Name: ……………………………………… Section: ………………. Date: ……………………..

5.5 HONORS CLASS WORKSHEET – TITRATIONS

Explain the meaning of the following terms:

Quantitative Analysis ……………………………………………………………………………………………………….

…….

Volumetric Analysis ……

…….

Titration …….

…….

Steps involved in carrying out a titration:

…….

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…….

Why should the titration be carried out three times?

The point during a titration at which the acid and the alkali have neutralised each other exactly

is called the …………………………………………………….

The choice of indicator for a titration depends on the type of acid and base involved:

Type of titration	pH change at equivalence point	best indicator
strong acid - strong base	3.0 – 11.0	
weak acid - strong base	7.0 – 11.0	
strong acid - weak base	3.0 – 7.0	

Name: ……………………………………… Section: ………………. Date: ……………………..

Using titration results:

- write an equation for the reaction taking place and hence deduce the ratio in which the acid and the alkali react together
- use $n = CV$ to deduce the number of moles of the known solution present
- use the mole ratio to deduce the number of moles of the unknown solution present
- use $C = n/V$ to deduce the molarity of the unknown solution:

Question: In a titration 28.3 mL of a 0.10 mol/L solution of H_2SO_4 was required to change the color of the indicator in 25 mL of a solution of NaOH. What was the molarity of the NaOH solution?

Equation:		
	acid	base
volume (mL)		
moles		
molarity (mol/L)		

(a) 18.4 mL of HCl was required to neutralise 25 mL of 0.1 mol/L NaOH. Deduce the molarity of the HCl.

(b) 13.9 mL of acetic acid ($HC_2H_3O_2$) was required to neutralise 25 mL of 0.1 mol/L NaOH. Deduce the molarity of the $HC_2H_3O_2$.

(c) 25.0 mL of a solution of Na_2CO_3 was titrated against 0.1 mol/L HCl and 24.5 mL of the acid were required. Calculate the molarity of the Na_2CO_3 solution.

Name: ……………………………………… Section: ………………. Date: ……………………..

(d) Sodium carbonate exists in hydrated form, $Na_2CO_3.xH_2O$, in the solid state. 0.35 g of a sodium carbonate sample was dissolved in water. The resulting solution was titrated against 0.1 mol/L HCl and 24.5 mL of the acid were required. Calculate the value of x given the equation: $Na_2CO_3 + 2HCl \rightarrow 2NaCl + CO_2 + H_2O$

(e) Succinic acid (H_2X) reacts with dilute sodium hydroxide as follows:
$H_2X + 2NaOH \rightarrow Na_2X + 2H_2O$
2.00 g of succinic acid were dissolved in water and used to prepare a 250 mL solution. This solution was placed in a burette and 18.4 mL was required to neutralise 25 mL of 0.1 mol/L NaOH. Deduce the molar mass of succinic acid.

(i) Calculate the mass concentration of the succinic acid solution

(ii) Use the titration result to deduce the molarity of the succinic acid solution

(iii) Hence calculate the molar mass of succinic acid

(f) Oxalic acid ($H_2C_2O_4.xH_2O$) reacts with NaOH in a 1:2 ratio. 1.85 g of oxalic acid was dissolved in water and used to prepare 250 mL of oxalic solution. This solution was placed in a burette and 21.3 mL were required to neutralise 25 mL of 0.1 mol/L NaOH.

(i) Calculate the mass concentration of the oxalic acid solution

(ii) Use the titration result to deduce the molarity of the oxalic acid solution

(iii) Hence calculate the molar mass of oxalic acid

(iv) Hence calculate the value of x