AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.4.2.5

Titrations (chemistry only)

Past-paper questions

Tier	**Foundation**
Question groups	**20**
Available paper years	**2007–2025**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.4.2.5 Titrations (chemistry only)

Question 01

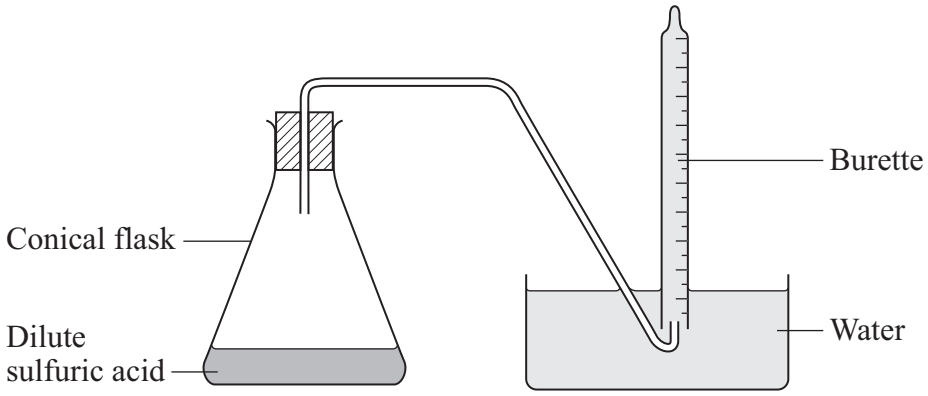
March 2007 | CHY1A | Original Q7 | Legacy

QUESTION SEVEN

Metals can react with acids to produce hydrogen gas.

Iron reacts with sulfuric acid to produce hydrogen gas.

Five students, **A**, **B**, **C**, **D** and **E**, reacted iron with dilute sulfuric acid in the apparatus shown below.



- In the first experiment, each student weighed out 0.04 grams of iron.
- The students then dropped the iron into the acid in the conical flask.
- The students replaced the bung in the flask as quickly as possible.
- They recorded the volume of hydrogen collected when all the iron had reacted.
- They repeated the experiment using 0.08, 0.12, 0.16 and 0.20 grams of iron.

Results

Mass of iron in grams	**Volume of hydrogen in cm^3**					
	Student **A**	Student **B**	Student **C**	Student **D**	Student **E**	Mean
0.04	14	10	11	12	13	12
0.08	32	23	30	33	29	31
0.12	53	49	49	48	46	49

4.4.2.5 Titrations (chemistry only)

Question 01 · continued March 2007 | CHY1A | Original Q7 | Legacy

7A The expected volume of hydrogen produced from 0.04 grams of iron and this volume of sulfuric acid is 17 cm^3.
All five students collected less hydrogen than this.

The most likely reason for this similar error is that . . .

1 the conical flask was too big.

2 the burette was not accurate enough.

3 some of the hydrogen gas escaped.

4 the acid was too dilute.

7B Student **B**'s result was not used to calculate the mean for 0.08 grams of iron.
This was because it was . . .

1 a systematic error.

2 an anomalous result.

3 a categoric error.

4 a negative result.

7C 86 cm^3 is the true value for the volume of hydrogen produced from 0.20 grams of iron.
All the students carried out the tests with greater accuracy by the time they reached the last of the five experiments.
Their results, using 0.20 grams of iron, are more accurate because they . . .

1 are much higher than their first results.

2 are close to 100 cm^3.

3 are about five times higher than their first results.

4 are all close to the true value.

7D Each student's results would be best shown as . . .

1 a pie chart.

2 a line graph.

3 a bar chart.

4 a scattergram.

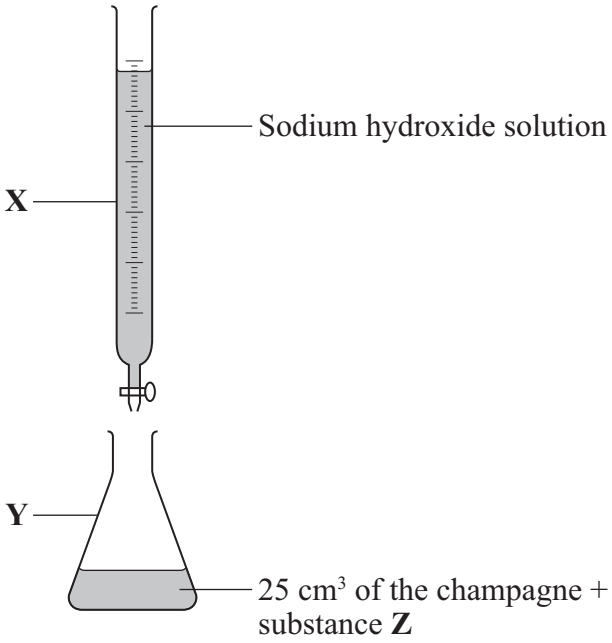
4.4.2.5 Titrations (chemistry only)

Question 02

January 2008 | CHY3F | Original Q3 | Legacy

3 In 1916 a ship was sunk by a German submarine. The ship was carrying bottles of champagne. The wreck was discovered in 1997 and the champagne was brought to the surface and analysed.

The diagram shows the apparatus used to find the amount of acid in 25 cm^3 of the champagne.



(a) Choose the correct words from the box to name apparatus **X** and **Y**.

beaker	**burette**	**conical flask**	**measuring cylinder**

(i) Apparatus **X** is a ..... .

(1 mark)

(ii) Apparatus **Y** is a ..... .

(1 mark)

4.4.2.5 Titrations (chemistry only)

Question 02 · continued

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(b) Sodium hydroxide solution was added to this champagne until 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)

(c) 250 cm^3 of this champagne were found to contain 1 g of acid.

Calculate the mass of acid in 750 cm^3 of this champagne.

.....

.....

.....

Mass = ... g

(2 marks)

Question 3 continues on the next page

4.4.2.5 Titrations (chemistry only)

Question 02 · continued

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(d) (i) Which **one** of the following ions makes champagne acidic?

Draw a ring around your answer.

chloride **hydrogen** **sodium**

(1 mark)

(ii) The acid in champagne is a *weak* acid.

Complete this sentence by drawing a ring around the correct answer.

The word *weak* means that the acid

has a low boiling point
is dilute
is partially ionised

.

(1 mark)

9

4.4.2.5 Titrations (chemistry only)

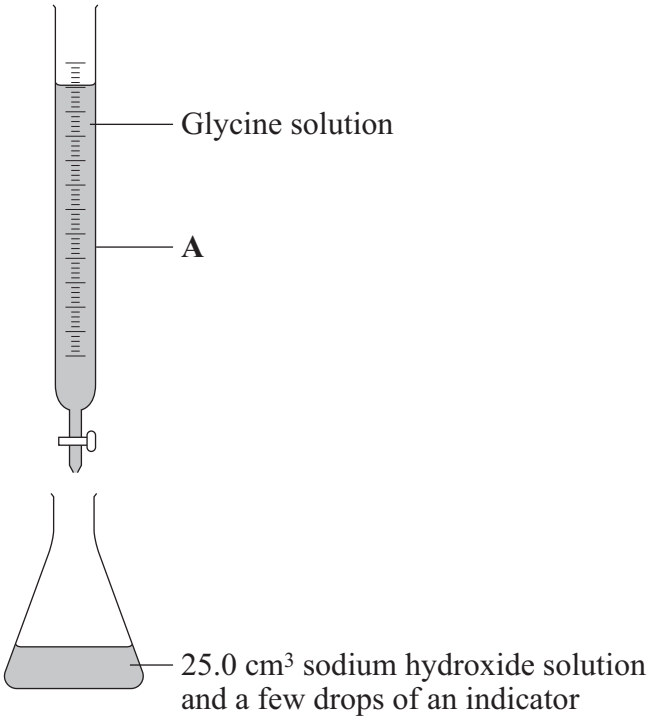
Question 03

January 2010 | CHY3F | Original Q2 | Legacy

2 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.



