AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 5.1.1.2

Mixtures

Past-paper questions

Tier	**Foundation**
Question groups	**27**
Available paper years	**2018–2025**

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.

5.1.1.2 Mixtures

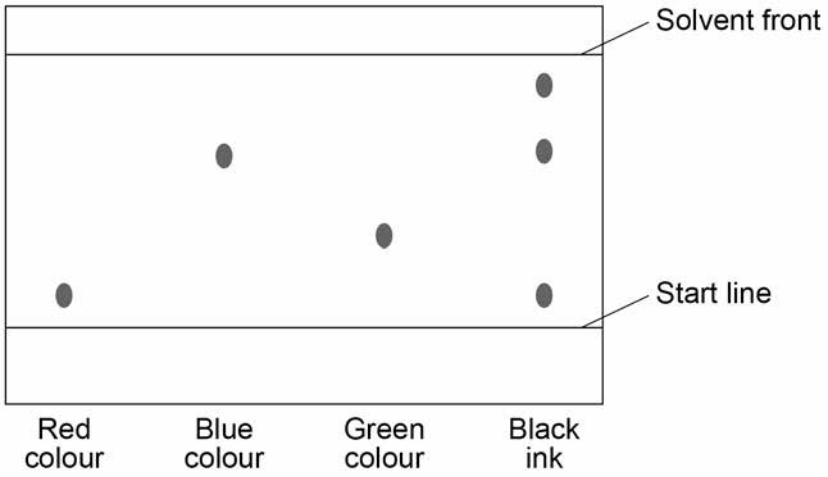
Question 01

June 2018 | 8464/C/2F | Original Q2

0 2 A student used paper chromatography to identify the colours in a black ink.

Figure 5 shows the student's results.

Figure 5



0 2 . 1 What colours are in the black ink?

[2 marks]

0 2 . 2 Suggest which colour is least soluble in the solvent.

Give a reason for your answer.

[2 marks]

Colour _____

Reason _____

5.1.1.2 Mixtures

Question 01 · continued

0 2 . 3 Use **Figure 5** to complete **Table 2**

Table 2

	Distance in mm
Distance moved by green colour	
Distance moved by solvent	

Calculate the R_f value for the green colour.

Use the equation:

$$R_f = \frac{\text{distance moved by green colour}}{\text{distance moved by solvent}}$$

[4 marks]

R_f value = _____

8

5.1.1.2 Mixtures

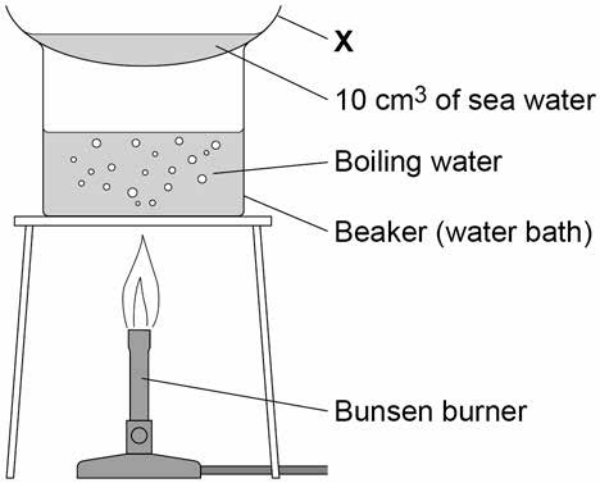
Question 02

June 2018 | 8464/C/2F | Original Q3

0 3 A student tested a sea water sample for dissolved solids.

Figure 6 shows the apparatus.

Figure 6



0 3 . 1 What is apparatus **X** on **Figure 6**?

[1 mark]

Tick **one** box.

- Boiling tube ☐
- Condenser ☐
- Funnel ☐
- Watch glass ☐

5.1.1.2 Mixtures

Question 02 · continued

0 3 . 2 The student did the test four times.

The student calculated the mass of solid on apparatus **X** after heating.

Table 3 shows the student's results.

Table 3

	Test 1	Test 2	Test 3	Test 4
Mass of solid in grams	0.12	0.29	0.14	0.15

Calculate the mean mass of solid.

Do not include the anomalous result in your calculation.

Give your answer to 2 significant figures.

[3 marks]

Mean mass = _____ g

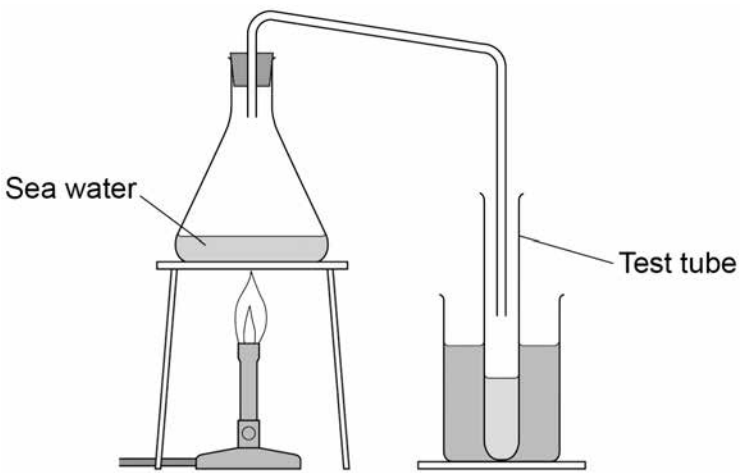
Question 3 continues on the next page

5.1.1.2 Mixtures

Question 02 · continued

The student distilled a sample of sea water in the apparatus shown in **Figure 7**

Figure 7



0 3 . 3 What change of state is happening at the surface of the sea water in **Figure 7**?

[1 mark]

0 3 . 4 Describe how the water in the test tube in **Figure 7** is different from the sea water.

[1 mark]

0 3 . 5 Why does producing drinking water from sea water using distillation cost a lot of money?

[1 mark]

5.1.1.2 Mixtures

Question 02 · continued

0 3 . 6 River water is filtered then sterilised to make drinking water.

Why are these **two** processes done?

[2 marks]

Filtering _____

_____

Sterilising _____

_____

9

Turn over for the next question

5.1.1.2 Mixtures

Question 03

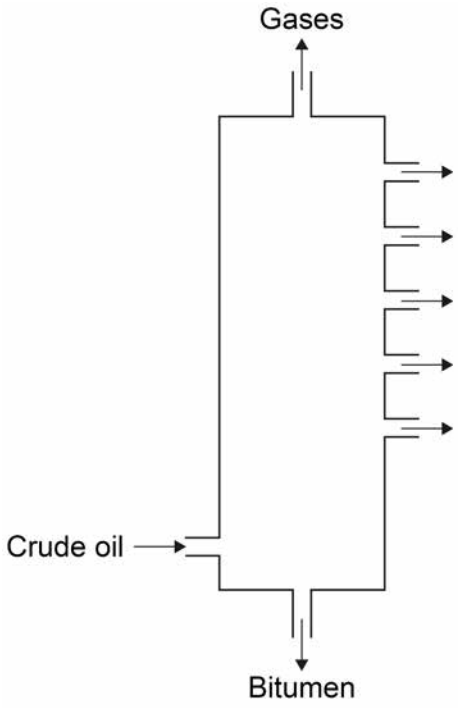
June 2018 | 8464/C/2F | Original Q6

0 6 Crude oil is a mixture of hydrocarbons.

0 6 . 1 The hydrocarbons in crude oil are separated into fractions by fractional distillation.

Figure 13 shows a fractional distillation column.

Figure 13



Crude oil vapour passes up the column.

Complete the sentence.

Choose the answer from the box.

[1 mark]

condenses	**dissolves**	**freezes**	**melts**

Each fraction _____ at a different level.

5.1.1.2 Mixtures

Question 03 · continued

0 6 . 2 Why do the fractions separate?

[1 mark]

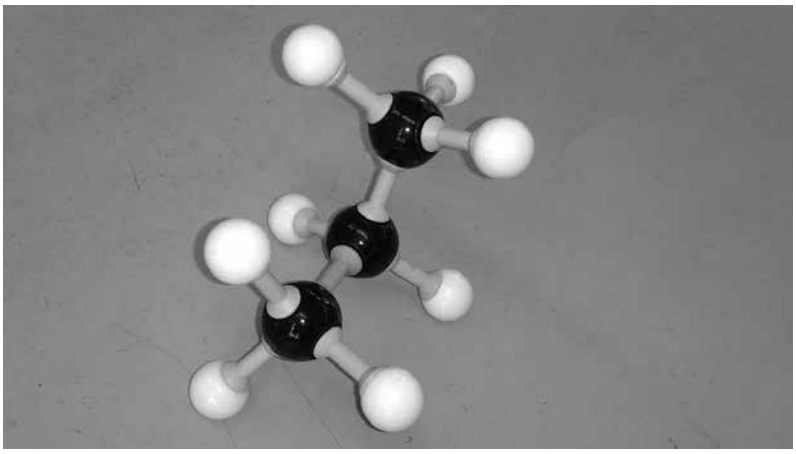
Tick **one** box.

- The fractions have different boiling points. ☐
- The fractions have different flammability. ☐
- The fractions have different melting points. ☐
- The fractions have different viscosity. ☐

Most of the hydrocarbons in crude oil are alkanes.

0 6 . 3 **Figure 14** represents an alkane molecule.

Figure 14



Name the alkane.

[1 mark]

5.1.1.2 Mixtures

Question 03 · continued

0 6 . 4 Methane (CH_4) is an alkane.

What is the general formula for alkanes?

[1 mark]

Tick **one** box.

- C_nH_n ☐
- C_nH_{2n} ☐
- C_nH_{2n-2} ☐
- C_nH_{2n+2} ☐

0 6 . 5 Alkanes burn in oxygen.

Balance the equation for methane burning.

[1 mark]

$$____ CH_4 + ____ O_2 \rightarrow ____ CO_2 + ____ H_2O$$

0 6 . 6 Ethene is an alkene.

Which reagent is used to test for alkenes?

[1 mark]

Tick **one** box.

- Anhydrous copper sulfate ☐
- Bromine water ☐
- Damp litmus paper ☐
- Limewater ☐

5.1.1.2 Mixtures

Question 03 · continued

Table 6 shows data from a life cycle assessment (LCA) for the disposal of 10 000 biodegradable plastic bags.

Table 6

	Burning and using the energy to generate electricity	Landfill
Mass of carbon dioxide produced in kg	25	15
Mass of solid residue in kg	0.050	0.070
Mass of sulfur dioxide produced in kg	0.20	0.30

0 6 . 7 Why are life cycle assessments (LCA) done?

[1 mark]

0 6 . 8 Compare the **two** methods for the disposal of biodegradable plastic bags.

Use information from **Table 6**

[4 marks]

11

5.1.1.2 Mixtures

Question 04

June 2019 | 8464/C/1F | Original Q2

0 2 This question is about salts and electrolysis.

A student wants to make copper chloride crystals.

The student adds excess copper oxide to some hot acid.

The student stirs the mixture.

0 2 . 1 Which acid should the student use?

[1 mark]

Tick (✓) **one** box.

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

0 2 . 2 Suggest how the student would know that excess copper oxide has been added.

[1 mark]

_____

_____

Question 2 continues on the next page

5.1.1.2 Mixtures

Question 04 · continued

0 2 . 3 There are four more stages, **A**, **B**, **C** and **D**, to make copper chloride crystals.

