

WJEC Chemistry GCSE

2.2: Acids, Bases and Salts

Practice Questions

Wales Specification

1.

Describe the similarities in the reactions of ethanoic acid and sulfuric acid with metals, carbonates and bases. Describe and explain any differences observed. You should include relevant equations in your answer. [6 QWC]

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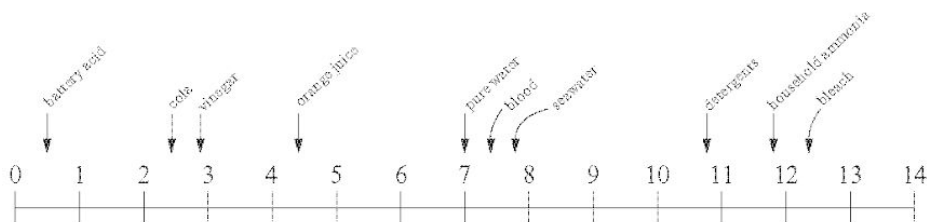
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2.

The following diagram shows the pH scale and the pH values of some common substances.



- (a) From the substances above, name
- (i) the strongest acid, [1]
 - (ii) the weakest alkali, [1]
 - (iii) a neutral substance, [1]
- (b) John was studying the reactions of acids with three different substances, **A**, **B** and **C**. He recorded his observations and temperature changes in the table shown below.

Substance added to acid	Observations	Temperature change (°C)
A	bubbles of gas produced, gas collected turns limewater milky, substance reacts to produce blue solution	+4
B	no gas produced, substance reacts to produce a blue solution	0
C	no visible change	+8

Identify **A**, **B** and **C** from the substances in the box below. [3]

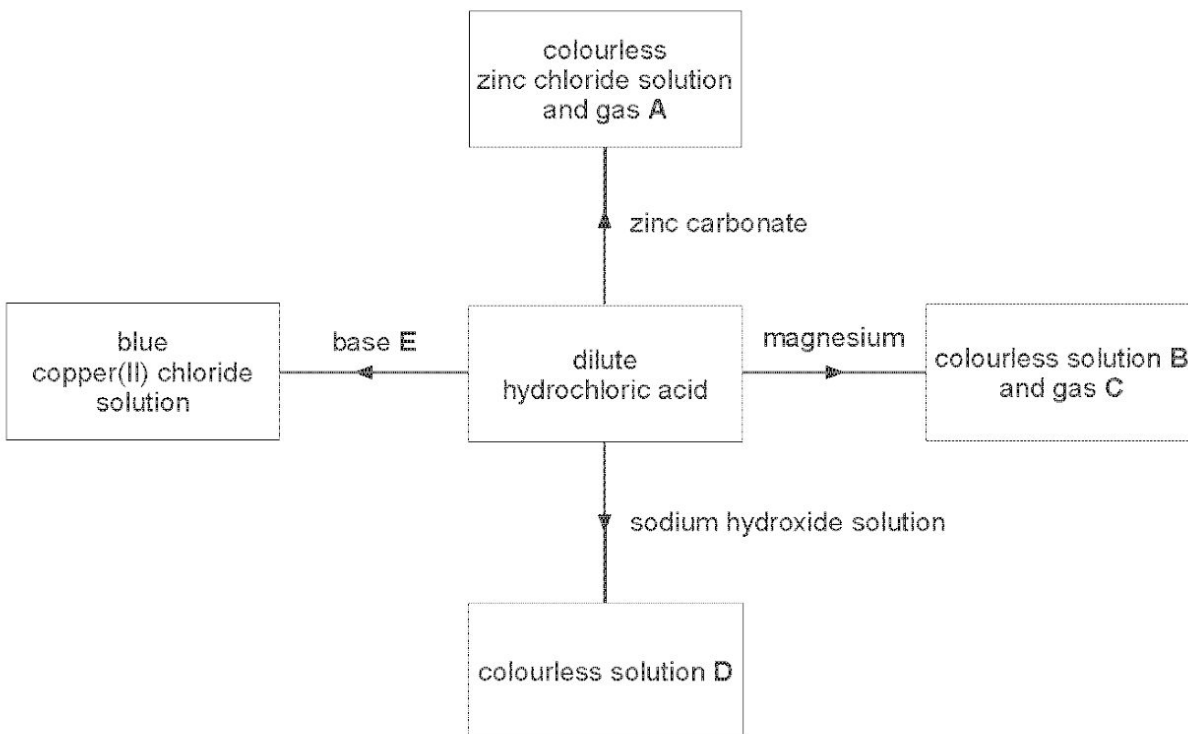
copper carbonate copper oxide magnesium
sodium chloride sodium hydroxide

- A**
- B**
- C**

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3.

