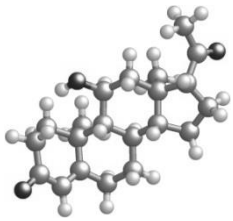

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Class: ……

Date: …… **/** …… **/** ……

Mole Calculations Assignment Six

Question One:

A titration was carried out to determine the concentration of a solution of hydrochloric acid.

a) To begin with, a primary standard solution of borax (formula: $Na_2B_4O_7 \cdot 10H_2O$) was made by dissolving 9.073 g of borax in exactly 250.0 cm^3 of water.

i) Calculate the relative molar mass of borax.

ii) Calculate the number of moles of borax weighed out in 9.073 g.

iii) Calculate the concentration of the borax primary standard solution (mol dm^{-3}).

b) 25.00 cm^3 of the borax primary standard solution were pipetted into a 250 cm^3 conical flask. Calculate the number of moles of borax that were pipetted.

c) A few drops of methyl orange indicator were added to the contents of the conical flask. Hydrochloric acid was then run from a burette into the conical flask until a "champagne" colour was observed. The volume of hydrochloric acid used = 23.80 cm^3.

Borax and hydrochloric acid react together in a 1:2 ratio:

$$1 \text{ mol } Na_2B_4O_7 \cdot 10H_2O \equiv 2 \text{ mol HCl}$$

i) With reference to your previous answer, and to the chemical equation, deduce the number of moles of hydrochloric present in 23.80 cm^3 of solution.

ii) With reference to your previous answer, calculate the concentration of the hydrochloric acid (mol dm^{-3}).

Question Two:

A titration was carried out to determine the concentration of a solution of hydrochloric acid.

a) To begin with, a primary standard solution of sodium carbonate (formula: Na_2CO_3) was made by dissolving 1.279 g of sodium carbonate in exactly 250.0 cm^3 of water.

i) Calculate the relative molar mass of sodium carbonate.

ii) Calculate the number of moles of sodium carbonate weighed out in 1.279 g.

iii) Calculate the concentration of the sodium carbonate primary standard solution (mol dm^{-3}).

b) 25.00 cm^3 of the sodium carbonate primary standard solution were pipetted into a 250 cm^3 conical flask. Calculate the number of moles of sodium carbonate that were pipetted.

c) A few drops of methyl orange indicator were added to the contents of the conical flask. Hydrochloric acid was then run from a burette into the conical flask until a "champagne" colour was observed. The volume of hydrochloric acid used = 16.10 cm^3.

Sodium carbonate and hydrochloric acid react together according to the following balanced chemical equation:

$$Na_2CO_3(aq) + 2HCl(aq) \rightarrow 2NaCl(aq) + CO_2(g) + H_2O(l)$$

i) With reference to your previous answer and to the chemical equation, deduce the number of moles of hydrochloric present in 16.10 cm^3 of solution.

ii) With reference to your previous answer, calculate the concentration of the hydrochloric acid (mol dm^{-3}).

Question Three:

A titration was carried out to determine the concentration of an aqueous solution of sodium hydroxide.

a) To start with, a primary standard solution of potassium hydrogenphthalate (formula: $C_6H_4COOKCOOH$) was made by dissolving 5.365 g of potassium hydrogenphthalate in exactly 250.0 cm^3 of water.

i) Calculate the relative molar mass of potassium hydrogenphthalate.

ii) Calculate the number of moles of potassium hydrogenphthalate weighed out in 5.365 g.

iii) Calculate the concentration (mol dm^{-3}) of the potassium hydrogenphthalate primary standard solution (mol dm^{-3}).

b) 25.00 cm^3 of the potassium hydrogenphthalate primary standard solution were pipetted into a 250 cm^3 conical flask. Calculate the number of moles of potassium hydrogenphthalate that were pipetted.

c) A few drops of phenolphthalein indicator were added to the contents of the conical flask. Sodium hydroxide solution was then run from a burette into the conical flask until a permanent pale pink colour was observed. The volume of sodium hydroxide used = 26.30 cm^3.

Potassium hydrogenphthalate and sodium hydroxide react together according to the following balanced chemical equation:

$$C_6H_4COOKCOOH(aq) + NaOH(aq) \rightarrow C_6H_4COOKCOONa(aq) + H_2O(l)$$

i) With reference to your previous answer and to the balanced chemical equation, deduce the number of moles of sodium hydroxide present in 26.30 cm^3 of solution.

ii) With reference to your previous answer, calculate the concentration of the sodium hydroxide solution (mol dm^{-3}).

- Scan the QR code below for the answers to this assignment.

http://www.chemist.sg/mole/assignments/mole_six_ans.pdf