The stages **A**, **B**, **C** and **D** are not in the correct order.

Stage **A**	Partially evaporate by heating with a water bath
Stage **B**	Filter the mixture into an evaporating basin
Stage **C**	Leave to crystallise
Stage **D**	Remove and dry the crystals

Put stages **A**, **B**, **C** and **D** in the correct order.

[2 marks]

First stage _____

Second stage _____

Third stage _____

Fourth stage _____

0 2 . 4 Molten copper chloride can be electrolysed.

State the product at each electrode when molten copper chloride is electrolysed.

[2 marks]

Negative electrode _____

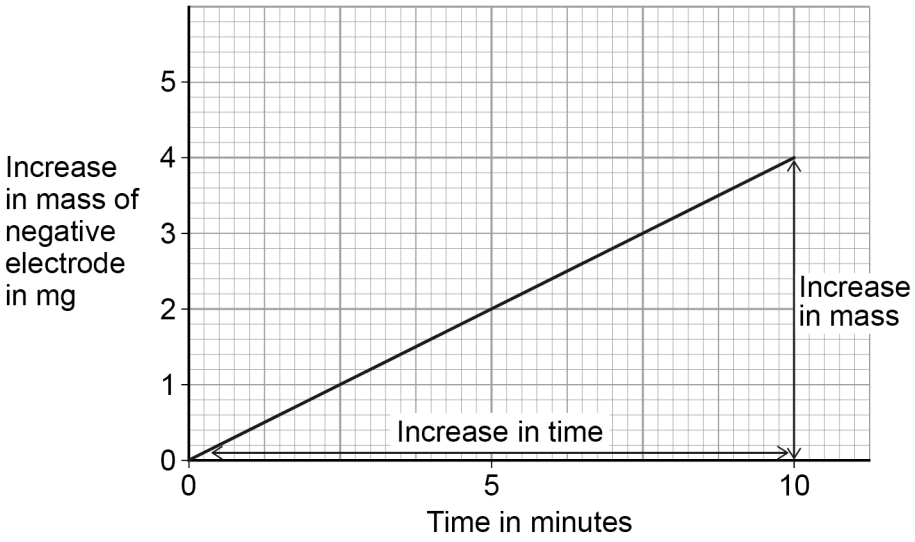
Positive electrode _____

0 2 . 5 A solution of copper chloride is electrolysed.

Figure 3 shows a graph of the increase in mass of the negative electrode.

This increase is shown over a time of 10 minutes.

Figure 3



Calculate the gradient of the line in **Figure 3**.

Use the equation:

$$\text{Gradient} = \frac{\text{increase in mass in mg}}{\text{increase in time in minutes}}$$

[3 marks]

Increase in mass _____

_____

Increase in time _____

_____

Gradient _____

_____

_____

_____

Gradient = _____ mg per minute

5.1.1.2 Mixtures

Question 04 · continued

0 2 . 6 Aluminium is produced by electrolysis of a molten mixture.

Complete the sentence.

Choose the answers from the box.

[2 marks]

carbon	**chloride**	**cryolite**	**oxide**	**sulfate**	**water**

The molten mixture contains _____ and

aluminium _____ .

11

5.1.1.2 Mixtures

Question 05

0 1 . 1 This question is about gases.

Draw **one** line from each substance to the description of the substance.

[3 marks]

Substance	Description of substance
	Compound
Air	Element
Carbon dioxide	Hydrocarbon
Oxygen	Metal
	Mixture

5.1.1.2 Mixtures

Question 05 · continued

0 1 . 2 What is used to test for each of the gases?

Draw **one** line from each gas to the test for the gas.

[2 marks]

Gas	Test
Carbon dioxide	A glowing splint
Oxygen	A lighted splint
	Limewater
	Litmus paper

0 1 . 3 Give **two** reasons why the percentage of carbon dioxide in the air has decreased in the last 2.7 billion years.

[2 marks]

Tick (✓) **two** boxes.

- Combustion ☐
- Dissolved in oceans ☐
- Intense volcanic activity ☐
- Photosynthesis ☐
- Respiration ☐

5.1.1.2 Mixtures

Question 05 · continued

Oxygen reacts with sulfur dioxide.

The reaction is reversible.

0 1 . 4 What is the symbol for a reversible reaction?

[1 mark]

_____

0 1 . 5 Complete the sentence.

[1 mark]

In a reversible reaction the forward reaction is exothermic, so the

reverse reaction is _____ .

0 1 . 6 A reversible reaction happens in apparatus which stops the escape of reactants and products.

Complete the sentence.

[1 mark]

Equilibrium is reached when the forward and reverse reactions happen at

exactly the same _____ .

10

5.1.1.2 Mixtures

Question 06

June 2019 | 8464/C/2F | Original Q2

0 2 Concrete contains cement, water, sand and small stones.

0 2 . 1 Concrete is a mixture designed as a useful product.

What do we call a mixture which has been designed as a useful product?

[1 mark]

Tick (✓) **one** box.

- Finite ☐
- Formula ☐
- Formulation ☐
- Fraction ☐

0 2 . 2 Concrete contains cement.

Cement is made by heating a mixture containing silicon dioxide (SiO_2).

Why does silicon dioxide have a very high melting point?

[2 marks]

Tick (✓) **two** boxes.

- It has a giant structure ☐
- It has a simple molecular structure ☐
- It has strong covalent bonds ☐
- It has strong ionic bonds ☐
- It has weak intermolecular forces ☐

5.1.1.2 Mixtures

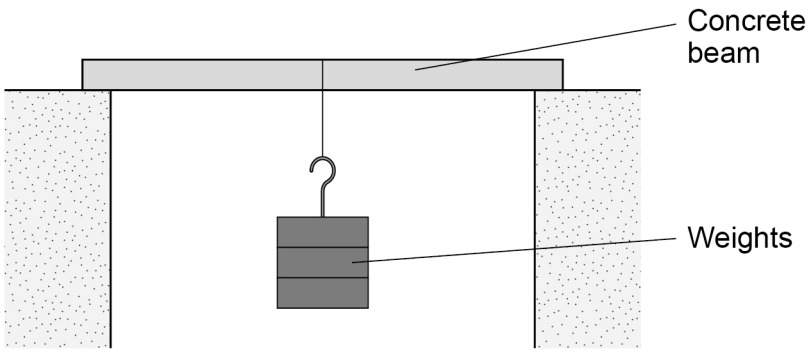
Question 06 · continued

Student **A** investigated how the mass of the small stones in concrete affects the strength of a concrete beam. All other variables were kept the same.

The student added weights until the concrete beam broke.

Figure 1 shows the apparatus Student **A** used.

Figure 1



0 2 . 3 Draw **one** line from each type of variable to the correct example of the variable.

[2 marks]

Type of variable	Example of variable
	Length of concrete beam
Control	Mass of small stones in concrete
Independent	Time taken to add weights
	Weight needed to break concrete beam

Question 06 · continued

Table 1 shows Student **A**'s results.

Table 1

Mass of small stones in grams (g)	Weight needed to break concrete beam in newtons (N)
500	70
1000	100
1500	110
2000	100
2250	85
2500	65
2750	35

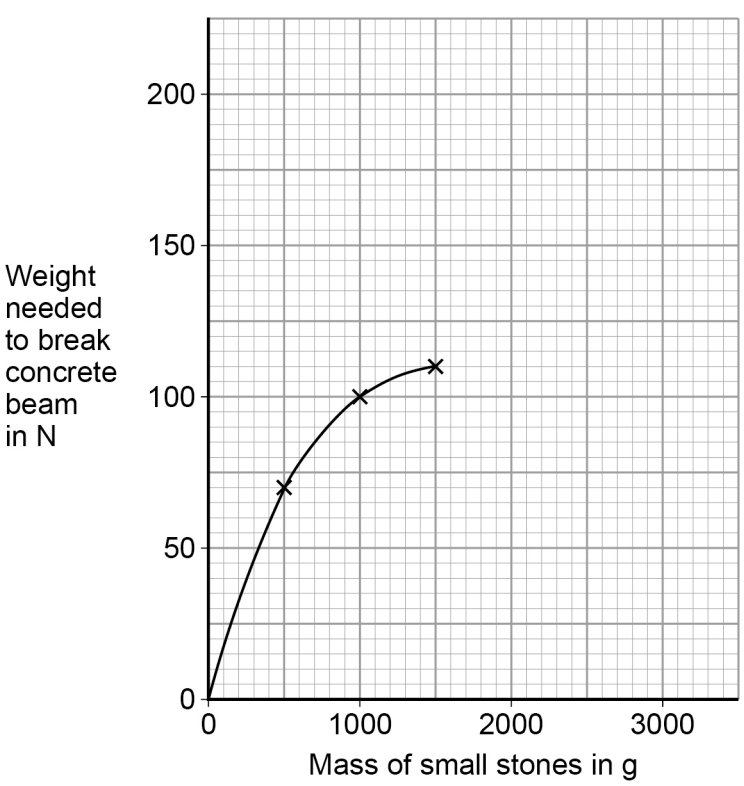
0 2 . 4 Plot the data from **Table 1** on **Figure 2**.

The first three points are plotted for you.

Draw the line of best fit.

[3 marks]

Figure 2



5.1.1.2 Mixtures

Question 06 · continued

0 2 . 5 What mass of small stones would be needed to make the strongest concrete?

Give a reason for your answer.

Use **Figure 2**.

[2 marks]

Mass = _____ g

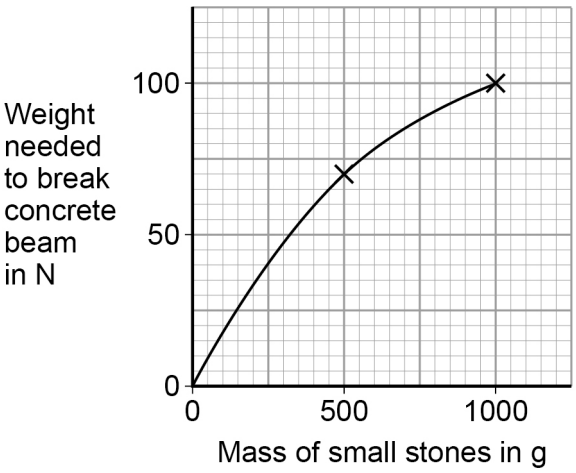
Reason _____

_____

0 2 . 6 Student **B** did a similar investigation.

Figure 3 shows Student **B**'s results.

Figure 3



How could Student **B** improve their investigation?

Use **Figure 2** and **Figure 3**.

[1 mark]

_____

_____

11

5.1.1.2 Mixtures

Question 07

November 2020 | 8464/C/1F | Original Q2

0 2 A student investigated the temperature change when metal **X** was added to copper sulfate solution.

This is the method used.

1. Add 25 cm^3 of copper sulfate solution to a beaker.
2. Measure the temperature of the copper sulfate solution.
3. Add 1.0 g of metal **X** and stir.
4. Measure the highest temperature reached when metal **X** is added to copper sulfate solution.
5. Repeat steps 1 to 4 with different metals.

Figure 1 shows the apparatus used.