The diagram below shows some reactions of dilute hydrochloric acid.



(a) Give the names of each of the substances A to E.

[5]

A

B

C

D

E

(b) Give the chemical formula of zinc chloride.

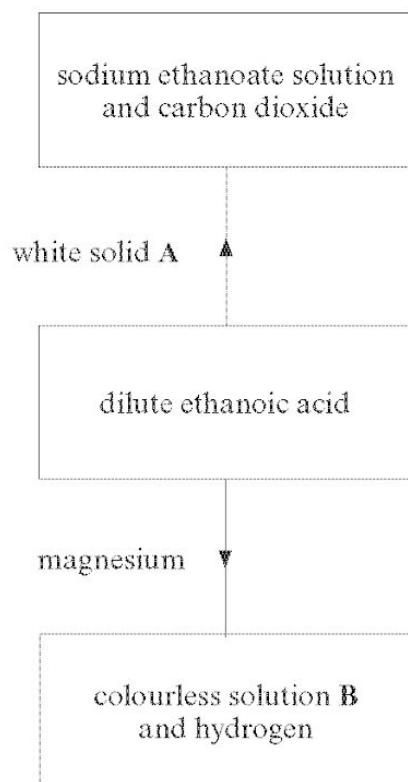
[1]

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4.

(a) The flow diagram below shows some reactions of ethanoic acid, CH_3COOH .



(i) Name white solid **A**. [1]

(ii) Name colourless solution **B**. [1]

(b) Dilute ethanoic acid reacts with magnesium less vigorously than dilute sulfuric acid of equal concentration.

Give the reason for this difference in behaviour. [1]

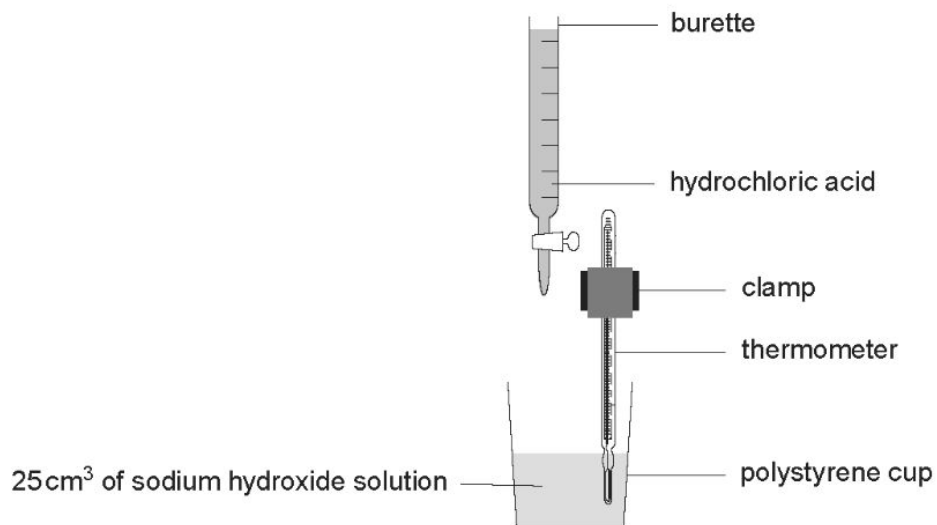
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(c) Ethanoic acid is formed when an alcoholic drink such as wine is left exposed to the air. Give the name of the compound in wine which turns into ethanoic acid. [1]

