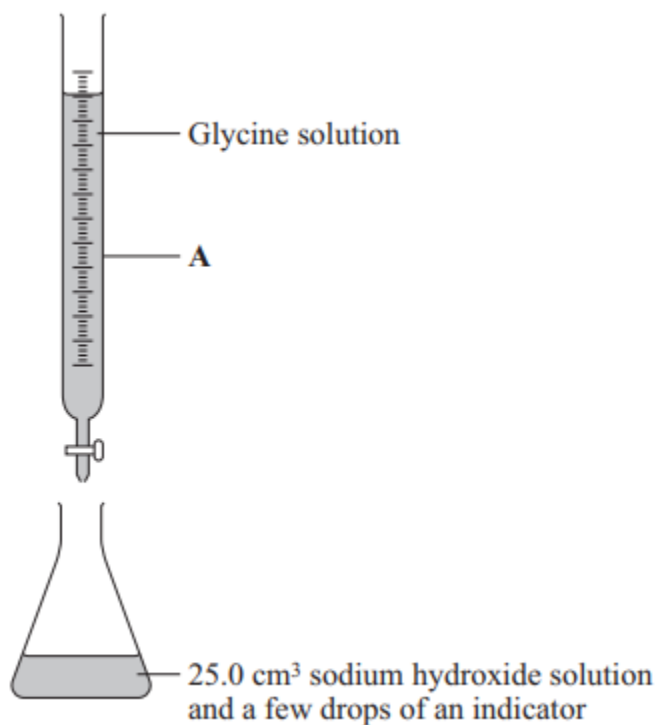


ACIDS BASES & TITRATION 2

Q1. Glycine is an amino acid. It is found in fish, meat, beans and dairy produce. A student carried out a titration to find the amount of glycine solution that reacts with 25.0 cm^3 of sodium hydroxide solution.

The diagram shows the apparatus that the student used.



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

Draw a ring around your answer.

burette **cylinder** **pipette**

(1 mark)

(b) How would the student know when enough glycine solution had been added to react with all of the sodium hydroxide solution?

(1 mark)

(c) The student's results are given in the table.

| Titration | Volume of glycine solution added in cm ³ |
|-----------|---|
| 1 | 18.5 |
| 2 | 18.3 |
| 3 | 18.4 |

(i) What is the range?

(1 mark)

(ii) Calculate the mean.

(1 mark)

(iii) Suggest why the student repeated the titration.

(1 mark)

Q2. Go Grease is a drain and oven cleaner.



The active ingredient in Go Grease is the alkali sodium hydroxide (NaOH).

(a) Name or give the formula of the ion that makes solutions alkaline.

(1 mark)

(b) Sodium hydroxide is a strong alkali. In terms of ionisation, what is meant by the word strong?

(1 marks)

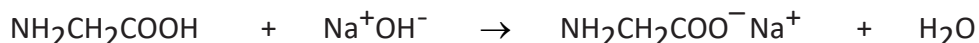
(c) You are given solutions of sodium hydroxide and ammonia of the same concentration. Describe and give the results of a test to show that sodium hydroxide is a stronger alkali than ammonia solution.

(2 marks)

Q3. Aminoethanoic acid (glycine), $\text{NH}_2\text{CH}_2\text{COOH}$, is an amino acid. It is found in fish, meat, beans and dairy produce. It can behave both as an acid and as a base.

In a titration, 25.00 cm^3 of a solution of aminoethanoic acid reacted with 18.40 cm^3 of sodium hydroxide solution of concentration $0.15 \text{ moles per cubic decimetre}$.

The equation which represents the reaction is:



Name an indicator used for weak acid-strong alkali titrations.

(1 mark)

Q4. Lemons contain citric acid.

Pure citric acid is a white solid that dissolves in water to form a weak acid.

(a) A student tested some solid citric acid with universal indicator paper.

Suggest why the universal indicator paper did not change colour.

(1 mark)

(b) Citric acid produces hydrogen ions in aqueous solution.

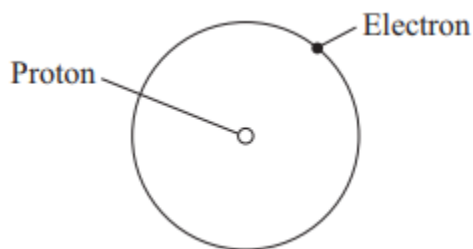
These ions can be represented as $\text{H}^+(\text{aq})$.