Figure 1

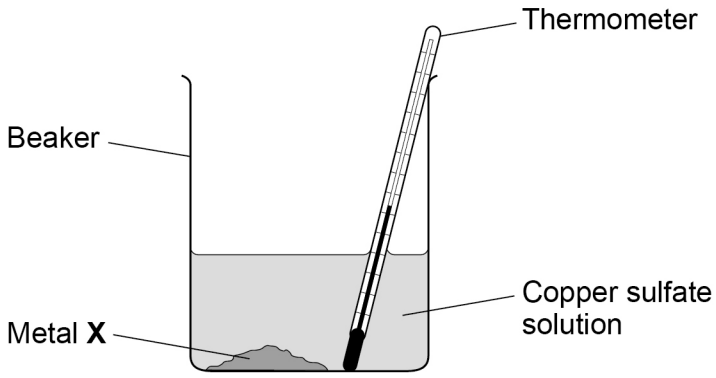
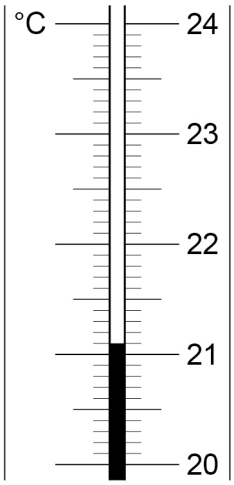


Figure 2 shows the thermometer reading of the copper sulfate solution at the start of the investigation.

Figure 2



Question 07 · continued

0 2 . 1 The highest temperature reached when metal **X** was added to copper sulfate solution was 35.5 °C

Determine the temperature change when metal **X** is added to copper sulfate solution.

Use **Figure 2**.

[2 marks]

Highest temperature = 35.5 °C

Temperature at start = _____ °C

Temperature change = _____ °C

0 2 . 2 Give **two** variables the student should keep the same in this investigation.

[2 marks]

1 _____

_____

2 _____

_____

0 2 . 3 The student repeated the experiment with metal **Y**.

Table 1 shows four results for metal **Y**.

Table 1

	Test 1	Test 2	Test 3	Test 4
Temperature change in °C	9.2	7.3	9.5	9.2

Calculate the mean temperature change for metal **Y**.

Do **not** include the anomalous result in your calculation.

[2 marks]

_____

_____

_____

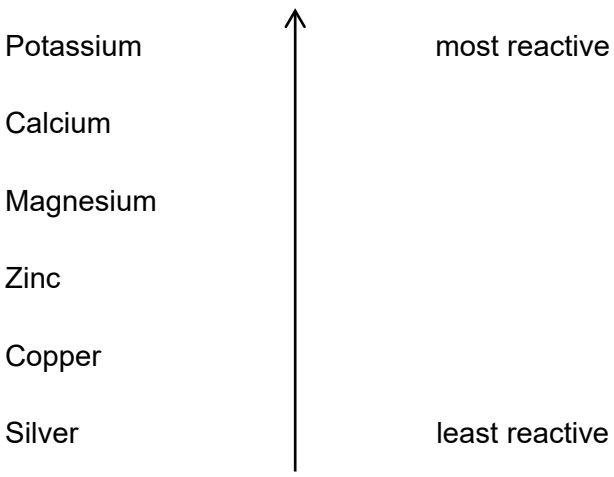
_____

Mean temperature change = _____ °C

The more reactive the metal added to copper sulfate solution, the greater the temperature change.

Figure 3 shows a reactivity series.

Figure 3



0 2 . 4 The student repeated the experiment.

The student added:

- magnesium to copper sulfate solution
- an unknown metal **A** to copper sulfate solution.

Table 2 shows the results.

Table 2

Metal	**Temperature change in °C**
Magnesium	12
Metal **A**	8

The student concludes metal **A** is zinc.

Give **one** reason why the student is correct.

Use **Figure 3** and **Table 2**.

[1 mark]

5.1.1.2 Mixtures

Question 07 · continued

0 2 . 5 The student did the experiment with silver and copper sulfate solution.

What happens to the temperature of the mixture?

Use **Figure 3**.

[1 mark]

Tick (✓) **one** box.

Decreases ☐

Increases ☐

Stays the same ☐

0 2 . 6 Suggest **one** reason why the student should **not** add potassium metal to copper sulfate solution.

[1 mark]

0 2 . 7 100 cm^3 of the copper sulfate solution contains 1.8 g of copper sulfate.

Calculate the mass of copper sulfate in 25 cm^3 of this copper sulfate solution.

[2 marks]

Mass = _____ g

11

5.1.1.2 Mixtures

Question 08

November 2020 | 8464/C/1F | Original Q6

0 6 This question is about the extraction of aluminium.

0 6 . 1 An aluminium atom is represented as:

$$^{27}_{13}Al$$

Give the number of electrons and neutrons in the aluminium atom.

[2 marks]

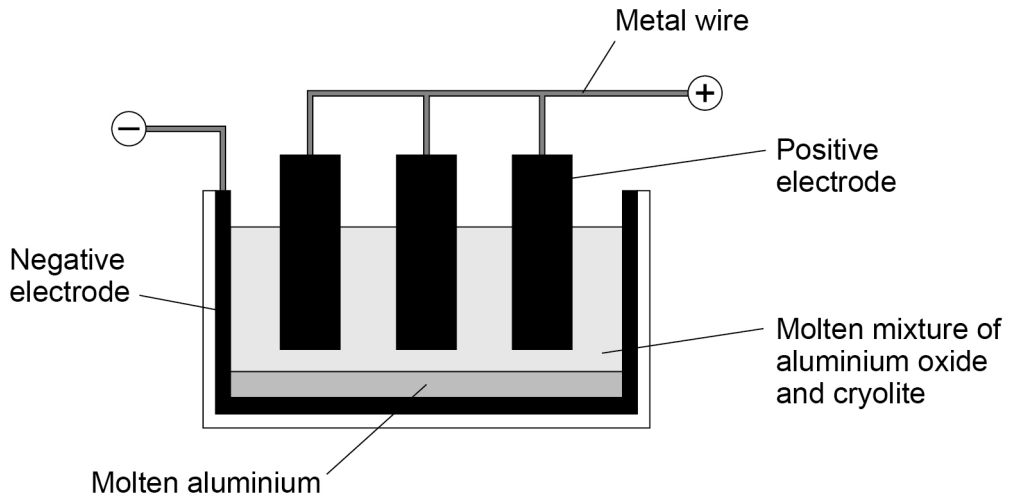
Number of electrons _____

Number of neutrons _____

Aluminium is extracted by the electrolysis of a molten mixture of aluminium oxide and cryolite.

Figure 11 shows the cell used for the electrolysis.

Figure 11



0 6 . 2 Aluminium is produced by the reduction of aluminium oxide (Al_2O_3).

What is meant by the term reduction?

[1 mark]

_____

_____

5.1.1.2 Mixtures

Question 08 · continued

0 6 . 3 Oxygen is formed at the positive carbon electrodes.

Explain why the positive carbon electrodes must be continually replaced.

[3 marks]

0 6 . 4 A substance conducts electricity because of free moving, charged particles.

What are the free moving, charged particles in a:

- carbon electrode (made from graphite)
- molten mixture of aluminium oxide and cryolite
- metal wire?

[3 marks]

Carbon electrode (made from graphite) _____

Molten mixture of aluminium oxide and cryolite _____

Metal wire _____

9

5.1.1.2 Mixtures

Question 09

November 2020 | 8464/C/2F | Original Q1

0 1 Crude oil is a mixture of hydrocarbons.

0 1 . 1 Complete the sentences.

Choose answers from the box.

[2 marks]

air	**enzymes**	**mud**	**plankton**	**trees**

Crude oil is the remains of _____ .

Millions of years ago biomass was buried under _____ .

0 1 . 2 There are three stages, **A**, **B** and **C**, in separating hydrocarbons from crude oil.

Stage **A** Hydrocarbons evaporate

Stage **B** Crude oil is heated

Stage **C** Vapours condense

Give the correct order for stages **A**, **B** and **C**.

[1 mark]

First stage _____

Second stage _____

Third stage _____

Question 09 · continued

0 1 . 3 What is the name of the process used in separating hydrocarbons from crude oil?

[1 mark]

Tick (✓) **one** box.

Chromatography ☐

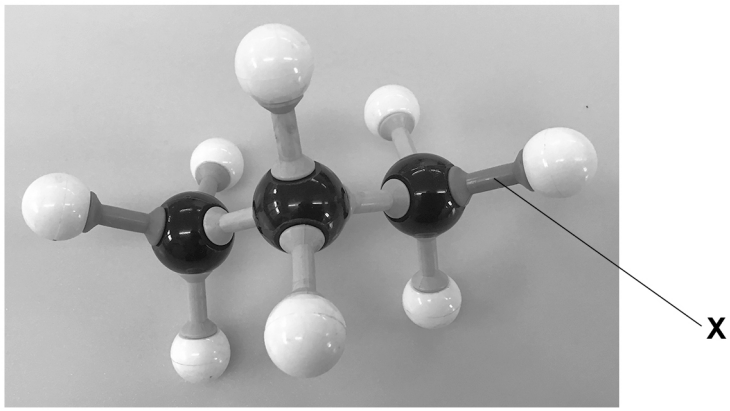
Filtration ☐

Fractional distillation ☐

0 1 . 4 Alkanes are hydrocarbons.

Figure 1 represents an alkane.

Figure 1



What is the formula of the alkane in **Figure 1**?

[1 mark]

C ____ H ____

0 1 . 5 What does **X** represent in **Figure 1**?

[1 mark]

Tick (✓) **one** box.

Covalent bond ☐

Ionic bond ☐

Metallic bond ☐

5.1.1.2 Mixtures

Question 09 · continued

0 1 . 6 What is the general formula for alkanes?

[1 mark]

Tick (✓) **one** box.

C_nH_{2n-2} ☐

C_nH_{2n} ☐

C_nH_{2n+2} ☐

0 1 . 7 Hydrocarbons are used to make polymers. Polymers are used to make plastic bags.

In one year 8.0 billion plastic bags were used.

The next year there was a charge for plastic bags and only 1.3 billion plastic bags were used.

Calculate the decrease in the number of plastic bags used.

[1 mark]

Decrease = _____ billion

8

5.1.1.2 Mixtures

Question 10

November 2020 | 8464/C/2F | Original Q5

0 5 This question is about mixtures.

0 5 . 1 Which substance is a mixture?

[1 mark]

Tick (✓) **one** box.

Air ☐ Gold ☐ Methane ☐ Nitrogen ☐

0 5 . 2 Food colourings are often mixtures of dyes.

What name is given to mixtures that are designed as useful products?