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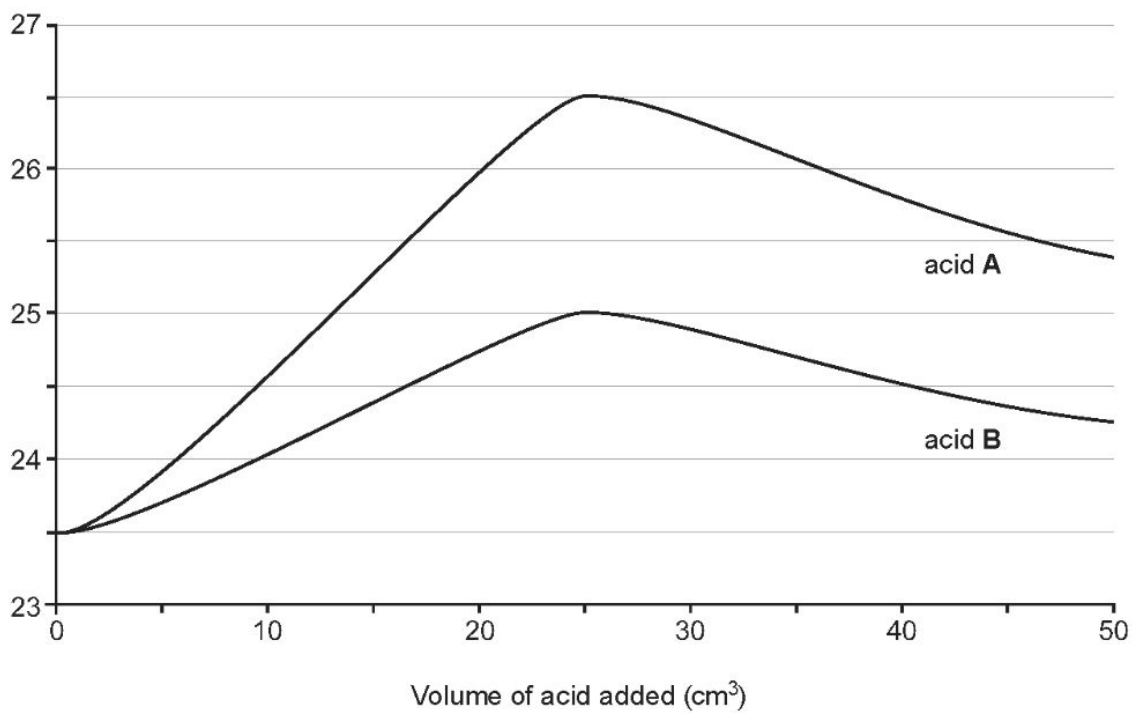
5.

The apparatus below can be used to measure the temperature as a neutralisation reaction takes place.



The graphs below show how the temperature changes when acids **A** and **B** are added separately to 25 cm³ of sodium hydroxide solution.

Temperature (°C)



(a) Use the graphs opposite to find the
(i) volume of acid required to neutralise the sodium hydroxide solution in both experiments, [1]

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(ii) maximum temperature rise for acid B. [1]

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(b) State which acid, A or B, is stronger and give a reason for your answer. [1]

Stronger acid

Reason

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(c) Describe how an indicator could be used to find the exact volume of acid needed for neutralisation. [3]

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6.

(a) Sulfuric acid is a **strong** acid.

Place a tick (✓) in the box with the pH value of sulfuric acid.

[1]

pH value

1

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14

(b) Give the chemical name of an acid other than sulfuric acid.

[1]

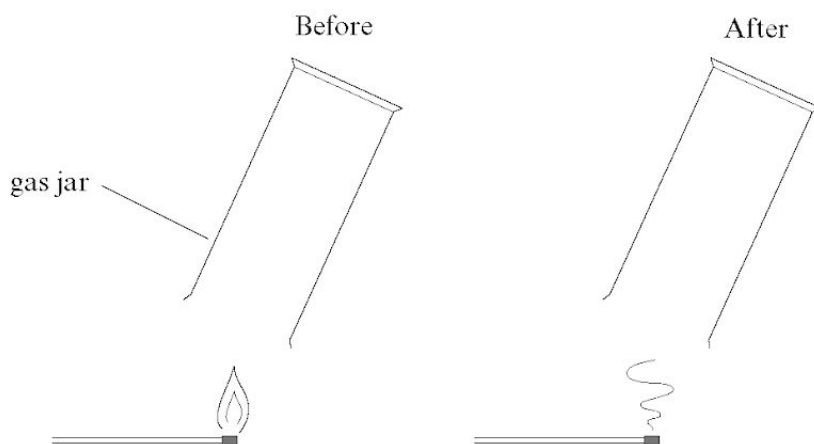
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(c) Name the gas given off when dilute sulfuric acid reacts with sodium carbonate.

[1]

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(d) The gas given off in part (c) was collected in a gas jar. The gas jar was turned upside down over a burning splint as shown in the diagrams below.



Suggest **two** properties of this gas that are shown by this experiment.

[2]

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7.

The following table shows the pH of some common substances.

Substance	pH
limewater	10.5
saliva	6.4
lemon juice	2.2
orange juice	2.6
milk of magnesia	10.0

(a) Use only information from the table to answer parts (i) and (ii).

(i) Name the strongest acid. [1]

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(ii) Name the substance closest to being neutral. [1]

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(b) Milk of magnesia is used to treat indigestion. It contains magnesium hydroxide which reacts with excess hydrochloric acid in the stomach.

(i) Complete the following word equation to show the products formed. [2]

magnesium hydroxide + hydrochloric acid \longrightarrow +

(ii) Another indigestion remedy contains calcium carbonate. Name the gas produced when calcium carbonate reacts with hydrochloric acid and state how this gas can be identified. [2]

Gas produced

How this gas can be identified

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8. An analytical chemist was asked to check the amount of vitamin C in a tablet. Vitamin C tablets contain ascorbic acid, $C_6H_8O_6$, and a starch "filler" which holds them together.