2 (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)

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

.....

.....

(1 mark)

4.4.2.5 Titrations (chemistry only)

Question 03 · continued

for mark

2 (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

2 (c) (i) What is the range?

.....

(1 mark)

2 (c) (ii) Calculate the mean.

.....

(1 mark)

2 (c) (iii) Suggest why the student repeated the titration.

.....

.....

(1 mark)

5

4.4.2.5 Titrations (chemistry only)

Question 04

1 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)**.

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

1 (a) (i) Hydrochloric acid is acidic.

This is because it contains [Cl^- / H^+ / OH^-] ions.

(1 mark)

1 (a) (ii) Sodium hydroxide solution is alkaline.

This is because it contains [H^+ / Na^+ / OH^-] ions.

(1 mark)

1 (a) (iii) The pH of acids is [higher than / lower than / the same as] the pH of alkalis.

(1 mark)

4.4.2.5 Titrations (chemistry only)

1 (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)

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

Strong acids and strong alkalis are | completely | not | partially | ionised in water.

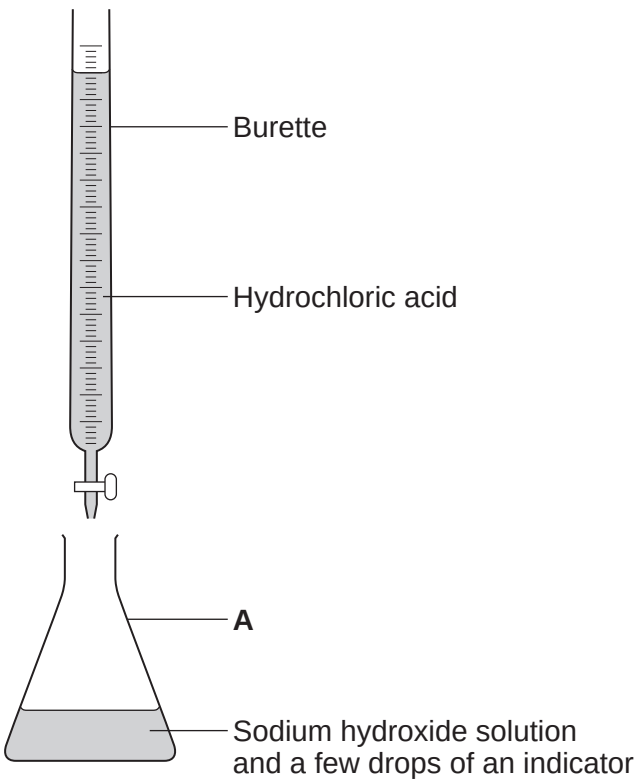
(1 mark)

Question 1 continues on the next page

4.4.2.5 Titrations (chemistry only)

Question 04 · continued

1 (d) The diagram shows the apparatus used to find the volume of hydrochloric acid that reacts with 25.0 cm^3 of sodium hydroxide solution.



1 (d) (i) Which **one** of the following is the correct name for **A**?

Draw a ring around your answer.

beaker **conical flask** **pipette**

(1 mark)

1 (d) (ii) Use the correct word from the box to complete the sentence.

distillation	**filtration**	**titration**

The method used to find the volume of acid that reacts with a known volume of alkali is ..... .

(1 mark)

1 (d) (iii) Suggest **one** way to make the results more reliable.

.....

(1 mark)

9

4.4.2.5 Titrations (chemistry only)

Question 05

3 This label was on a bottle of vinegar.



Vinegar contains ethanoic acid, which is a *weak* acid.

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

3 (a) (i) Ethanoic acid is an acid because it contains [hydrogen / hydroxide / oxide] ions.

(1 mark)

3 (a) (ii) Ethanoic acid is a *weak* acid because it is [completely / not / partially] ionised in water.

(1 mark)

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

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

.....

.....

(1 mark)

3 (b) (ii) Give the results of this test.

.....

.....

.....

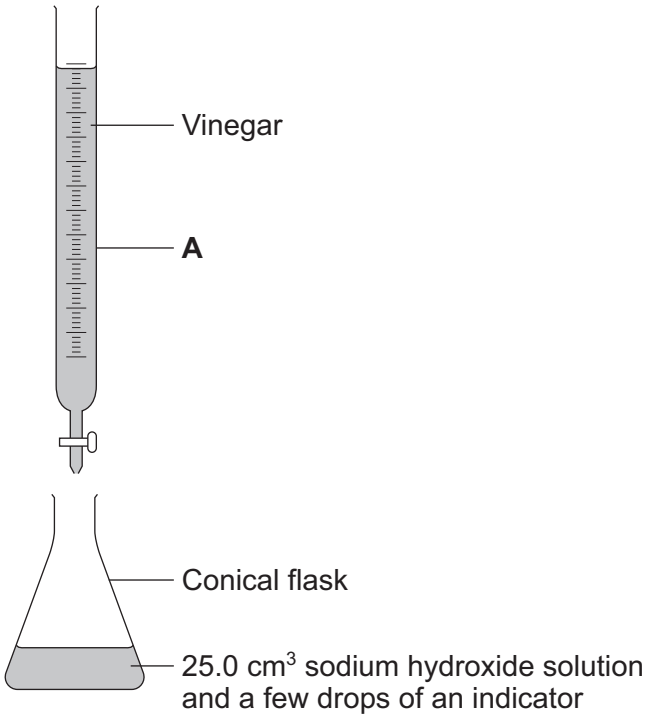
.....

(2 marks)

4.4.2.5 Titrations (chemistry only)

Question 05 · continued

3 (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.



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

filtration	**polymerisation**	**titration**

The name of this method is ..... .

(1 mark)

3 (c) (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)

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

.....

.....

(1 mark)

8

4.4.2.5 Titrations (chemistry only)

Question 06

June 2011 | CHY1BP | Original Q6 | Legacy

QUESTION SIX

This question is about unsaturated oils.

A student tested four oils, **K**, **L**, **M** and **N**, to find out which was the most unsaturated.

The student:

- used the same volume of each of the oils for all the tests.
- added bromine water from a burette to oil **K** and shook the mixture.
- continued until the bromine water was no longer decolourised.
- recorded the volume of bromine water added.
- repeated this two more times for oil **K**.

He then repeated the same procedure for oils **L**, **M** and **N**.

His results are given in the table.