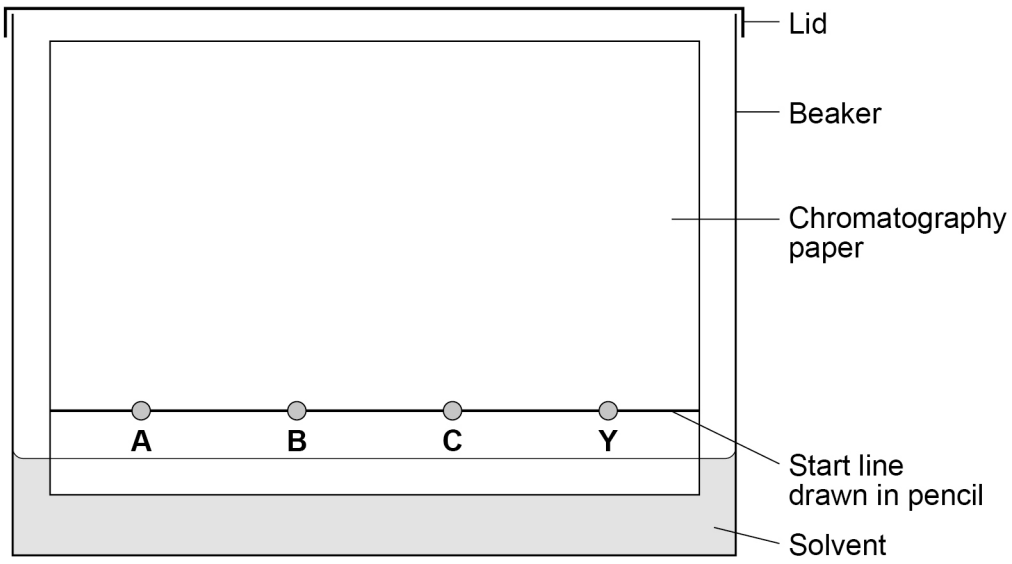
[1 mark]

A student investigated a purple food colouring, **Y**, using chromatography.

The student compares **Y** with dyes **A**, **B** and **C**.

0 5 . 3 **Figure 8** shows the apparatus used.

Figure 8



5.1.1.2 Mixtures

Question 10 · continued

Chromatography involves a stationary phase and a mobile phase.

Draw **one** line from each phase to what is used for that phase.

Use **Figure 8**.

[2 marks]

Phase	What is used
Mobile phase	Chromatography paper
Stationary phase	Pencil line

Beaker

Food colouring

Solvent

Question 5 continues on the next page

5.1.1.2 Mixtures

Question 10 · continued

Figure 9 shows the student's results.

Figure 9



0 5 . 4 What **three** conclusions can you make about the dyes in food colouring **Y**?

[3 marks]

1 _____

_____

2 _____

_____

3 _____

_____

5.1.1.2 Mixtures

Question 10 · continued

0 5 . 5 In a different experiment a student recorded these results:

Distance moved by dye **G** = 60 mm

Distance moved by solvent = 80 mm

Calculate the R_f value of dye **G**.

$$R_f = \frac{\text{distance moved by dye } \mathbf{G}}{\text{distance moved by solvent}}$$

[2 marks]

R_f = _____

9

5.1.1.2 Mixtures

Question 11

November 2021 | 8464/C/1F | Original Q7

0 7 Acids react to produce salts.

Universal indicator is added to water and then nitric acid is added to the mixture.

0 7 . 1 Give the colour change when nitric acid is added to the mixture of universal indicator and water.

[1 mark]

Tick (✓) **one** box.

- Blue to red ☐
- Green to purple ☐
- Green to red ☐
- Red to purple ☐

0 7 . 2 What happens to the pH of water when nitric acid is added?

[1 mark]

Tick (✓) **one** box.

- Decreases ☐
- Stays the same ☐
- Increases ☐

0 7 . 3 What is the state symbol for nitric acid?

[1 mark]

_____

5.1.1.2 Mixtures

Question 11 · continued

Zinc carbonate reacts with nitric acid.

The word equation for the reaction is:

zinc carbonate (white solid) + nitric acid → zinc nitrate (colourless solution) + water + carbon dioxide

0 7 . 4 Give **two** observations that would be made when zinc carbonate is added to nitric acid until the zinc carbonate is in excess.

[2 marks]

1 _____

_____

2 _____

_____

0 7 . 5 The formula of the zinc ion is Zn^{2+}

The formula of the nitrate ion is NO_3^-

What is the formula for zinc nitrate?

[1 mark]

Tick (✓) **one** box.

- $ZnNO_3$ ☐
- $Zn(NO_3)_2$ ☐
- Zn_2NO_3 ☐
- $Zn_2(NO_3)_2$ ☐

Question 7 continues on the next page

5.1.1.2 Mixtures

Question 11 · continued

0 7 . 6 Acids react with insoluble metal oxides to produce salts.

Plan a method to produce a pure, dry sample of the soluble salt copper chloride from an acid and a metal oxide.

[6 marks]

12

5.1.1.2 Mixtures

Question 12

November 2021 | 8464/C/2F | Original Q1

0 1 Fresh water contains low levels of dissolved salts.

Water reacts with anhydrous copper sulfate in a reversible reaction.

The word equation for the reaction is:

water + anhydrous copper sulfate ⇌ hydrated copper sulfate

0 1 . 1 How does the equation show that the reaction is reversible?

[1 mark]

_____

_____

0 1 . 2 Complete the sentences.

Choose answers from the box.

[2 marks]

blue	**green**	**orange**	**white**	**yellow**

The colour of anhydrous copper sulfate is _____ .

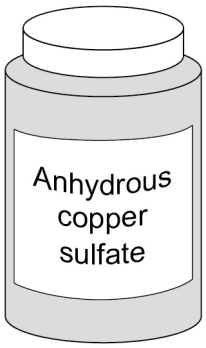
The colour of hydrated copper sulfate is _____ .

5.1.1.2 Mixtures

Question 12 · continued

0 1 . 3 **Figure 1** shows anhydrous copper sulfate in a sealed container.

Figure 1



Suggest **one** reason why anhydrous copper sulfate is kept in a sealed container.

[1 mark]

Question 1 continues on the next page

5.1.1.2 Mixtures

Question 12 · continued

Sodium chloride dissolves in water to form sodium chloride solution.

0 1 . 4 Draw **one** line from each substance to the description of the substance.

[2 marks]

Substance	Description of substance
	Compound
Sodium chloride solution	
	Element
	Hydrocarbon
Water	
	Mixture

0 1 . 5 Name the process used to obtain solid sodium chloride from sodium chloride solution.

[1 mark]

_____

5.1.1.2 Mixtures

Question 12 · continued

0 1 . 6 Two processes used to obtain potable water from fresh water are:

- filtering
- sterilising.

Give **one** reason why each process is used.

[2 marks]

Filtering _____

_____

Sterilising _____

_____

0 1 . 7 Which type of water is the easiest to obtain potable water from?

[1 mark]

Tick (✓) **one** box.

Ground water ☐

Salt water ☐

Waste water ☐

0 1 . 8 Which of the following is the first stage of waste water treatment?

[1 mark]

Tick (✓) **one** box.

Aerobic biological treatment of effluent ☐

Anaerobic digestion of sewage sludge ☐

Screening and removal of grit ☐

11

5.1.1.2 Mixtures

Question 13

June 2022 | 8464/C/2F | Original Q3

0 3 This question is about ammonia and its compounds.

A student heated a sample of ammonium chloride.

The equation for the reaction is:

$$\underset{\text{ammonium chloride}}{NH_4Cl} \rightleftharpoons \underset{\text{ammonia}}{NH_3} + HCl$$

0 3 . 1 One product is ammonia.

What is the name of the product with the formula HCl?

[1 mark]

0 3 . 2 Ammonia is a gas.

What is the state symbol for ammonia?

[1 mark]

Tick (✓) **one** box.

(aq) ☐ (g) ☐ (l) ☐ (s) ☐

0 3 . 3 How does the equation show that the reaction is reversible?

[1 mark]

0 3 . 4 Complete the sentence.

[1 mark]

The forward reaction is endothermic,

so the reverse reaction is _____ .

5.1.1.2 Mixtures

Question 13 · continued

0 3 . 5 Complete the sentence.

Choose the answer from the box.

[1 mark]

concentration	**rate**	**temperature**

Equilibrium is reached when the forward and reverse reactions happen at exactly the same _____ .

Question 3 continues on the next page

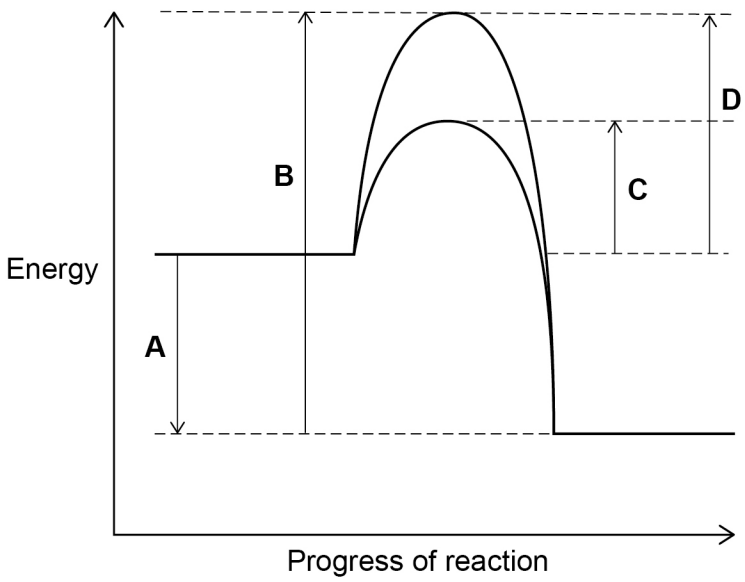
5.1.1.2 Mixtures

Question 13 · continued

The industrial process to produce ammonia uses a catalyst.

0 3 . 6 **Figure 5** shows the reaction profile for the reaction with and without a catalyst.

Figure 5



Which letter represents the activation energy for the reaction with a catalyst?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

5.1.1.2 Mixtures

Question 13 · continued

0 3 . 7 Give **one** reason why using a catalyst reduces costs.

Do **not** answer in terms of activation energy.

[1 mark]

0 3 . 8 Ammonia is in a mixture that is used as a household cleaner.

What is a mixture that has been designed as a useful product called?

[1 mark]

8

Turn over for the next question

5.1.1.2 Mixtures

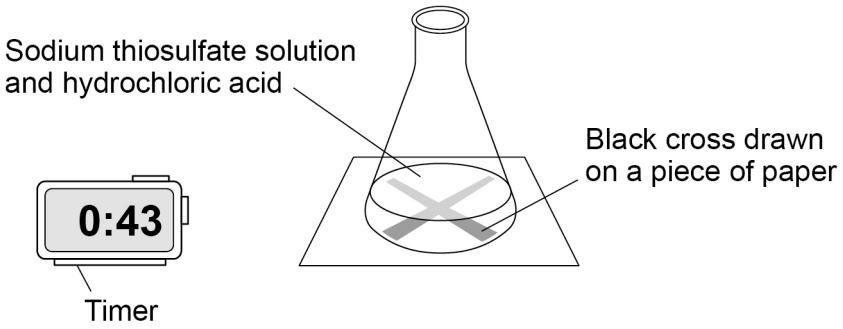
Question 14

0 4 A student investigates the effect of concentration on the rate of the reaction between sodium thiosulfate solution and hydrochloric acid.

Figure 6 shows the experiment.

The experiment was done in a fume cupboard.

Figure 6



This is the method used.

1. Pour 50 cm^3 of sodium thiosulfate solution into a conical flask.

2. Put the conical flask on a black cross drawn on a piece of paper.

3. Pour 10 cm^3 of hydrochloric acid into the conical flask and start a timer.

4. Stop the timer when the cross can no longer be seen.

5. Repeat the experiment with different concentrations of sodium thiosulfate solution.

5.1.1.2 Mixtures

Question 14 · continued

0 4 . 1 Draw **one** line from each type of variable to the correct example of the variable in this investigation.