Ascorbic acid reacts with sodium hydroxide solution according to the equation below:



To determine how much vitamin C is present, a tablet was dissolved in water and titrated with sodium hydroxide solution of concentration 0.10 mol/dm^3 . The endpoint was determined using the indicator phenolphthalein. The procedure was repeated three times and the mean value of sodium hydroxide solution needed to neutralise a vitamin C tablet was found to be 17.5 cm^3 .

- (a) Calculate the number of moles of sodium hydroxide in 17.5 cm^3 of the 0.10 mol/dm^3 solution. [2]

Number of moles = mol

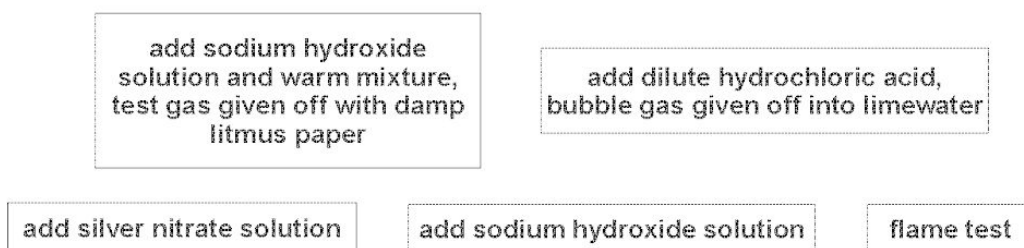
- (b) Calculate the relative molecular mass, M_r , of ascorbic acid, $C_6H_8O_6$. [1]

$$A_r(\text{H}) = 1 \quad A_r(\text{O}) = 16 \quad A_r(\text{C}) = 12$$

$M_r = \dots\dots\dots$

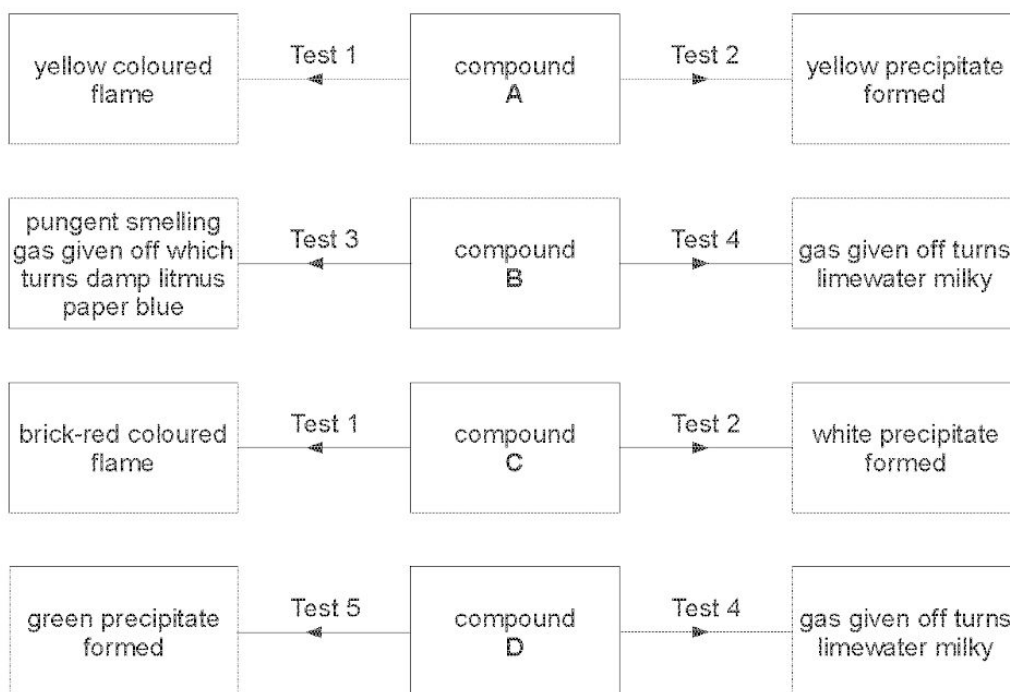
- (c) The label on the bottle states that each tablet contains 300 mg (0.3g) of vitamin C. Using your answers to parts (a) and (b) show whether this statement is correct. [2]

9. (a) A pupil used the following tests to identify unknown compounds A, B, C and D.



These are described as tests 1 to 5 but not necessarily in this order.

The flow charts show the results obtained for each compound.



Deduce which test is which and hence give the names of compounds A, B, C and D. [4]

- A
- B
- C
- D

(b) Describe the test for sulfate ions in solution. Include the result for your test.

[1]

5

10.

Sodium chloride is made when sodium hydroxide solution reacts with dilute hydrochloric acid.



