 16.4 mL of a solution of H_2SO_4 reacts exactly with 20 mL of 0.04 mol L^{-1} Na_2CO_3

0.04 molL^{-1} × 0.02 L = 0.0008 mol of Na_2CO_3 ratio Na_2CO_3 : H_2SO_4 = 1 : 1

0.0008 mol × 1 = 0.0008 mol 0.0008 mol ÷ 0.0164 L = 0.0488 molL^{-1} is the concentration of H_2SO_4

d) 9.8 mL of a solution of HBr reacts exactly with 10 mL of 0.25 mol L^{-1} NaOH

0.25 molL^{-1} × 0.01 L = 0.0025 mol of NaOH ratio NaOH : HBr = 1 : 1

0.0025 mol × 1 = 0.0025 mol 0.0025 mol ÷ 0.0098 L = 0.255 molL^{-1} is the concentration of HBr

e) 13.8 mL of a solution of NaOH reacts exactly with 20 mL of 0.15 mol L^{-1} HNO_3

0.15 molL^{-1} × 0.02 L = 0.003 mol of HNO_3 ratio HNO_3 : NaOH = 1 : 1

0.003 mol × 1 = 0.003 mol 0.003 mol ÷ 0.0138 L = 0.217 molL^{-1} is the concentration of NaOH

Question 2

Mr. Yung used standard solution of 0.132 molL^{-1} sodium carbonate (Na_2CO_3) titrated against with 20.0 mL of unknown HNO_3 solution. The following table is experimental result.

Trial	#1	#2	#3	#4
Titre (mL)	~~23.42~~	22.56	22.55	22.56

The equation between sodium carbonate and nitric acid is shown below

$$Na_2CO_3 + 2\ HNO_3 \rightarrow H_2O + 2\ NaNO_3 + CO_2$$

Average (22.56 + 22.55 + 22.56) ÷ 3 = 22.556… mL = 0.022556… L of Na_2CO_3

0.132 molL^{-1} × 0.022557… L = 0.002977… mol ratio Na_2CO_3 : HNO_3 = 1 : 2

0.002977 mol × 2 = 0.005955 mol 0.005955 mol ÷ 0.02 L = 0.298 molL^{-1} is the concentration of NHO_3

Question 3

Mr. Macann conducted the same experiment but has a different result. Calculate the concentration from this data.

Trial	#1	#2	#3	#4
Titre (mL)	22.16	21.90	22.03	~~20.89~~

Average (21.9 + 22.03 + 22.16) ÷ 3 = 22.03 mL = 0.02203… L of Na_2CO_3

0.132 molL^{-1} × 0.02203… L = 0.002908… mol ratio Na_2CO_3 : HNO_3 = 1 : 2

0.002908 mol × 2 = 0.005816 mol 0.005816 mol ÷ 0.02 L = 0.291 molL^{-1} is the concentration of NHO_3