Oil tested	Volume of bromine water added in cm^3		
	Test 1	Test 2	Test 3
K	20.1	20.2	20.2
L	42.2	44.2	46.2
M	25.6	26.3	27.0
N	15.8	16.5	14.3

6A The student used the burette to measure the volume of bromine water to the nearest . . .

1 $0.1\,cm^3$

2 $0.2\,cm^3$

3 $1.0\,cm^3$

4 $2.0\,cm^3$

4.4.2.5 Titrations (chemistry only)

Question 06 · continued

6B The student obtained the largest range of burette readings for oil . . .

1 **K**

2 **L**

3 **M**

4 **N**

6C The student obtained the most precise results for oil . . .

1 **K**

2 **L**

3 **M**

4 **N**

6D A valid conclusion from his experiment is that . . .

1 four oils were tested.

2 oil **N** was the most unsaturated.

3 all four of the oils were unsaturated.

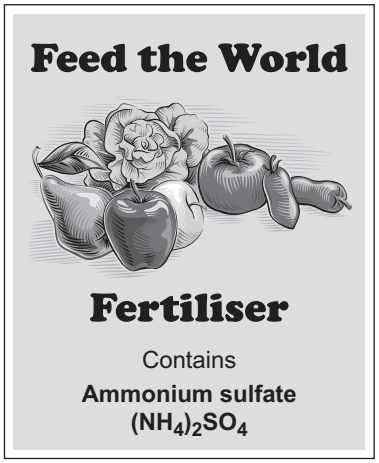
4 all oils react with bromine.

4.4.2.5 Titrations (chemistry only)

Question 07

June 2011 | CHY3F | Original Q3 | Legacy

3 Ammonium sulfate is an artificial fertiliser.



3 (a) A student tested this fertiliser to prove that it contained ammonium ions and sulfate ions.

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

3 (a) (i) Test for ammonium ions (NH_4^+).

The student added [sodium chloride solution / sodium hydroxide solution / dilute sulfuric acid] to the fertiliser.

A gas called ammonia was produced.

Ammonia turns damp litmus paper [blue. / green. / red.]

(2 marks)

3 (a) (ii) Test for sulfate ions (SO_4^{2-}).

The student added [barium chloride / silver nitrate / sodium chloride] solution to a solution of the fertiliser.

A [blue / red / white] precipitate was formed.

(2 marks)

4.4.2.5 Titrations (chemistry only)

3 (b) Ammonium sulfate is made by reacting sulfuric acid with ammonia solution.

Sulfuric acid is a *strong* acid.

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

The word *strong* means that the acid is

- difficult to break.
- very concentrated.
- fully ionised in water.

(1 mark)

3 (c) Use the information about acids in the table to help you answer these questions.

Name of chemical	Ions produced in aqueous solution		pH	Universal Indicator added
Ethanoic acid	H^+	CH_3COO^-	5	Goes orange
Sulfuric acid	H^+	SO_4^{2-}	1	Goes red

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

3 (c) (i) Sulfuric acid and ethanoic acid are both acids because they contain

- CH_3COO^- ions.
- H^+ ions.
- SO_4^{2-} ions.

(1 mark)

3 (c) (ii) Sulfuric acid is a stronger acid than ethanoic acid.

The pH of stronger acids is

- higher than
- lower than
- the same as

the pH of weaker acids.

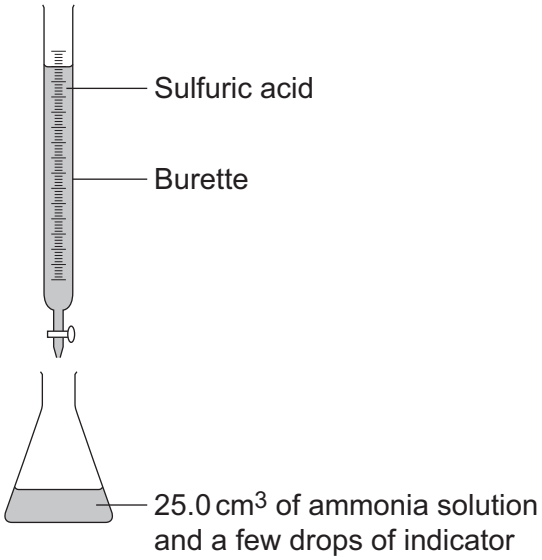
(1 mark)

4.4.2.5 Titrations (chemistry only)

Question 07 · continued

3 (d) The volume of sulfuric acid that reacts with 25.0 cm^3 of ammonia solution can be found by titration.

The diagram shows the apparatus used for the titration.



A student did the titration five times and recorded the following results.

Titration	1	2	3	4	5
Volume of acid added in cm^3	13.3	13.9	13.2	13.1	13.2

3 (d) (i) How did the student know when enough sulfuric acid had been added to neutralise the ammonia solution?

.....

.....

(1 mark)

3 (d) (ii) The student did **not** use one of the results because it was anomalous.

Which result was anomalous? .....

(1 mark)

3 (d) (iii) Use the **other** four results to calculate the mean volume of sulfuric acid that reacted with the ammonia.

.....

.....

Mean volume = ... cm^3

(1 mark)

10

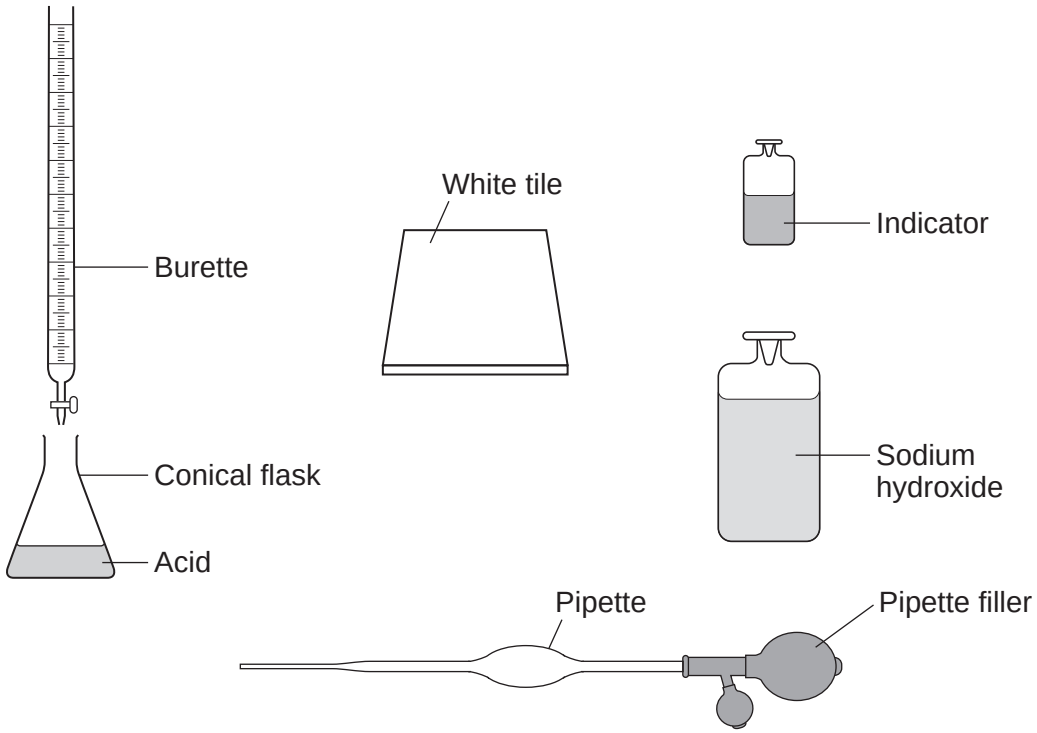
4.4.2.5 Titrations (chemistry only)

Question 08

June 2013 | CH3FP | Original Q9 | Legacy

9 *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.

