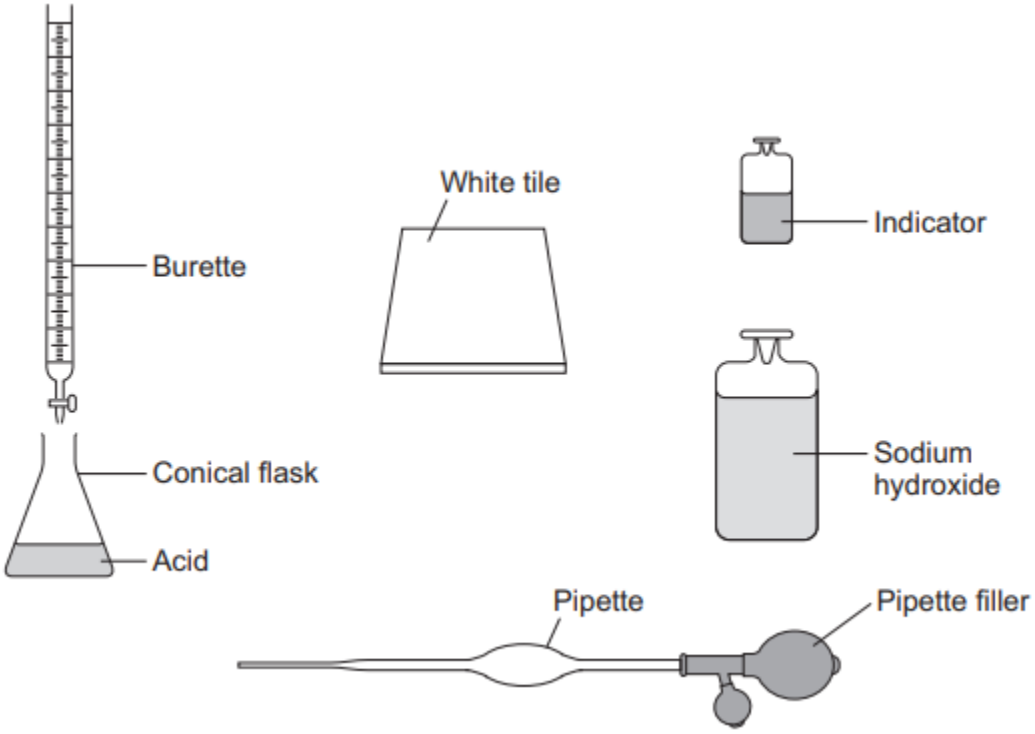
ACIDS, BASES & TITRATION 1

Q1. In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

A student used the equipment shown to do a titration.



Describe how the student should use this equipment to find the volume of sodium hydroxide solution that reacts with a known volume of acid. Include any measurements the student should make.

Do **not** describe how to do any calculations.

_____

_____

_____

_____

_____

(6 marks)

Q2. This label was on a bottle of vinegar.

Vinegar contains ethanoic acid, which is a weak acid.

(a) Draw a ring around the correct answer to complete the sentences.

(i)

Ethanoic acid is an acid because it contains

hydrogen
hydroxide
oxide

ions.

(1 mark)

(ii)

Ethanoic acid is a *weak* acid because it is

completely
not
partially

ionised in water.

(1 mark)

(b) Magnesium ribbon can be used in a test to show that ethanoic acid is a weaker acid than hydrochloric acid.

(i) State one way of making this test fair.

_____

_____

(1 mark)

(ii) Give the results of this test.

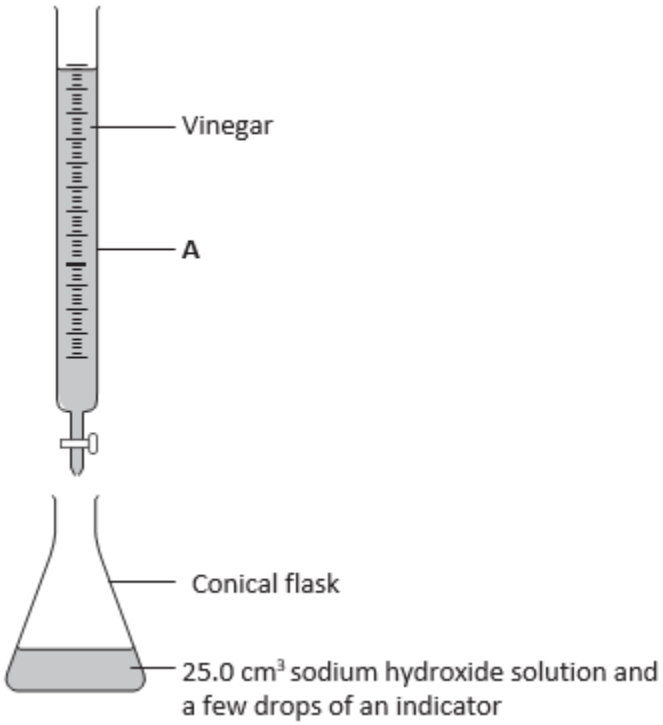
_____

_____

_____

(2 marks)

(c) The diagram shows the apparatus a student used to find the volume of vinegar that reacts with 25.0 cm^3 of sodium hydroxide solution.