Describe a laboratory method for making crystals of pure sodium chloride from sodium hydroxide solution and dilute hydrochloric acid. [6 QWC]

Diagrams may be used as part of your answer.

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11.

Indigestion is caused by excess acid in the stomach. Antacid tablets contain mainly calcium carbonate. The calcium carbonate in an antacid tablet neutralises the excess acid. A group of pupils was asked to carry out an investigation to find

“Which brand of antacid tablet is the best?”

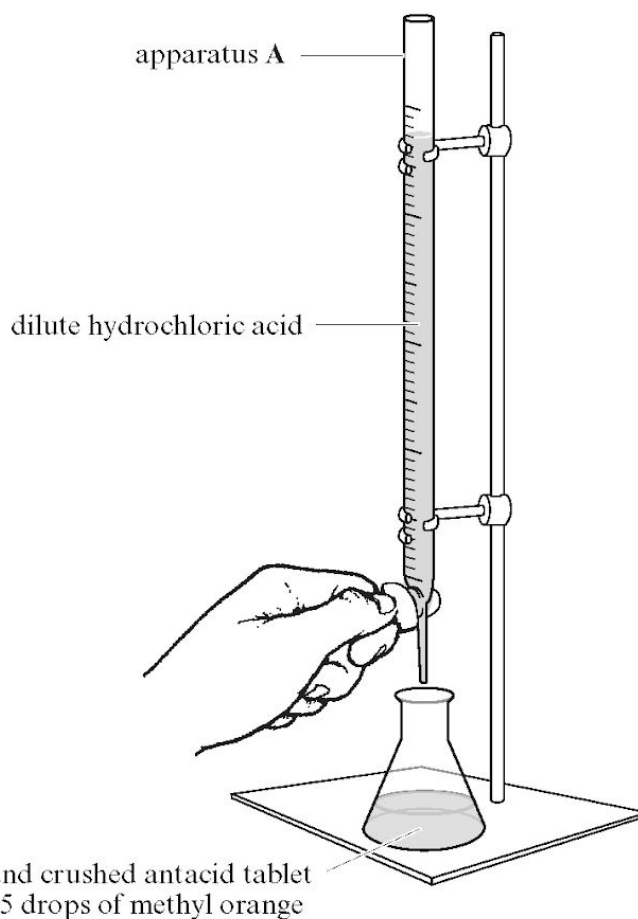
The group was provided with three different tablets, **A**, **B** and **C**, each of equal mass. The apparatus below was used to find out how much dilute hydrochloric acid was needed to react with all the calcium carbonate in each antacid tablet.

Tablet **A** was crushed and added to 50 cm^3 of water in a conical flask. Five drops of methyl orange were then added.

The mixture was titrated with dilute hydrochloric acid. The acid was added 0.5 cm^3 at a time until the methyl orange turned red.

The total volume of acid added was recorded.

This procedure was repeated using tablets **B** and **C**.



The results for each tablet are shown below.

	Tablet		
	A	B	C
Volume of acid needed to neutralise all the calcium carbonate in a single tablet (cm^3)	12.5	13.5	11.0

(a)

burette	measuring cylinder	pipette	gas syringe	test tube
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Choose from the box above the name of apparatus A in the diagram.

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[1]

(b) Give the name for substances, such as methyl orange, which have one colour in acids and a different colour in alkalis.

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[1]

(c) State, giving a reason, how the results could be made more accurate.

[2]

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(d) State, giving a reason, which brand of indigestion tablet is the best.

[1]

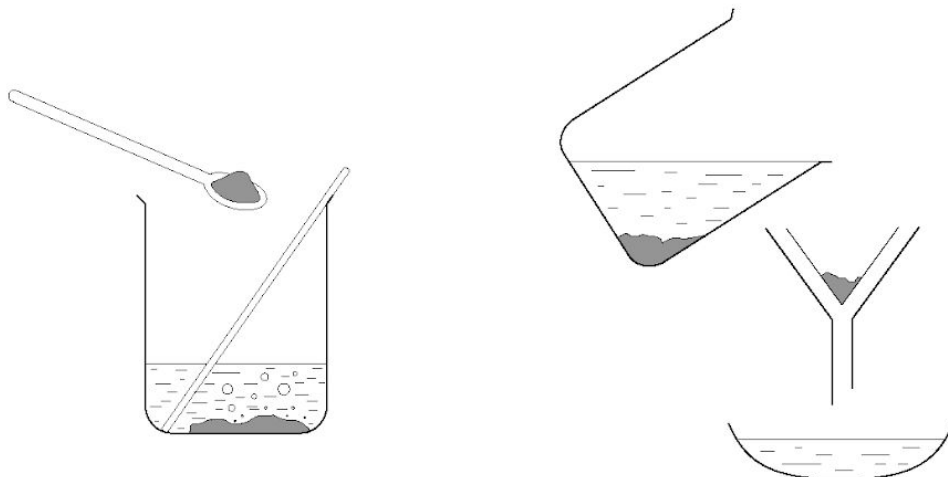
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12.