.....

.....

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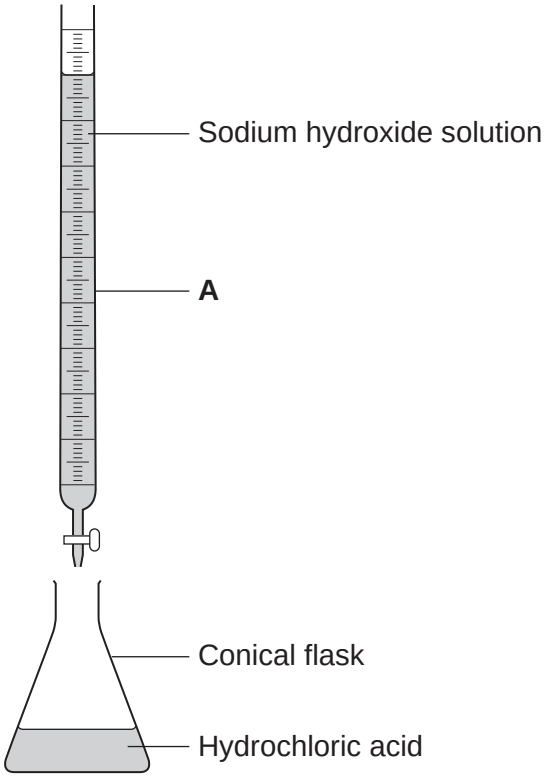
4.4.2.5 Titrations (chemistry only)

Question 09

June 2014 | CH3FP | Original Q3 | Legacy

3 A student used the apparatus in **Figure 2** to do a titration.

Figure 2



3 (a) (i) What is the name of the piece of apparatus labelled **A**?

Draw a ring around the correct answer.

[1 mark]

burette **measuring cylinder** **test tube**

3 (a) (ii) What should the student add to the acid in the conical flask?

Draw a ring around the correct answer.

[1 mark]

catalyst **indicator** **water**

3 (a) (iii) What would the student see when the end point of the titration has been reached?

[1 mark]

.....

4.4.2.5 Titrations (chemistry only)

Question 09 · continued

3 (b) The student does the titration three times.

3 (b) (i) State **one** variable that the student needs to keep the same to make it a fair test.

[1 mark]

.....

3 (b) (ii) The student's results are shown in **Table 1**.

Table 1

Titration	Volume of sodium hydroxide solution added in cm^3
1	22.40
2	22.20
3	22.30

Calculate the mean volume of sodium hydroxide solution added.

[1 mark]

..... cm^3

5

4.4.2.5 Titrations (chemistry only)

Question 10

June 2015 | CH3FP | Original Q7 | Legacy

7 Some pollutants cause acid rain.

A student tested 25.0 cm^3 samples of three types of rainwater, **P**, **Q** and **R**.
The student titrated the samples with sodium hydroxide solution (an alkali).

The student recorded the volume of sodium hydroxide solution needed to neutralise the rainwater. The student's results are shown in **Table 1**.

Table 1

	Volume of sodium hydroxide needed to neutralise the rainwater in cm^3				
Type of rainwater	**Titration 1**	**Titration 2**	**Titration 3**	**Titration 4**	**Mean value**
P	18.0	15.5	14.5	15.0	15.0
Q	13.0	10.0	11.0	10.5	10.5
R	23.0	19.5	18.5	19.0	19.0

7 (a) (i) The student calculated the mean value for rainwater **R** as 19.0 cm^3.

Show how the student calculated the mean value for rainwater **R**.

[2 marks]

.....

.....

.....

.....

7 (a) (ii) Write down **P**, **Q** and **R** in order of their acidity.

[2 marks]

Most acidic .....

.....

Least acidic .....

4.4.2.5 Titrations (chemistry only)

Question 10 · continued

7 (b) A second student repeated the experiment and recorded the results in **Table 2**.

Table 2

	Volume of sodium hydroxide needed to neutralise the rainwater in cm^3	
Type of rainwater	**Titration 1**	**Titration 2**
P	17	15
Q	11	9
R	20	18

Use **Table 1** and **Table 2** to suggest **two** improvements the second student could make to obtain more accurate results.

[2 marks]

.....

.....

.....

.....

7 (c) The results of the two students show that the experiment is reproducible.

Give the reason why.

[1 mark]

.....

.....

7

4.4.2.5 Titrations (chemistry only)

Question 11

June 2016 | CH3FP | Original Q6 | Legacy

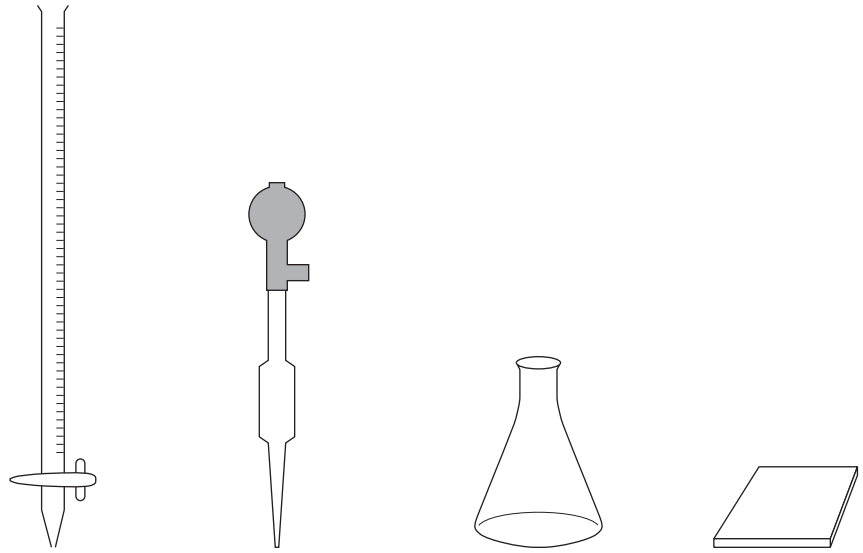
6 **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

A student has to check if two samples of hydrochloric acid, **A** and **B**, are the same concentration.

Describe how the student could use the apparatus and the solutions in **Figure 9** to carry out titrations.

[6 marks]

Figure 9



4.4.2.5 Titrations (chemistry only)

Question 12

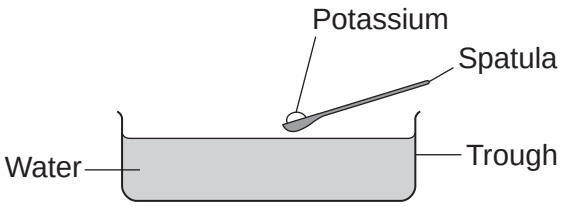
June 2017 | CH3FP | Original Q4 | Legacy

4 This question is about potassium and its compounds.

4 (a) Potassium reacts with water.