[2 marks]

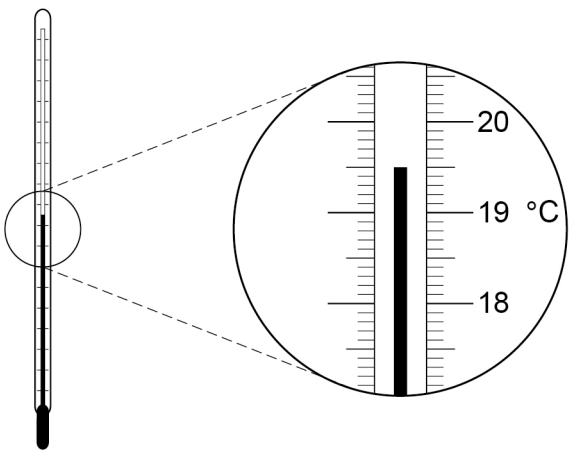
Type of variable	Example of variable
	Concentration of sodium thiosulfate solution
Dependent	
	Temperature of reaction mixture
	Time taken for the cross to no longer be seen
Independent	
	Volume of acid
	Volume of the flask

Question 4 continues on the next page

5.1.1.2 Mixtures

0 4 . 2 The experiment is done at room temperature.

Figure 7



What is the temperature shown on the thermometer in **Figure 7**?

[1 mark]

Temperature = _____ °C

Table 1 shows the student's results.

Table 1

Concentration of sodium thiosulfate solution in mol/dm^3	Time in seconds
0.1	82
0.2	40
0.3	20
0.4	13
0.5	10
0.6	8

5.1.1.2 Mixtures

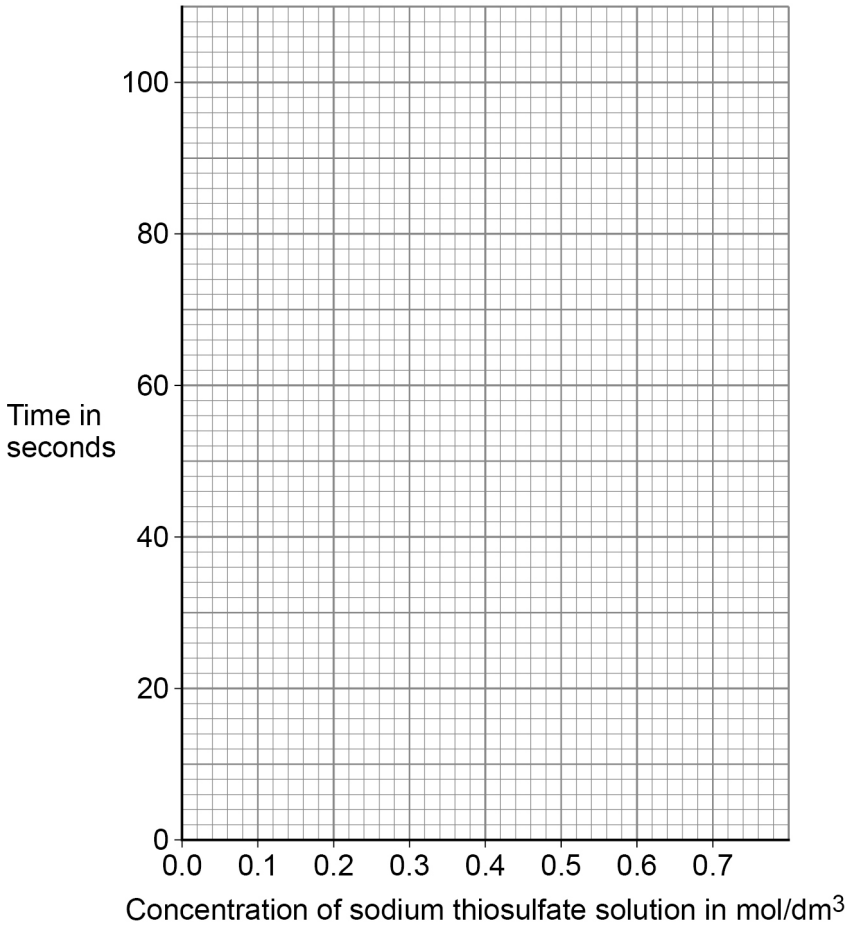
Question 14 · continued

0 4 . 3 Plot the data from **Table 1** on **Figure 8**.

Draw a line of best fit.

[3 marks]

Figure 8



0 4 . 4 Predict the time taken for the cross to no longer be seen at a concentration of 0.7 mol/dm^3

Use your graph in **Figure 8**.

[1 mark]

Time = _____ s

0 4 . 5 Complete the sentence.

[1 mark]

As the concentration of sodium thiosulfate solution increases, the time taken for the cross to no longer be seen _____ .

5.1.1.2 Mixtures

Question 14 · continued

0 4 . 6 In one experiment 0.725 g of sulfur is produced in 20 seconds.

Calculate the mean rate of the reaction from 0 to 20 seconds.

Use the equation:

$$\text{mean rate of reaction} = \frac{\text{mass of sulfur produced in grams}}{\text{time in seconds}}$$

[2 marks]

Mean rate of reaction = _____

0 4 . 7 What is the unit for the mean rate of reaction calculated in Question **04.6**?

[1 mark]

Tick (✓) **one** box.

g ☐ g/s ☐ s ☐ s/g ☐

5.1.1.2 Mixtures

Question 14 · continued

0 4 . 8 The student did the experiment with 0.15 mol/dm^3 sodium thiosulfate solution and repeated the experiment three more times.

Table 2 shows the results.

Table 2

	Test 1	Test 2	Test 3	Test 4
Time in seconds for the cross to no longer be seen	60.5	63.2	82.3	65.7

Calculate the mean time for this reaction.

Do **not** include the anomalous result in your calculation.

Give your answer to 3 significant figures.

[3 marks]

Mean time for the reaction (3 significant figures) = _____ s

14

5.1.1.2 Mixtures

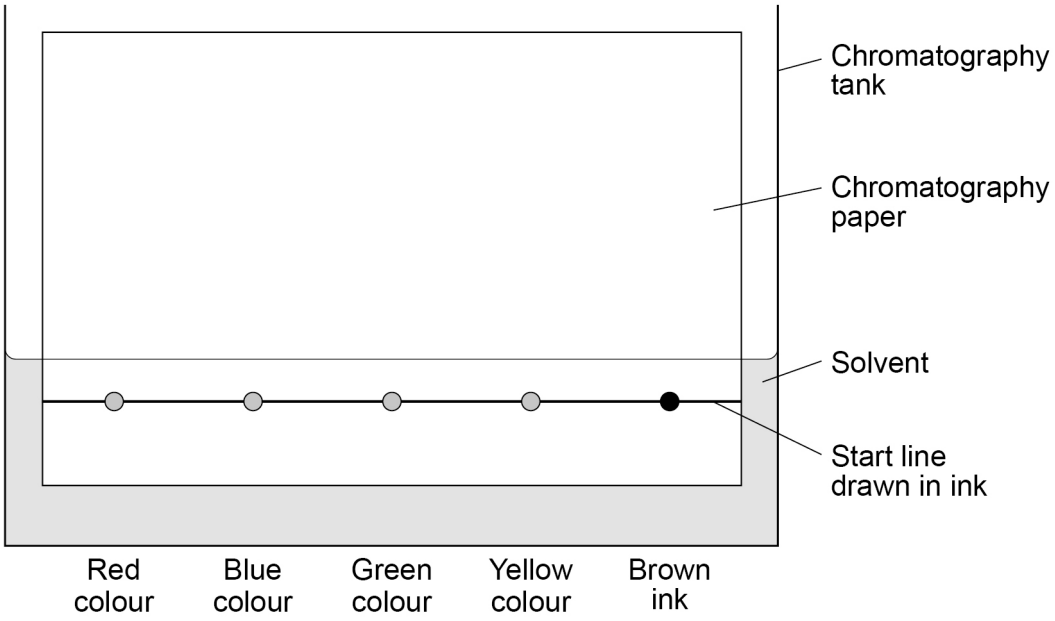
Question 15

June 2022 | 8464/C/2F | Original Q6

0 6 A student investigated the colours in a brown ink using chromatography.

0 6 . 1 **Figure 10** shows the apparatus used.

Figure 10



Give **two** errors made by the student.

Describe the problem each error would cause.

[4 marks]

Error 1 _____

_____

Problem 1 _____

_____

Error 2 _____

_____

Problem 2 _____

_____

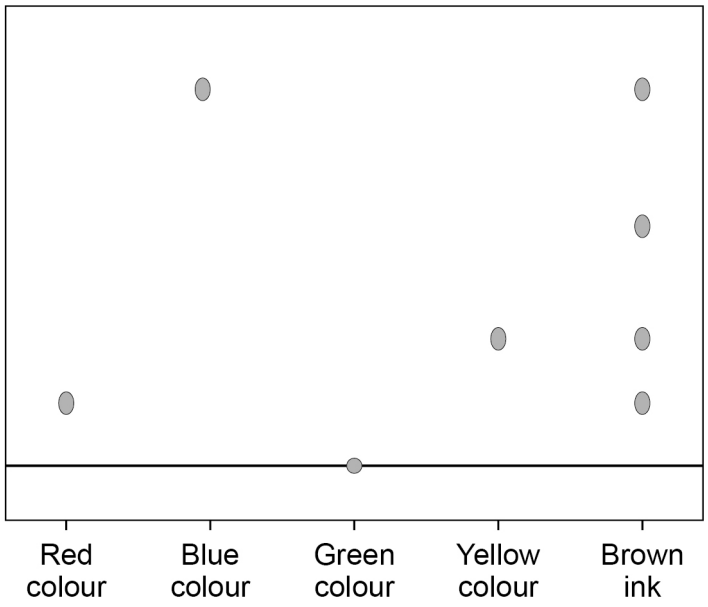
5.1.1.2 Mixtures

Question 15 · continued

A different student set up the apparatus correctly.

Figure 11 shows the results.

Figure 11



0 6 . 2 Give **two** conclusions the student can make from **Figure 11** about the four colours in the brown ink.

[2 marks]

1 _____

_____

2 _____

_____

Question 6 continues on the next page

5.1.1.2 Mixtures

Question 15 · continued

0 6 . 3 Why was the green colour still on the start line at the end of the experiment?

[1 mark]

Tick (✓) **one** box.

- The experiment was left for too long. ☐
- The green colour was insoluble in the solvent. ☐
- The green spot contained too many colours. ☐
- The green spot was too small. ☐

0 6 . 4 A student calculated the R_f value of a colour to be 0.24

The colour moved 1.8 cm from the start line.

Calculate the distance the solvent moved.