Copper sulfate crystals can be prepared by reacting copper carbonate with dilute sulfuric acid.

The unlabelled diagrams below show two of the three stages involved.



Describe the preparation of copper sulfate crystals by this method. Include in your answer what you would expect to see at each stage.

[6 QWC]

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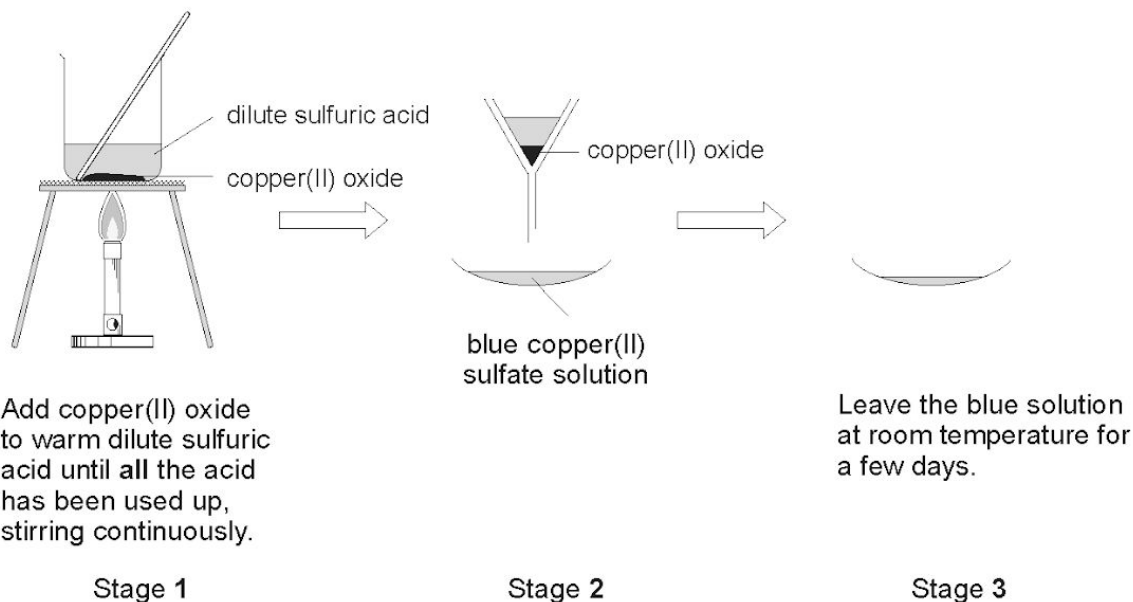
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13.

One method of preparing a salt is by reacting a base with a dilute acid. The information below shows the stages a pupil follows to make a salt.



Use the information in the diagrams to answer the following questions.

(a) State what the pupil can see when **all** the acid has been used up. [1]

(b) (i) Name the process used in stage 2. [1]

(ii) Name the substance removed during stage 3. [1]

(c) (i) Give the name of the **base** used in this experiment. [1]

(ii) Give the name of the **salt** formed in this experiment. [1]

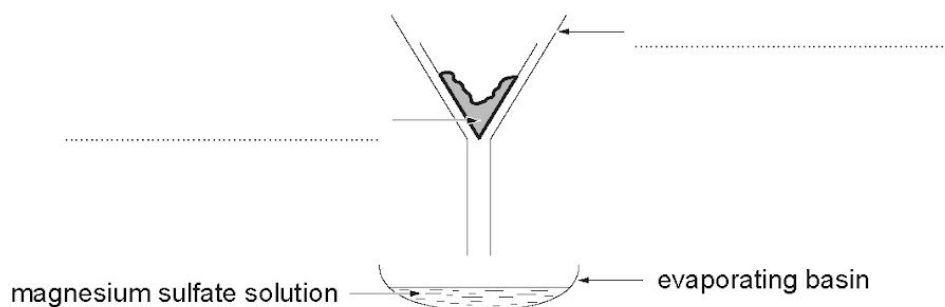
14.

Magnesium sulfate can be made by adding excess magnesium oxide to sulfuric acid. Magnesium oxide is insoluble in water.

(a) State why excess magnesium oxide is added. [1]

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(b) The following apparatus could be used to remove the excess magnesium oxide from the solution. Complete the labelling of the diagram. [2]



(c) State how you can obtain crystals from the solution. [1]

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(d) Complete the word equation for the reaction. [1]



(e) If the reaction was carried out with hydrochloric acid, instead of sulfuric acid, magnesium chloride would be formed.