Figure 5 shows potassium being added to water.

Figure 5



The word equation for the reaction is:

potassium + water ⟶ potassium hydroxide + hydrogen

Give **two** observations that can be seen when potassium is added to water.

[2 marks]

Question 4 continues on the next page

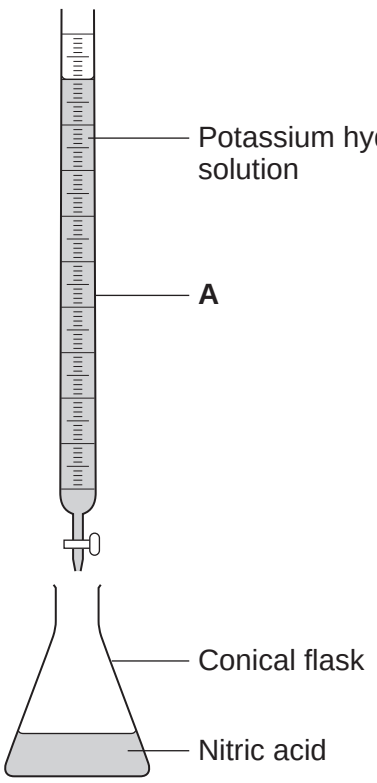
4.4.2.5 Titrations (chemistry only)

Question 12 · continued

4 (b) Potassium hydroxide solution is used in titrations.

A student used the apparatus in **Figure 6** to do a titration to find the concentration of some nitric acid.

Figure 6



4 (b) (i) Name the piece of apparatus labelled **A**.

[1 mark]

_____

4 (b) (ii) What should the student add to the nitric acid before starting the titration?

[1 mark]

_____

4.4.2.5 Titrations (chemistry only)

Question 12 · continued

4 (b) (iii) Describe how the student could use the apparatus in **Figure 6** to complete the titration.

[3 marks]

4 (b) (iv) The student did the titration four times.

Give **one** variable the student should keep the same for each titration.

[1 mark]

Question 4 continues on the next page

4.4.2.5 Titrations (chemistry only)

Question 12 · continued

4 (c) **Table 2** shows the student's results.

Table 2

	Volume of potassium hydroxide solution used in cm^3
Titration 1	23.8
Titration 2	18.2
Titration 3	19.0
Titration 4	18.6
Mean value	

4 (c) (i) Calculate the mean volume of potassium hydroxide solution used.

Do not use any anomalous results in your calculation.

[2 marks]

Mean volume of potassium hydroxide solution used = _____ cm^3

4.4.2.5 Titrations (chemistry only)

Question 12 · continued

4 (c) (ii) A second student repeated the experiment and recorded the results in **Table 3**.

Table 3

	Volume of potassium hydroxide solution used in cm^3
Titration 1	24
Titration 2	18

Look at **Table 2** and **Table 3**.

Suggest **two** improvements the second student could make to obtain results that are more accurate.

[2 marks]

_____

_____

_____

_____

12

4.4.2.5 Titrations (chemistry only)

Question 13

0 9 This question is about acids and alkalis.

0 9 . 1 Which ion do all acids produce in aqueous solution?

[1 mark]

Tick (✓) **one** box.

H^+ ☐

H^- ☐

O^{2-} ☐

OH^- ☐

0 9 . 2 Calcium hydroxide solution reacts with an acid to form calcium chloride.

Complete the word equation for the reaction.

[2 marks]

calcium hydroxide + _____ acid → calcium chloride + _____

Question 9 continues on the next page

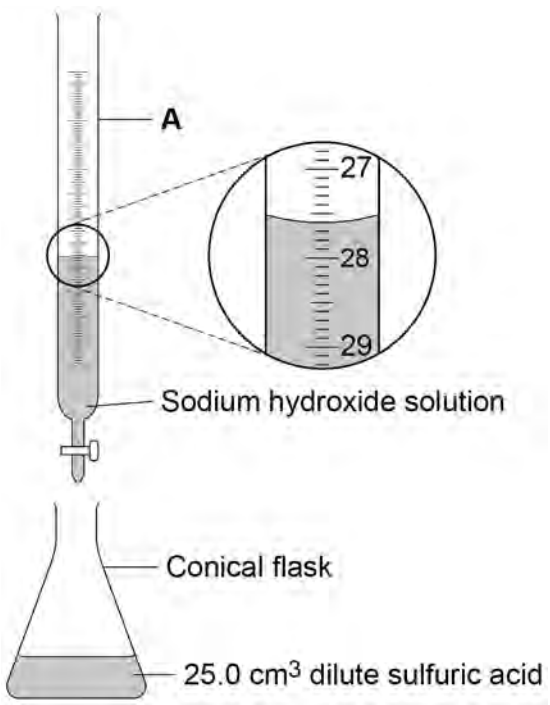
4.4.2.5 Titrations (chemistry only)

Question 13 · continued

A student investigates the volume of sodium hydroxide solution that reacts with 25.0 cm^3 of dilute sulfuric acid.

Figure 12 shows the apparatus the student uses.

Figure 12



Use **Figure 12** to answer Questions **09.3** and **09.4**

0 9 . 3 Name apparatus **A**.

[1 mark]

0 9 . 4 What is the reading on apparatus **A**?

[1 mark]

_____ cm^3

4.4.2.5 Titrations (chemistry only)

Question 13 · continued

0 9 . 5 The higher the concentration of a sample of dilute sulfuric acid, the greater the volume of sodium hydroxide needed to neutralise the acid.

The student tested two samples of dilute sulfuric acid, **P** and **Q**.

Describe how the student could use titrations to find which sample, **P** or **Q**, is more concentrated.

[6 marks]

11

4.4.2.5 Titrations (chemistry only)

Question 14

November 2020 | 8462/1F | Original Q7

0 7 This question is about acids, bases and salts.

Zinc nitrate is a salt.

A student produces zinc nitrate using an acid and a base.

0 7 . 1 Which acid should the student use to produce zinc nitrate?

[1 mark]

Tick (✓) **one** box.

- Hydrochloric acid ☐
- Nitric acid ☐
- Sulfuric acid ☐

0 7 . 2 Which is a base the student could use to produce zinc nitrate?

[1 mark]

Tick (✓) **one** box.