(i) Choose the correct word from the box to complete the sentence.

filtration	**polymerisation**	**titration**

The name of this method is _____.

(1 mark)

(ii) Which one of the following is the correct name for apparatus A?

Draw a ring around one answer.

burette **measuring cylinder** **pipette**

(1 mark)

(iii) State how the student knew when enough vinegar had been added.

_____

(1 mark)

(d) According to Arrhenius, acids are chemicals that produce hydrogen ions (H+) in aqueous solution.

(i) Complete the following equation to show why ethanoic acid (CH3COOH) is an acid in aqueous solution.

$$CH_3COOH\ (l) \xrightleftharpoons{\text{water}} \text{.....}\ (aq) + \text{.....}\ (aq)$$

(1 mark)

(ii) Explain the meaning of weak in terms of ionization.

_____

_____

(1 mark)

(e) 25.0 cm^3 of diluted vinegar were placed in a conical flask using a pipette. The volume of sodium hydroxide solution needed to react completely with the ethanoic acid in 25.0 cm^3 of diluted vinegar can be found by titration using phenolphthalein indicator.

(i) Why is phenolphthalein used instead of methyl orange for this titration?

_____

_____

(1 mark)

(ii) Describe how you would do the titration.

You should include the names of any apparatus you would use.

_____

_____

_____

_____

_____

_____

_____

_____

(4 marks)

Q3. The table shows some information about acids and alkalis.

Name of acid or alkali	Type	Ions produced in solution		pH	Effect on Universal Indicator
Hydrochloric acid	Strong acid	H^+	Cl^-	1	Goes red
Sodium hydroxide	Strong alkali	Na^+	OH^-	13	Goes purple

Use the information in the table to help you answer parts (a) and (b).

(a) Draw a ring around the correct answer to complete each sentence.

(i) Hydrochloric acid is acidic.

This is because it contains _____ ions.

H^+
Na^+
OH^-

(1 mark)

(ii) Sodium hydroxide solution is alkaline.

This is because it contains _____ ions.

H^+
Na^+
OH^-

(1 mark)

(iii) The pH of acids is _____ the pH of alkalis.

higher than
lower than
the same as

(1 mark)

(b) Ethanoic acid is a weak acid. Universal Indicator can be used to show that hydrochloric acid is a stronger acid than ethanoic acid of the same concentration.

Explain how.

_____

_____

_____

(2 marks)

(c) Draw a ring around the correct answer to complete this sentence.

Strong acids and strong alkalis are _____ ionised in water.

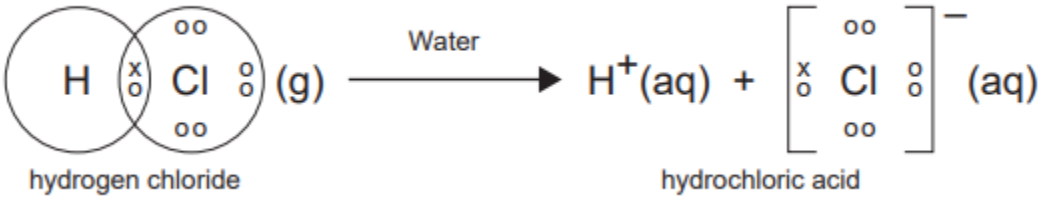
completely
not
partially

(1 mark)

Q4. In 1884 Svante Arrhenius put forward ideas to explain acid-base behaviour. It was many years before his ideas were accepted. In 1903 he was awarded the Nobel Prize for Chemistry.

Use the ideas of Arrhenius to answer parts (a) and (b).

(a) Hydrogen chloride solution is called hydrochloric acid. It is made by dissolving hydrogen chloride gas in water.



Explain why

- a solution of hydrogen chloride in water is acidic
- dry hydrogen chloride gas is not acidic

_____

_____

_____

_____

(2 marks)

(b) The equation below represents the reaction between potassium hydroxide solution and dilute hydrochloric acid.

$$KOH(aq) + HCl(aq) \rightarrow KCl(aq) + H_2O(l)$$

(i) Explain why potassium hydroxide solution, KOH(aq), is a strong alkali.

_____

_____

_____

_____

(2 marks)

(ii) Explain why potassium chloride solution, KCl(aq), is neutral.

_____

_____

(1 mark)

Total marks (32)