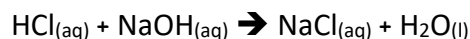


Titration Calculations & Questions

1. Use the information to determine the concentration of the hydrochloric acid.
 - A 25 cm³ sample of hydrochloric acid is sucked into a pipette and transferred into a 250 cm³ volumetric flask. The solution is made up to the mark.
 - 25 cm³ of the diluted acid is transferred into a conical flask using a pipette.
 - A burette is used to neutralise the acid with 0.100 mol dm⁻³ sodium hydroxide.

Hydrochloric acid reacts with sodium hydroxide according to the equation:



- a. The average titre of the sodium hydroxide solution was 30.00 cm³. Calculate the number of moles in the average titre.

_____ mol (1)

- b. Determine the number of moles in the diluted sample of hydrochloric acid, and hence the concentration of the diluted acid.

_____ mol dm⁻³ (2)

- c. Calculate the concentration of the undiluted hydrochloric acid in mol dm⁻³.

_____ mol dm⁻³ (1)

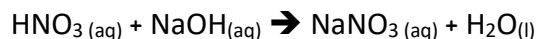
- d. Calculate the concentration of the hydrochloric acid in g dm⁻³.

_____ g dm⁻³ (2)

2. Use the information to determine the concentration of the nitric acid.

- A 10 cm³ sample of nitric acid is sucked into a pipette and transferred into a 100 cm³ volumetric flask. The solution is made up to the mark.
- 25 cm³ of the diluted acid is transferred into a conical flask using a pipette.
- A burette is used to neutralise the acid with 0.150 mol dm⁻³ sodium hydroxide.

Nitric acid reacts with sodium hydroxide according to the equation:



a. The average titre of the sodium hydroxide solution was 23.33 cm³. Calculate the number of moles in the average titre.

_____ mol (1)

b. Determine the number of moles in the diluted sample of nitric acid, and hence the concentration of the diluted acid.

_____ mol dm⁻³ (2)

c. Calculate the concentration of the undiluted nitric acid in mol dm⁻³.

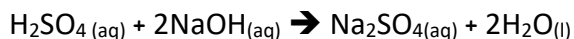
_____ mol dm⁻³ (1)

d. Calculate the concentration of the nitric acid in g dm⁻³.

_____ g dm⁻³ (2)

3. Use the information to determine the concentration of the sulfuric acid.
- A 25 cm³ sample of sulfuric acid is sucked into a pipette and transferred into a 500 cm³ volumetric flask. The solution is made up to the mark.
 - 25 cm³ of the diluted acid is transferred into a conical flask using a pipette.
 - A burette is used to neutralise the acid with 0.100 mol dm⁻³ sodium hydroxide.

Sulfuric acid reacts with sodium hydroxide according to the equation:



- a. The average titre of the sodium hydroxide solution was 25.00 cm³. Calculate the number of moles in the average titre.

_____ mol (1)

- b. Determine the number of moles in the diluted sample of sulfuric acid, and hence the concentration of the diluted acid.

_____ mol dm⁻³ (2)

- c. Calculate the concentration of the undiluted sulfuric acid in mol dm⁻³.

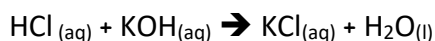
_____ mol dm⁻³ (1)

- d. Calculate the concentration of the sulfuric acid in g dm⁻³.

_____ g dm⁻³ (2)

4. Use the information to determine the concentration of the hydrochloric acid.
- A 10 cm³ sample of hydrochloric acid is sucked into a pipette and transferred into a 500 cm³ volumetric flask. The solution is made up to the mark.
 - 25 cm³ of the diluted acid is transferred into a conical flask using a pipette.
 - A burette is used to neutralise the acid with 0.050 mol dm⁻³ potassium hydroxide.

Hydrochloric acid reacts with potassium hydroxide according to the equation:



- a. The average titre of the potassium hydroxide solution was 20.00 cm³. Calculate the number of moles in the average titre.

_____ mol (1)

- b. Determine the number of moles in the diluted sample of hydrochloric acid, and hence the concentration of the diluted acid.

_____ mol dm⁻³ (2)

- c. Calculate the concentration of the undiluted hydrochloric acid in mol dm⁻³.

_____ mol dm⁻³ (1)

- d. Calculate the concentration of the hydrochloric acid in g dm⁻³.

_____ g dm⁻³ (2)

Questions

1. Explain what the effect on the titre would be if:

- a. The pipette used to transfer the acid solution was filled to slightly above the mark. (2)

- b. The pipette used to transfer the acid solution was filled to slightly below the mark. (2)

- c. The volumetric flask was filled to slightly above the mark. (2)

- d. The volumetric flask was filled to slightly below the mark. (2)

2. Calculate the percentage uncertainty of:

- a. A 100 cm^3 volumetric flask with an uncertainty of 0.1 cm^3 . (1)

- b. A 250 cm^3 volumetric flask with an uncertainty of 0.2 cm^3 . (1)

- c. A 500 cm^3 volumetric flask with an uncertainty of 0.5 cm^3 . (1)

3. A student suggests washing out the pipette with water before filling it with acid solution. Explain why this is not a good idea. (2)

Total marks: 37