- Zinc chloride ☐
- Zinc oxide ☐
- Zinc sulfate ☐

0 7 . 3 Name the salt with the formula $MgBr_2$

[1 mark]

_____

4.4.2.5 Titrations (chemistry only)

Question 14 · continued

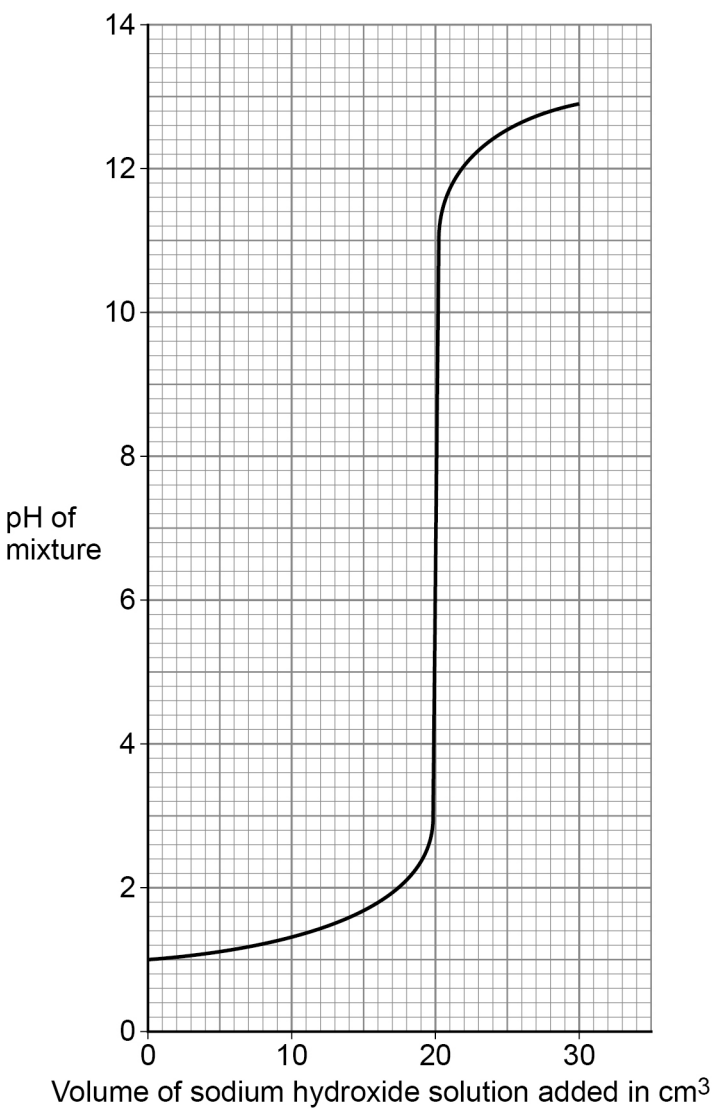
A student investigated how pH changes during a titration.

This is the method used.

1. Pour 25.0 cm^3 of hydrochloric acid into a beaker.
2. Measure the pH of the hydrochloric acid with a pH probe.
3. Add 1.0 cm^3 of sodium hydroxide solution from a burette.
4. Swirl the mixture.
5. Measure the pH of the mixture.
6. Repeat steps 3 to 5 until a total of 30.0 cm^3 of sodium hydroxide solution has been added.

Figure 10 shows the student's results.

Figure 10



4.4.2.5 Titrations (chemistry only)

Question 14 · continued

0 7 . 4 Describe how the pH of the mixture changes as sodium hydroxide solution is added to hydrochloric acid.

Use data from **Figure 10** in your answer.

[3 marks]

0 7 . 5 What volume of sodium hydroxide solution is needed to neutralise 25.0 cm^3 of hydrochloric acid?

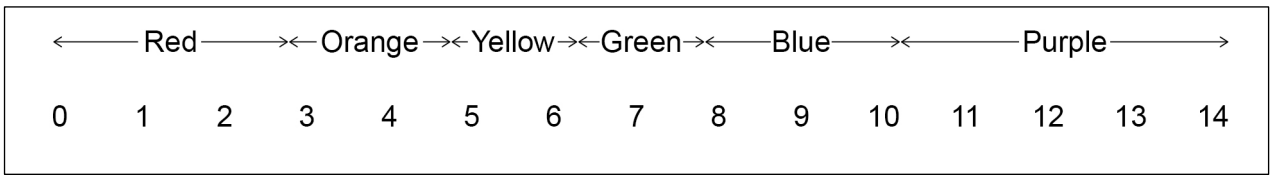
Use **Figure 10**.

[1 mark]

Volume = _____ cm^3

0 7 . 6 **Figure 11** shows the colour of universal indicator at different pH values.

Figure 11



The student could have used universal indicator instead of a pH probe.

Determine the colour of universal indicator when 10.0 cm^3 of sodium hydroxide solution has been added to 25.0 cm^3 of hydrochloric acid.

Use **Figure 10** and **Figure 11**.

[1 mark]

Colour = _____

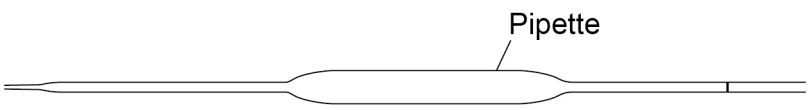
4.4.2.5 Titrations (chemistry only)

Question 14 · continued

0 7 . 7 The student used a pipette to measure 25.0 cm^3 of hydrochloric acid.

Figure 12 shows a pipette.

Figure 12



The pipette is labelled 25.0 ± 0.06 cm^3

Calculate the percentage uncertainty in the volume measured using this pipette.

Use the equation:

$$\text{percentage uncertainty} = \frac{\text{uncertainty}}{\text{volume measured}} \times 100$$

[2 marks]

Percentage uncertainty = _____ %

0 7 . 8 Give **one** advantage of using a pipette rather than using a measuring cylinder to measure the volume of hydrochloric acid.

[1 mark]

11

4.4.2.5 Titrations (chemistry only)

Question 15

November 2021 | 8462/1F | Original Q5

0 5 This question is about acids and alkalis.

0 5 . 1 Which ion do acids produce in aqueous solution?

[1 mark]

Tick (✓) **one** box.

H^+ ☐ OH^- ☐ O^{2-} ☐

0 5 . 2 Acids react with alkalis.

What is the name of this type of reaction?

[1 mark]

Tick (✓) **one** box.

Decomposition ☐

Electrolysis ☐

Neutralisation ☐

Redox ☐

0 5 . 3 Balance the equation for the reaction between sulfuric acid and potassium hydroxide.

[1 mark]

$$H_2SO_4 + ____ KOH \rightarrow K_2SO_4 + ____ H_2O$$

0 5 . 4 Universal indicator turns purple in potassium hydroxide solution.

What is the pH of the solution?

[1 mark]

Tick (✓) **one** box.