Complete this sentence.

The (aq) means that the acid has been dissolved in _____.

(1 mark)

(c) The diagram represents a hydrogen atom, H.



Use the diagram to explain why a hydrogen ion, H^+ , is a proton.

(1 mark)

(d) Citric acid is a *weak* acid.

Draw a ring around the correct answer to complete the sentence.

The word *weak* means that the acid

has a low boiling point.

is dilute.

is partially ionised in water.

(1 mark)

(e) A student measured the pH of four acids, A, B, C and D. The acids were the same concentration. The same quantity of magnesium ribbon was added to each of the acids. The volume of gas produced after 5 minutes was recorded.

The results are shown in the table.

| Acid | pH | Volume of gas in cm ³ |
|------|----|----------------------------------|
| A | 2 | 18 |
| B | 5 | 6 |
| C | 1 | 24 |
| D | 4 | 12 |

(i) State one way in which the student made sure that the experiment was fair.

(1 mark)

(ii) Use the results to arrange the acids, **A**, **B**, **C** and **D** in order of **decreasing** acid strength.

Most acidic _____ Least acidic.

(1 mark)

(f) When acids react with alkalis, the hydrogen ions from the acid react with the hydroxide

ions from the alkali.

(i) Which one of the following represents the formula of a hydroxide ion?

Draw a ring around your answer.



(1 mark)

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

A solution with more hydrogen ions than hydroxide ions is

| |
|-----------|
| acidic. |
| alkaline. |
| neutral. |

(1 mark)

Q5.

(a) Nicotinic acid is a weak acid. It has the formula $\text{C}_5\text{H}_4\text{NCOOH}$.

Hydrochloric acid is a strong acid. It has the formula HCl .

(i) Give the name or formula of the ion that makes solutions acidic.

(1 mark)

(ii) Weak acids contain fewer of these ions than strong acids of the same concentration. Describe and give the results of an experiment to show that nicotinic acid is a weaker acid than hydrochloric acid of the same concentration.

(2 marks)

(b) Read the following information.

It's all in a name

Nicotinic acid is an important chemical. It is also known as niacin or vitamin B₃. It is found in many foods, including eggs, meat, poultry, fish, leafy vegetables, carrots and cereals. It is also in tea and coffee.

A lack of nicotinic acid in our diet causes the disease pellagra. The symptoms of pellagra include diarrhoea, dermatitis and dementia. People can die. Pellagra is a common disease of malnutrition in Africa.

Nicotinic acid can be made by oxidising nicotine.

Nicotine is found in tobacco, tomatoes and potatoes. Smoking tobacco is said to cause the death of millions of people each year from cancer.

DC/AC (Dedicated Citizens Against Chemicals) is a pressure group that wants the government to ban nicotine and chemicals made from nicotine. Many people oppose such a ban and there is to be a televised debate.

In the television programme, DC/AC and their opponents gave their reasons. You have to suggest what they were.

(i) DC/AC said that nicotine and chemicals made from nicotine should be banned because

(2 marks)

(ii) Their opponents said that nicotine and chemicals made from nicotine should not be banned because

(2 marks)

Q6. A solution of sodium hydroxide was added to some champagne until a substance Z showed that the reaction was complete. The volume of sodium hydroxide used was recorded. The result was used to calculate the amount of acid present.

Complete these sentences by drawing a ring around the correct answer.

(i) Substance Z is

| |
|--------------|
| a catalyst |
| a conductor |
| an indicator |

(1 mark)

(ii) The reaction was complete when substance Z

| |
|--------------------|
| changed colour |
| formed a gas |
| gave a precipitate |

(1 mark)

(iii) The name of this method of analysis is

| |
|--------------|
| distillation |
| filtration |
| titration |

(1 mark)

Q7. *Drain Buster* is used to clear and degrease drains. Sodium hydroxide is the main chemical substance in *Drain Buster*.



(a) A student planned an experiment to find the concentration of the sodium hydroxide solution in *Drain Buster*.

The teacher had to dilute the Drain Buster before the student could use it.

Explain why.

(2 marks)

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

The student wanted to find the volume of hydrochloric acid that reacts with a known volume of diluted Drain Buster.

Describe how the student could do this by titration.

In your description you should include:

- the names of pieces of apparatus used
- the names of the substances used
- a risk assessment