Write the chemical formula for magnesium chloride. [1]

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15.

Copper(II) sulfate was made by reacting copper(II) carbonate with an acid.

(a) Give the name of the acid used. [1]

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(b) The first stage of the preparation is the addition of excess copper(II) carbonate to the acid. Give two observations that show a reaction is taking place. [2]

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(c) Describe how you would prepare copper(II) sulfate crystals from the mixture in part (b). [2]

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(d) A different salt can be made by reacting copper(II) oxide with dilute hydrochloric acid. Complete the word equation for the reaction that takes place. [1]



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16. (a) Grapes contain tartaric acid.
Place a tick (✓) in the box with the expected value for the pH of tartaric acid and explain your choice. [3]

pH value

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13

Explanation

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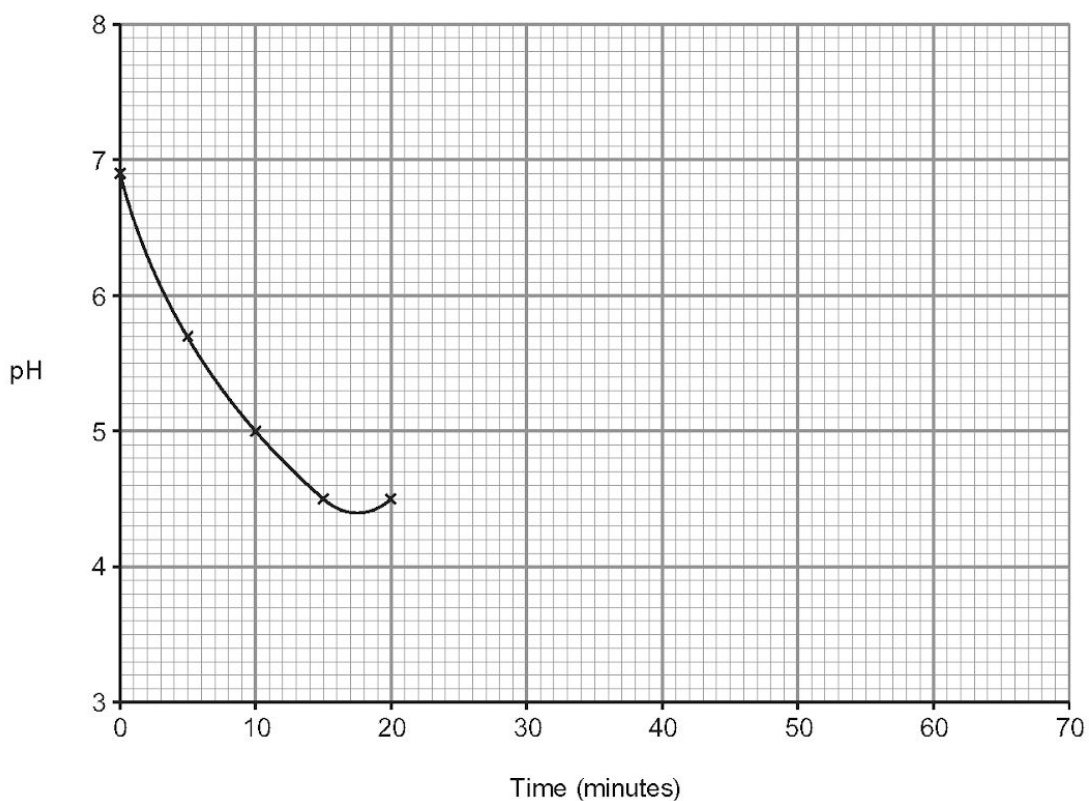
- (b) Tim was asked to carry out an experiment to investigate the effect of food on the pH of saliva.

At the start of the experiment the pH of saliva in Tim's mouth was 6.9. He ate an apple and the pH of his saliva was measured every 5 minutes for 45 minutes.

The results of the experiment are shown in the table below.

Time (minutes)	0	5	10	15	20	25	30	35	40	45
pH	6.9	5.7	5.0	4.5	4.5	5.0	5.7	6.1	6.4	6.6

- (i) Five points have already been plotted. Complete the graph. [3]



- (ii) Use the graph to give the minimum pH value obtained during the experiment. [1]

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- (iii) Use the graph to predict when the pH of Tim's saliva will return to its original value. [1]