1 ☐ 4 ☐ 7 ☐ 14 ☐

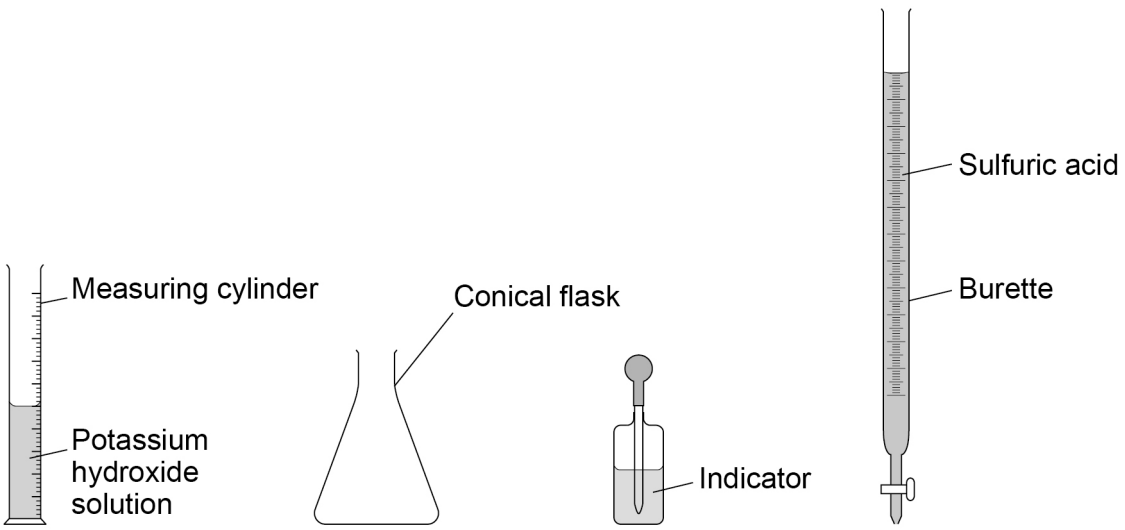
4.4.2.5 Titrations (chemistry only)

Question 15 · continued

A student does a titration to find the volume of sulfuric acid that reacts with 25 cm^3 of potassium hydroxide solution.

Figure 7 shows the equipment used.

Figure 7



0 5 . 5 The 25 cm^3 of potassium hydroxide solution is measured with the measuring cylinder.

Which piece of equipment could the student use to measure the 25 cm^3 of potassium hydroxide solution more accurately?

[1 mark]

Tick (✓) **one** box.

- Beaker ☐
- Evaporating basin ☐
- Pipette ☐
- Test tube ☐

4.4.2.5 Titrations (chemistry only)

Question 15 · continued

0 5 . 6 Describe how the student would use the equipment in **Figure 7** to complete the titration.

[5 marks]

10

4.4.2.5 Titrations (chemistry only)

Question 16

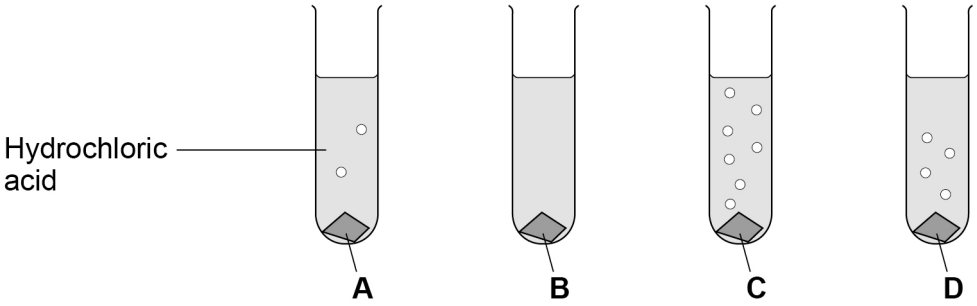
June 2022 | 8462/1F | Original Q3

0 3 This question is about acids.

A student added four metals, **A**, **B**, **C** and **D** to hydrochloric acid.

Figure 4 shows the rate of bubbling in each tube.

Figure 4



Use **Figure 4** to answer questions **03.1** and **03.2**.

0 3 . 1 Which metal is copper?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 3 . 2 Which metal is the most reactive?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 3 . 3 A metal oxide reacts with an acid to produce zinc sulfate and water.

Name the metal oxide and the acid used in this reaction.

[2 marks]

Name of metal oxide _____

Name of acid _____

4.4.2.5 Titrations (chemistry only)

Question 16 · continued

0 3 . 4 Universal indicator is used to measure the pH of a solution.

Draw **one** line from each pH to the colour of universal indicator in a solution with that pH.

[2 marks]

pH	Colour of universal indicator
	Blue
1	Green
	Purple
7	Red
	Yellow

Question 3 continues on the next page

4.4.2.5 Titrations (chemistry only)

Question 16 · continued

A student reacts an acid with an alkali in a titration.

0 3 . 5 What is the type of reaction when an acid reacts with an alkali?

[1 mark]

Tick (✓) **one** box.

Combustion ☐

Decomposition ☐

Neutralisation ☐

0 3 . 6 **Figure 5** shows a piece of equipment used to measure the volume of the acid in the titration.

Figure 5



What is the name of this piece of equipment?

[1 mark]

Tick (✓) **one** box.

Burette ☐

Pipette ☐

Syringe ☐

Tube ☐

8

4.4.2.5 Titrations (chemistry only)

Question 17

June 2023 | 8462/2F | Original Q10

1 0 This question is about chemical analysis.

Potassium bromide is used in medicine.

A scientist tested a sample of medicine to show the presence of potassium ions and of bromide ions.

The sample is soluble in water.

1 0 . 1 Plan a method the scientist could use to show that the sample of medicine contains potassium ions **and** bromide ions.

The scientist has:

- a Bunsen burner
- a metal wire
- test tubes
- a dropping pipette
- distilled water
- dilute nitric acid
- silver nitrate solution.

You should give the results of the tests.

[6 marks]

4.4.2.5 Titrations (chemistry only)

Question 17 · continued

The scientist could also use an instrumental method to show the presence of potassium ions in the medicine.

10.2 Which instrumental method could be used to show the presence of potassium ions in the medicine?

[1 mark]

10.3 Give **one** advantage of using this instrumental method instead of a chemical test.

[1 mark]

8

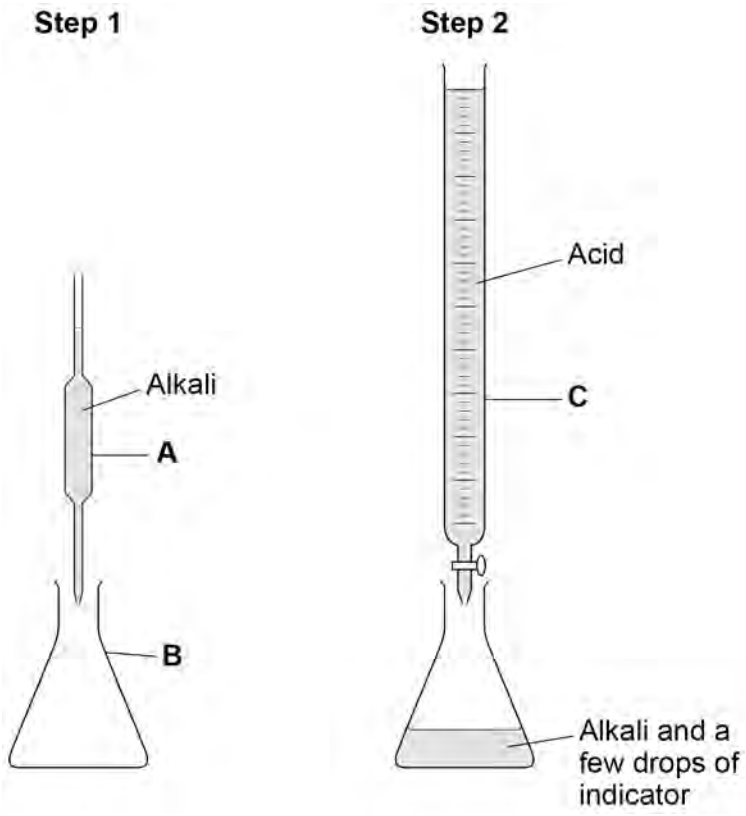
4.4.2.5 Titrations (chemistry only)

Question 18

0 2 A titration measures the volumes of an acid and an alkali that neutralise each other.