Use the equation:

$$R_f = \frac{\text{distance moved by colour}}{\text{distance moved by solvent}}$$

[3 marks]

Distance moved by solvent = _____ cm

10

5.1.1.2 Mixtures

Question 16

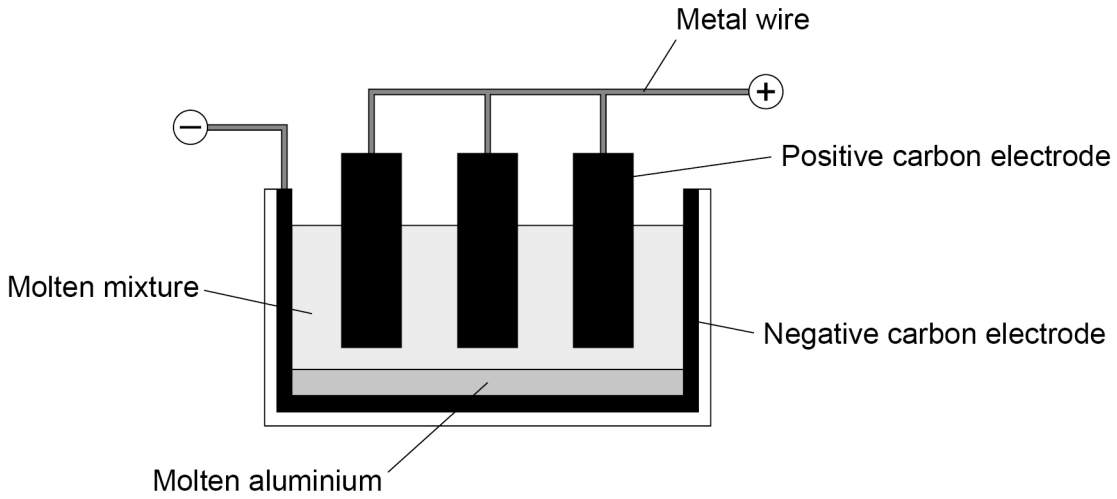
June 2023 | 8464/C/1F | Original Q5

0 5 This question is about extraction of metals.

Aluminium is extracted from a molten mixture of aluminium oxide and cryolite using electrolysis.

Figure 12 shows the electrolysis cell.

Figure 12



0 5 . 1 Complete the sentence.

[1 mark]

The extraction of aluminium is expensive because the process uses large amounts of _____ .

0 5 . 2 Oxygen is produced at the positive carbon electrodes.

The oxygen reacts with the carbon electrodes.

Which gas is produced when oxygen reacts with the positive carbon electrodes?

[1 mark]

_____

5.1.1.2 Mixtures

Question 16 · continued

Titanium is extracted from titanium chloride by reacting titanium chloride with sodium.

The reaction between titanium chloride and sodium is carried out in an inert atmosphere.

0 5 . 3 Suggest why the reaction is carried out in an inert atmosphere.

[1 mark]

0 5 . 4 Complete the sentence.

Choose the answer from the box.

[1 mark]

argon	**chlorine**	**hydrogen**

The gas used for the inert atmosphere is _____ .

0 5 . 5 Balance the equation for the reaction.

[1 mark]

$$TiCl_4 + 4\,Na \rightarrow Ti + ____\ NaCl$$

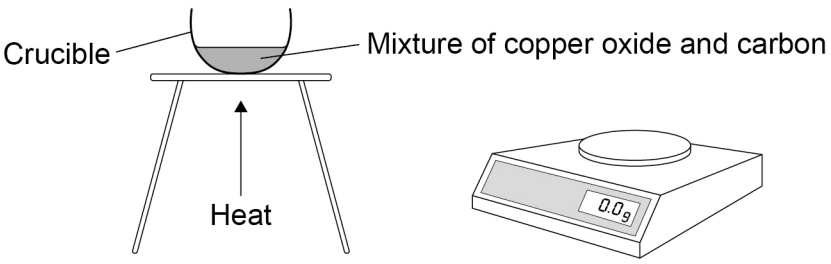
5.1.1.2 Mixtures

Question 16 · continued

Copper is extracted from copper oxide by reacting copper oxide with carbon.

Figure 13 shows the apparatus.

Figure 13



The equation for the reaction is:

$$2\,CuO(s) + C(s) \rightarrow 2\,Cu(s) + CO_2(g)$$

In an experiment 15.9 g of copper oxide and 1.2 g of carbon reacted.

12.7 g of copper was produced in the reaction.

0 5 . 6 Calculate the mass of carbon dioxide produced in this experiment.

[1 mark]

Mass of carbon dioxide = _____ g

0 5 . 7 Explain why the mass of the contents in the crucible changed during the experiment.

[2 marks]

5.1.1.2 Mixtures

Question 16 · continued

0 5 . 8 What happens to copper oxide in the reaction?

Give **one** reason for your answer.

Use the equation for the reaction.

[2 marks]

Tick (✓) **one** box.

The copper oxide is dissolved ☐

The copper oxide is oxidised ☐

The copper oxide is reduced ☐

Reason _____

_____

10

Turn over for the next question

5.1.1.2 Mixtures

Question 17

June 2023 | 8464/C/2F | Original Q5

0 5 The combustion of fuels is a source of atmospheric pollutants.

0 5 . 1 Methane is a fuel.

Balance the equation for the combustion of methane.

[1 mark]

$$CH_4 + ____ O_2 \rightarrow CO_2 + ____ H_2O$$

0 5 . 2 Many fuels are mixtures.

Petrol and diesel are mixtures of hydrocarbons.

Table 4 shows properties of petrol and of diesel.

Table 4

	Petrol	**Diesel**
Range of number of carbon atoms in a hydrocarbon molecule	4 to 12	12 to 20
Range of boiling points in °C	40 to 205	250 to 350

Compare the properties of petrol and diesel.

Use **Table 4**.

[2 marks]

5.1.1.2 Mixtures

Question 17 · continued

0 5 . 3 The gases released when a fuel is burned in car engines may include:

- oxides of nitrogen
- carbon monoxide
- water vapour.

Which chemical element do all these gases contain?

[1 mark]

Tick (✓) **one** box.

Carbon ☐

Hydrogen ☐

Nitrogen ☐

Oxygen ☐

0 5 . 4 When diesel burns in car engines, oxides of nitrogen are produced.

Where does the nitrogen come from?

[1 mark]

0 5 . 5 When diesel burns, particulates may be produced.

What environmental effect do particulates from burning diesel cause?

[1 mark]

5.1.1.2 Mixtures

Question 17 · continued

0 5 . 6 Carbon monoxide may be produced when diesel burns.

Give **one** reason why carbon monoxide is difficult to detect.

[1 mark]

0 5 . 7 Explain why water vapour and **not** liquid water is produced when diesel burns.

[2 marks]

0 5 . 8 Sulfur is a common impurity in diesel.

Explain why this causes an environmental problem.

[3 marks]

12

5.1.1.2 Mixtures

Question 18

June 2023 | 8464/C/2F | Original Q6

0 6 Chromatography is used to separate mixtures.

Chromatography involves a mobile phase and one other phase.

0 6 . 1 What is the other phase in chromatography?

[1 mark]

Tick (✓) **one** box.

- Moving phase ☐
- Recycled phase ☐
- Stationary phase ☐
- Viscous phase ☐

0 6 . 2 Why do the substances in the mixture separate in the mobile phase?

[1 mark]

_____

_____

0 6 . 3 How many spots will be produced on the chromatogram of a pure compound?

[1 mark]

Number of spots = _____

5.1.1.2 Mixtures

Question 18 · continued

0 6 . 4 In a chromatography experiment, a blue colour moved 4.77 cm.

The solvent moved 5.30 cm.

Calculate the R_f value for the blue colour.

[2 marks]

R_f value = _____

Question 6 continues on the next page

5.1.1.2 Mixtures

Question 18 · continued

0 6 . 5 Black ink is a mixture of several colours.

Plan an experiment using paper chromatography to:

- separate the colours in black ink
- identify the colours from their R_f values.

[6 marks]

11

5.1.1.2 Mixtures

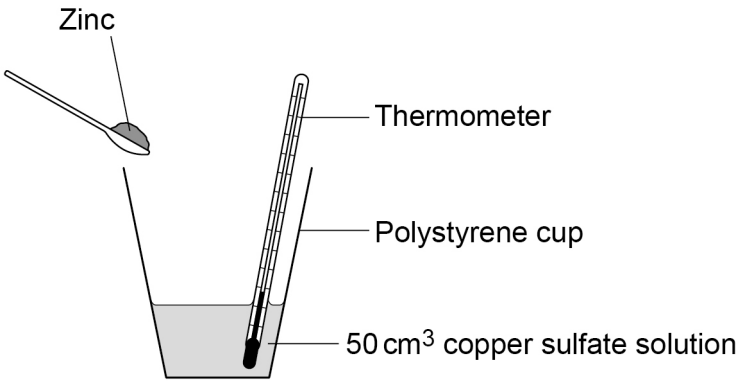
Question 19

June 2024 | 8464/C/1F | Original Q3

0 3 A student investigated the temperature change when different masses of zinc were added to copper sulfate solution.

Figure 5 shows the apparatus.

Figure 5



This is the method used.

1. Pour 50 cm^3 of copper sulfate solution into a polystyrene cup.

2. Measure the starting temperature of the copper sulfate solution.

3. Add 1.0 g of zinc.

4. Stir the mixture.

5. Measure the highest temperature reached.

6. Repeat steps 1 to 5 two more times.

7. Repeat steps 1 to 6 with different masses of zinc.

5.1.1.2 Mixtures

Question 19 · continued

0 3 . 1 The student varied the mass of zinc.

What type of variable is the mass of zinc?

[1 mark]

Tick (✓) **one** box.

Control ☐

Dependent ☐

Independent ☐

Question 3 continues on the next page

5.1.1.2 Mixtures

Question 19 · continued

Zinc reacts with copper sulfate solution to produce salt **A** and copper.

The word equation for the reaction is:

zinc + copper sulfate → salt **A** + copper

0 3 . 2 What is the name of salt **A**?

[1 mark]

0 3 . 3 The temperature of the solution increases when zinc reacts with copper sulfate solution.

Give **two** other observations that can be made when zinc reacts with copper sulfate solution.

[2 marks]

1 _____

_____

2 _____

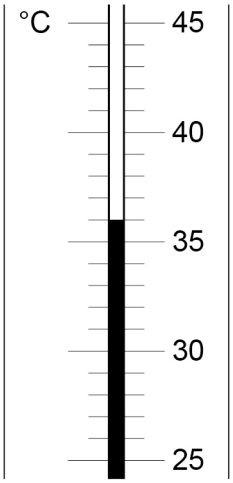
_____

5.1.1.2 Mixtures

Question 19 · continued

0 3 . 4 **Figure 6** shows the highest temperature reached in one experiment.

Figure 6



Complete **Table 3**.

Use **Figure 6**.

[2 marks]

Table 3

Starting temperature in °C	21
Highest temperature reached in °C	
Temperature increase in °C	

Question 3 continues on the next page

Question 19 · continued

A teacher repeated the investigation using a digital thermometer.

Table 4 shows the results.

Table 4

Mass of zinc in grams	Temperature increase in °C			
	Experiment 1	Experiment 2	Experiment 3	**Mean**
1.0	7.8	7.3	7.7	**B**
2.0	13.1	13.8	13.3	13.4
3.0	20.4	12.9	20.2	20.3

0 3 . 5 Calculate value **B** in **Table 4**.

[2 marks]

B = _____ °C

0 3 . 6 The range of the results is the minimum value of temperature increase to the maximum value of temperature increase.

What is the range of temperature increase for the experiment with **2.0 g** of zinc?