..... minutes

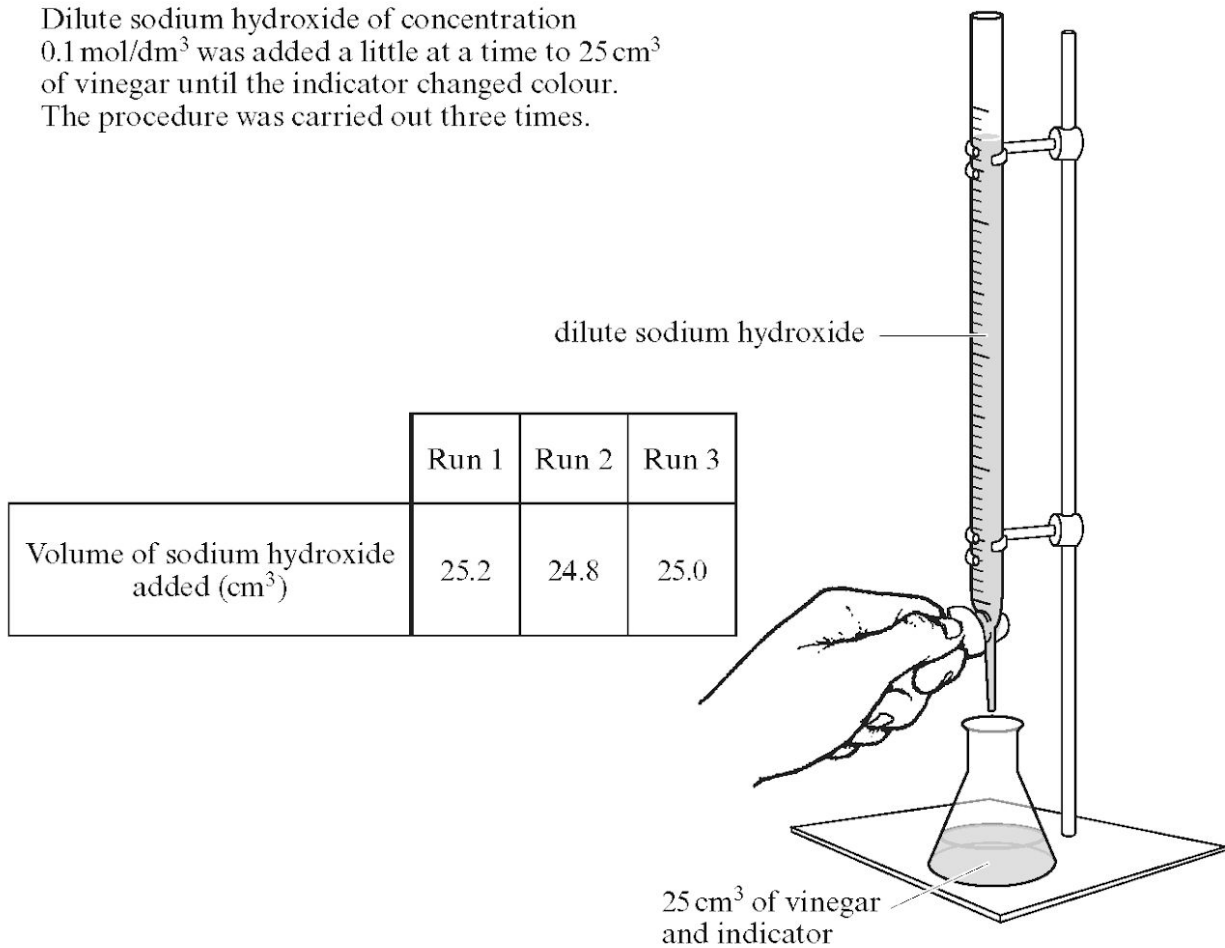
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17.

A food scientist was asked to check the quality of a bottle of vinegar. Vinegar contains ethanoic acid, CH_3COOH .

The apparatus shown was used to find the concentration of ethanoic acid in the vinegar.

Dilute sodium hydroxide of concentration 0.1 mol/dm^3 was added a little at a time to 25 cm^3 of vinegar until the indicator changed colour. The procedure was carried out three times.



(a) Calculate the mean volume of sodium hydroxide needed to neutralise 25 cm^3 of vinegar. [1]

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(b) Ethanoic acid reacts with sodium hydroxide solution according to the equation below.



Using the mean volume of sodium hydroxide from part (a), calculate the concentration of the ethanoic acid in mol/dm³. [3]

Concentration of ethanoic acid = mol/dm³

(c) The label on the vinegar bottle states that it contains 5 g of ethanoic acid, CH₃COOH, in 100 cm³ vinegar.

$$A_r(\text{H}) = 1 \quad A_r(\text{C}) = 12 \quad A_r(\text{O}) = 16$$

(i) Calculate the relative molecular mass, M_r , of ethanoic acid. [1]

$$M_r = \dots\dots\dots$$

(ii) Using your answers to parts (b) and (c)(i) show whether the information on the label is correct. [2]

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