Figure 4 shows the apparatus used.

Figure 4



0 2 . 1 Name the pieces of equipment labelled **A**, **B** and **C** in **Figure 4**.

Choose answers from the box.

[3 marks]

beaker	**burette**	**conical flask**
measuring cylinder	**pipette**	**test tube**

A _____

B _____

C _____

4.4.2.5 Titrations (chemistry only)

Question 18 · continued

In **Step 2** in **Figure 4** the acid is added to the alkali until the solution is neutralised.

The volume of acid added is then read from equipment **C**.

0 2 . 2 Name a suitable indicator for use in **Step 2** of the titration.

[1 mark]

0 2 . 3 Give **one** observation that shows the alkali is neutralised.

[1 mark]

0 2 . 4 Give **two** ways to make sure that the volume of acid added is accurate.

[2 marks]

1

2

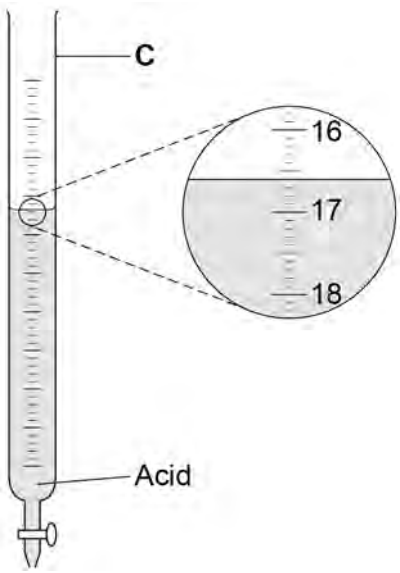
Question 2 continues on the next page

4.4.2.5 Titrations (chemistry only)

Question 18 · continued

0 2 . 5 **Figure 5** shows the reading on equipment **C** at the end of **Step 2**.

Figure 5



What is the reading on equipment **C** in **Figure 5**?

[1 mark]

Tick (✓) **one** box.

- 16.4 cm^3 ☐
- 16.6 cm^3 ☐
- 17.4 cm^3 ☐
- 17.6 cm^3 ☐

4.4.2.5 Titrations (chemistry only)

Question 18 · continued

0 2 . 6 A student did a different titration.

Table 1 shows the results.

Table 1

	Trial 1	Trial 2	Trial 3
Volume of acid added in cm^3	25.3	23.7	23.6

Which **two** results should be used to calculate the mean volume of acid added?

[1 mark]

Tick (✓) **one** box.

Trial 1 and Trial 2 ☐

Trial 1 and Trial 3 ☐

Trial 2 and Trial 3 ☐

0 2 . 7 A salt is produced when an acid neutralises an alkali.

Barium chloride is a salt containing the ions Ba^{2+} and Cl^-

What is the formula of barium chloride?

[1 mark]

Tick (✓) **one** box.

BaCl ☐ $BaCl_2$ ☐ Ba_2Cl ☐ Ba_2Cl_2 ☐

10

4.4.2.5 Titrations (chemistry only)

Question 19

June 2025 | 8462/1F | Original Q4

0 4 A student did an experiment to find the volume of an acid that neutralised 25.0 cm^3 of an alkali.

This is the method used.

1. Measure 25.0 cm^3 of the alkali into a conical flask.
2. Add a few drops of substance **X** to the alkali.
3. Place the conical flask on a white tile.
4. Add the acid to the alkali until a colour change is seen.
5. Measure the volume of acid added.
6. Repeat steps 1 to 5 three more times.

0 4 . 1 What is the name of this experiment?

[1 mark]

Tick (✓) **one** box.

- Crystallisation ☐
- Distillation ☐
- Electrolysis ☐
- Titration ☐

0 4 . 2 Substance **X** is used in step 2 of the method.

What type of substance is **X**?

[1 mark]

_____

4.4.2.5 Titrations (chemistry only)

Question 19 · continued

0 4 . 3 Which piece of equipment is used to add the acid to the alkali in step 4?

[1 mark]

Tick (✓) **one** box.

Beaker ☐

Burette ☐

Test tube ☐

0 4 . 4 Suggest **one** improvement to step 4 of the method.

[1 mark]

_____

_____

Question 4 continues on the next page

4.4.2.5 Titrations (chemistry only)

0 4 . 5 **Table 3** shows the results.

Table 3

	Trial 1	Trial 2	Trial 3	Trial 4
Volume of acid in cm^3	8.95	9.00	8.85	8.45

Calculate the mean volume of the acid needed to neutralise 25.0 cm^3 of the alkali.

Give your answer to 3 significant figures.

Do **not** include the anomalous result.

[4 marks]

Mean volume (3 significant figures) = _____ cm^3

4.4.2.5 Titrations (chemistry only)

Question 19 · continued

0 4 . 6 Aqueous solutions of acids and alkalis contain ions.

Draw **one** line from each type of aqueous solution to the ion that is **always** in the aqueous solution.

[2 marks]

Type of aqueous solution	Ion
	Cl^-
Acid	H^+
Alkali	Na^+
	OH^-

10

4.4.2.5 Titrations (chemistry only)

Question 20

June 2025 | 8462/2F | Original Q8

0 8 A student investigated the mass of dissolved solids in sea water.

This is the method used.

1. Weigh an empty evaporating basin.
2. Measure 10.0 cm^3 of sea water sample **A** into the evaporating basin using a burette.
3. Heat the evaporating basin until all the water seems to have evaporated.
4. Weigh the evaporating basin and contents.
5. Calculate the mass of dissolved solids in the sample.
6. Repeat steps 1 to 5 with sea water samples **B**, **C** and **D**.

0 8 . 1 Why did the student use a burette rather than a measuring cylinder to measure 10.0 cm^3 of each sample?

[1 mark]

0 8 . 2 What was the dependent variable in this investigation?

[1 mark]

0 8 . 3 Describe how the student could make sure **all** of the water had evaporated in **step 3**.

[2 marks]

0 8 . 4 How did the student calculate the mass of dissolved solids in each sea water sample?

[1 mark]

4.4.2.5 Titrations (chemistry only)

Table 3 shows the results.

Table 3

Sea water sample	A	B	C	D
Mass of dissolved solids in grams	0.35	0.37	0.33	0.34

0 8 . 5 Calculate the mean concentration of dissolved solids in 10.0 cm^3 samples of sea water **A**, **B**, **C** and **D**.

Use **Table 3** and the equation:

$$\text{mean concentration of dissolved solids } (g/dm^3) = \frac{\text{mean mass of dissolved solids (g)}}{\text{volume of sample } (dm^3)}$$

Give your answer in g/dm^3.

[5 marks]

Mean concentration = _____ g/dm^3

0 8 . 6 Suggest why sea water samples **A**, **B**, **C** and **D** contain different masses of dissolved solids.

[1 mark]

11