[1 mark]

Range = _____ °C to _____ °C

5.1.1.2 Mixtures

Question 19 · continued

0 3 . 7 One of the results for **3.0 g** of zinc is anomalous.

Which result is anomalous?

Suggest **one** reason why this result is anomalous.

[2 marks]

Anomalous result _____

Reason _____

_____

_____

11

Turn over for the next question

5.1.1.2 Mixtures

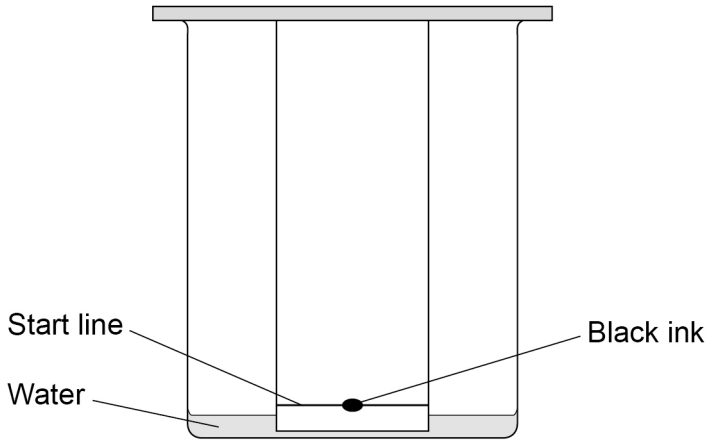
Question 20

June 2024 | 8464/C/1F | Original Q4

0 4 Mixtures can be separated by different methods.

0 4 . 1 **Figure 7** shows the apparatus used to separate the dyes in a black ink.

Figure 7



What is the name of this method?

[1 mark]

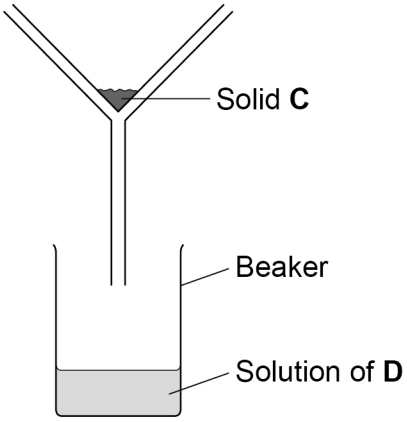
5.1.1.2 Mixtures

Question 20 · continued

Some water was added to a mixture of two solids, **C** and **D**.

The mixture was stirred and then poured into the apparatus shown in **Figure 8**.

Figure 8



0 4 . 2 Name the separation method shown in **Figure 8**.

[1 mark]

0 4 . 3 Explain why solid **C** separated from the mixture of **C** and **D**.

Use **Figure 8**.

[2 marks]

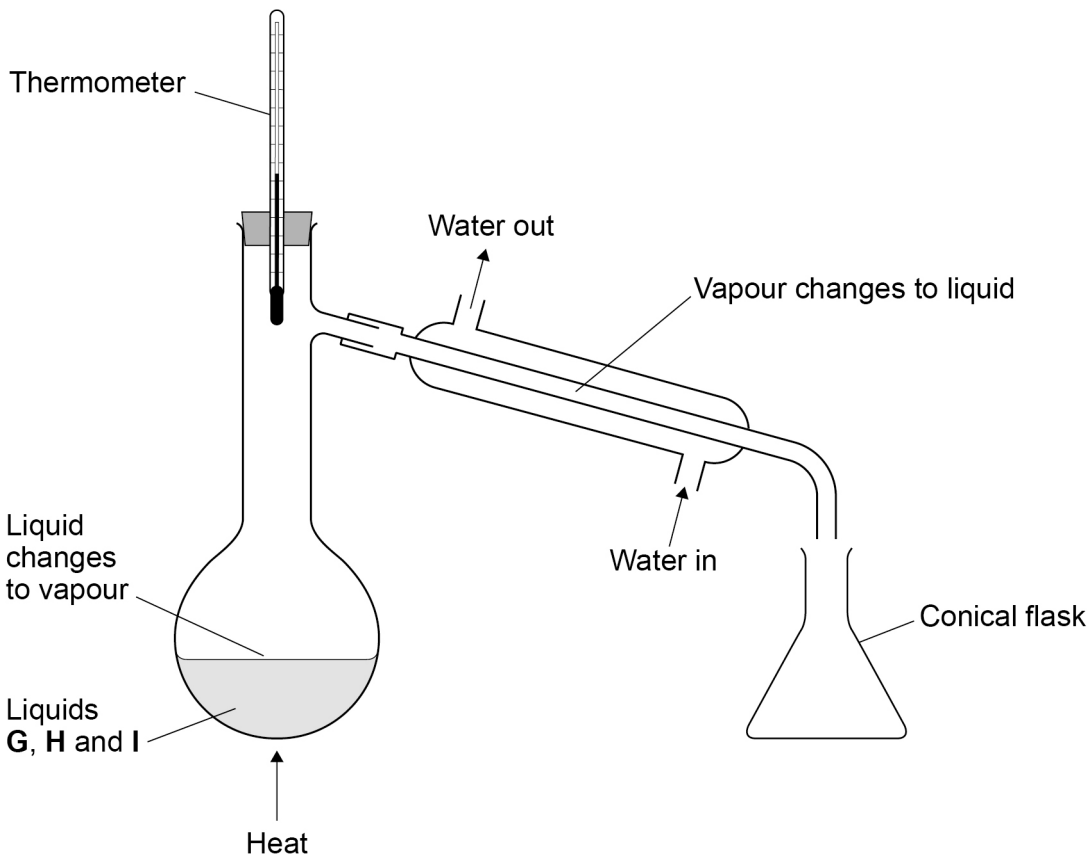
5.1.1.2 Mixtures

Question 20 · continued

A student separated a mixture of three liquids, **G**, **H** and **I**.

Figure 9 shows the apparatus.

Figure 9



0 4 . 4 Name the separation method shown in **Figure 9**.

[1 mark]

Question 20 · continued

0 4 . 5 **Table 5** shows the boiling points of the three liquids, **G**, **H** and **I**.

Table 5

Liquid	Boiling point in °C
G	56
H	78
I	100

Which liquid collected **first** in the conical flask?

[1 mark]

Tick (✓) **one** box.

G ☐ **H** ☐ **I** ☐

0 4 . 6 Two processes occur in the apparatus shown in **Figure 9**.

Draw **one** line from each description to the name of the process.

[2 marks]

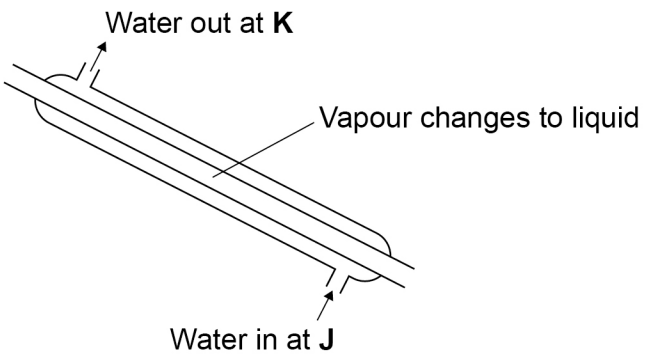
Description	Name of process
	Condensing
Liquid changes to vapour	Evaporating
Vapour changes to liquid	Freezing
	Melting

5.1.1.2 Mixtures

Question 20 · continued

0 4 . 7 **Figure 10** shows part of the apparatus shown in **Figure 9**.

Figure 10



Which statement is correct?

[1 mark]

Tick (✓) **one** box.

The temperature of water at **K** is lower than at **J**. ☐

The temperature of water at **K** is the same as at **J**. ☐

The temperature of water at **K** is higher than at **J**. ☐

9

5.1.1.2 Mixtures

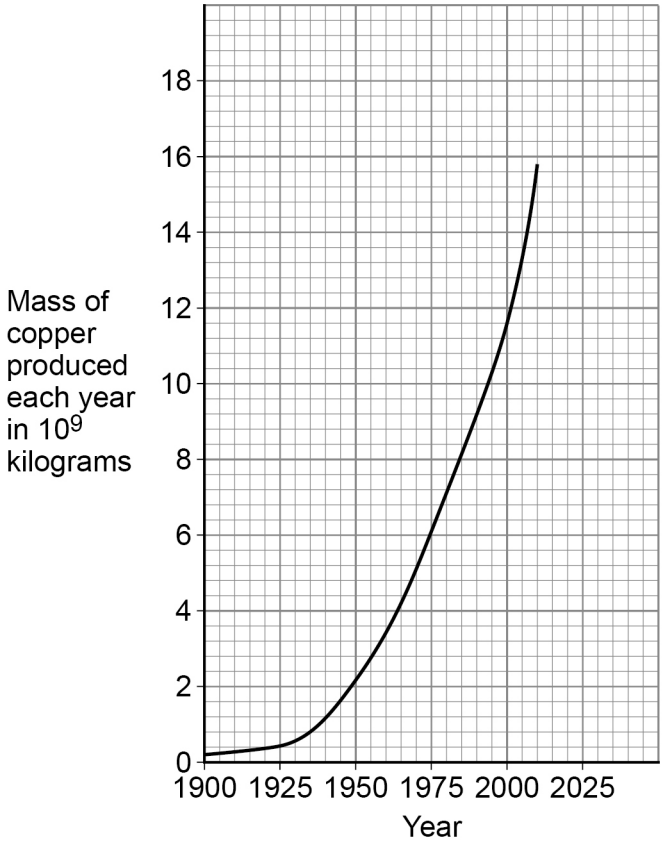
Question 21

June 2024 | 8464/C/1F | Original Q6

0 6 Copper is a useful metal.

0 6 . 1 **Figure 11** shows the mass of copper produced between 1900 and 2010.

Figure 11



Give **two** conclusions that can be made from **Figure 11**.

[2 marks]

1 _____

_____

2 _____

_____

Question 6 continues on the next page

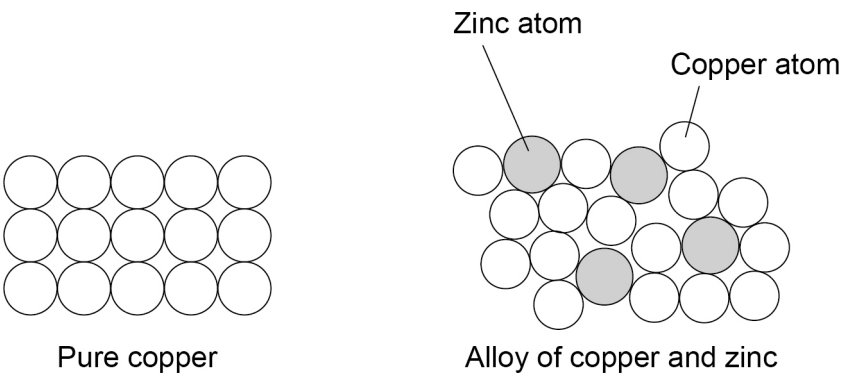
5.1.1.2 Mixtures

Question 21 · continued

Mixtures of copper and zinc are heated to produce alloys.

0 6 . 2 **Figure 12** represents the structures of pure copper and of an alloy of copper and zinc.

Figure 12



Explain why the alloy of copper and zinc is harder than pure copper.

Use **Figure 12**.

[3 marks]

5.1.1.2 Mixtures

Question 21 · continued

0 6 . 3 A 5.25 g sample of an alloy of copper and zinc contains 13.5% zinc by mass.

Calculate the mass of **copper** in the 5.25 g sample.

Give your answer to 3 significant figures.

[4 marks]

Mass of **copper** (3 significant figures) = _____ g

9

Turn over for the next question

5.1.1.2 Mixtures

Question 22

0 3 Printer ink is a mixture of chemicals.

0 3 . 1 What is the name given to a mixture that has been designed as a useful product?

[1 mark]

Tick (✓) **one** box.

Formula ☐

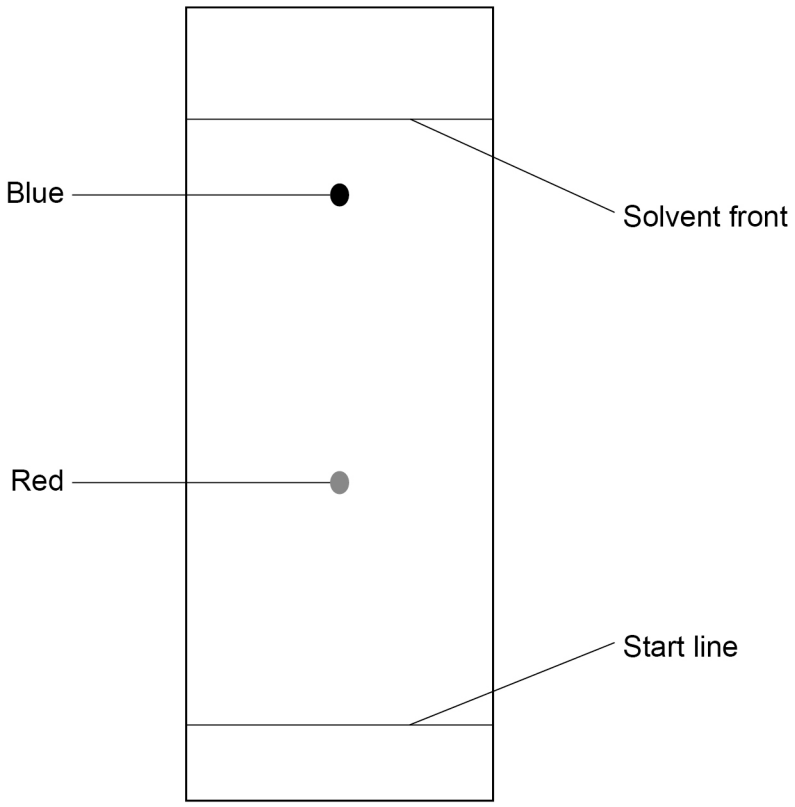
Formulation ☐

Fraction ☐

A student used chromatography to investigate the colours in a printer ink.

Figure 2 shows the chromatogram.

Figure 2



5.1.1.2 Mixtures

Question 22 · continued

0 3 . 2 The student used a ruler for the start line.

What would the student have used to draw the start line?

Give **one** reason for your answer.

[2 marks]

_____

Reason _____

_____

0 3 . 3 Determine the R_f value of the **red** colour.

Use the equation:

$$R_f = \frac{\text{distance moved by colour}}{\text{distance moved by solvent}}$$

[4 marks]

Distance moved by red colour _____

Distance moved by solvent _____

_____

_____

_____

R_f = _____

Question 3 continues on the next page

0 3 . 4 **Table 2** shows the R_f values of four blue colours.

Table 2

Blue colour	R_f
Cerulean	0.40
Cobalt	0.15
Prussian	0.88
Ultramarine	0.68

The student determined that the R_f value of the blue colour in the printer ink was 0.86

Suggest which blue colour was used in the printer ink.

Give **one** reason for your answer.

[2 marks]

Blue colour _____

Reason _____

_____

9

5.1.1.2 Mixtures

Question 23

June 2024 | 8464/C/2F | Original Q6

0 6 Alkanes and alkenes are hydrocarbons.

0 6 . 1 Define the term 'hydrocarbon'.

[1 mark]

0 6 . 2 The general formula for alkanes is C_nH_{2n+2}

Determine the formula of the alkane with 10 carbon atoms.

[1 mark]

Formula = _____

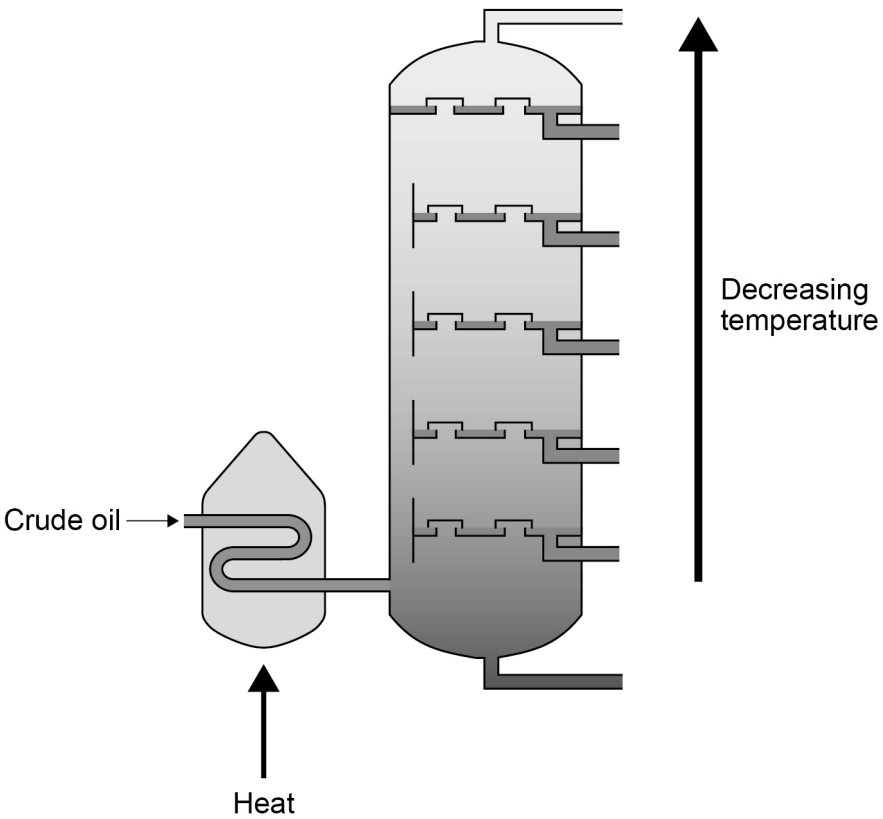
Question 6 continues on the next page

Question 23 · continued

0 6 . 3 Crude oil is a mixture of hydrocarbons.

Figure 4 represents industrial equipment used to separate crude oil into fractions.

Figure 4



Explain how crude oil is separated into fractions.

Use **Figure 4**.

[4 marks]

5.1.1.2 Mixtures

Question 23 · continued

0 6 . 4 The alkane molecule $C_{14}H_{30}$ can be cracked to produce smaller molecules.

Balance the equation for the reaction.

[1 mark]

$$C_{14}H_{30} \rightarrow C_8H_{18} + ____ C_3H_6$$

Question 6 continues on the next page

5.1.1.2 Mixtures

Question 23 · continued

Propene (C_3H_6) is an alkene.

0 6 . 5 Describe the test for alkenes.

Give the result.

[2 marks]

Test _____

_____

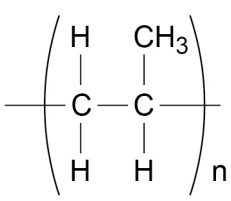
Result _____

_____

0 6 . 6 Poly(propene) is made from propene.

Figure 5 represents the repeating unit of poly(propene).

Figure 5



What type of substance is poly(propene)?

[1 mark]

_____

10

5.1.1.2 Mixtures

Question 24

June 2025 | 8464/C/1F | Original Q4

0 4 This question is about metals.

0 4 . 1 Complete the sentence.

Choose the answer from the box.

[1 mark]

compounds	elements	polymers

Most metals are found in the Earth as _____.

0 4 . 2 Iron is extracted from iron oxide by reduction with carbon.

Why is iron extracted by reduction with carbon?

[1 mark]

Tick (✓) **one** box.

Iron is less reactive than carbon. ☐

Iron has the same reactivity as carbon. ☐

Iron is more reactive than carbon. ☐

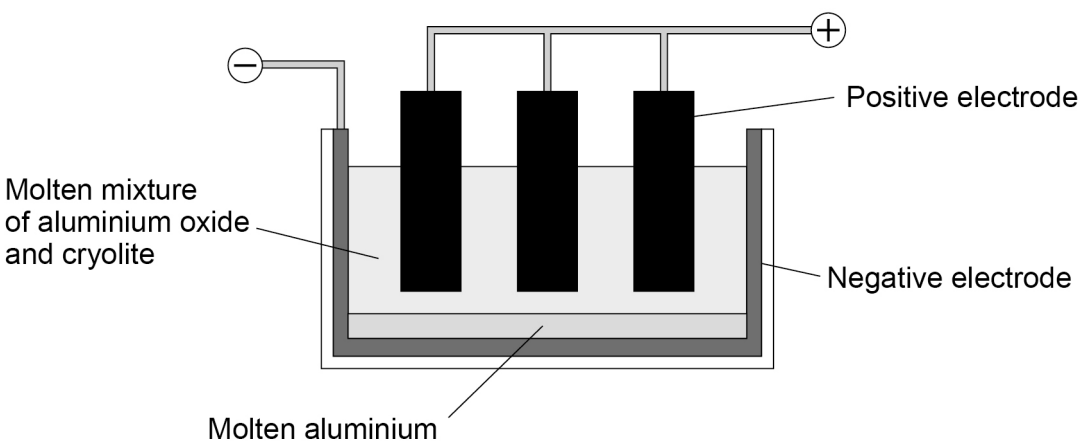
Question 4 continues on the next page

Question 24 · continued

Aluminium is extracted by the electrolysis of aluminium oxide.

Figure 8 shows the apparatus used to extract aluminium.

Figure 8



0 4 . 3 The mixture of aluminium oxide and cryolite has a lower melting point than aluminium oxide alone.

Why is the melting point lowered?

[1 mark]

Tick (✓) **one** box.

To reduce the amount of energy used ☐

To reduce the purity of the aluminium formed ☐

To reduce the rate of reaction ☐

5.1.1.2 Mixtures

Question 24 · continued

June 2025 | 8464/C/1F | Original Q4

0 4 . 4 After some time, the positive electrodes need to be replaced.

Why must the positive electrodes be replaced?

[1 mark]

Tick (✓) **one** box.

- The electrodes dissolve in the molten mixture. ☐
- The electrodes melt in the molten mixture. ☐
- The electrodes react with aluminium. ☐
- The electrodes react with oxygen gas. ☐

Question 4 continues on the next page

5.1.1.2 Mixtures

Question 24 · continued

Aluminium can be mixed with other metals to form alloys.

0 4 . 5 How does the hardness of an alloy of aluminium compare with the hardness of pure aluminium?

[1 mark]

Tick (✓) **one** box.

The alloy is harder than the pure metal. ☐

The alloy and the pure metal have the same hardness. ☐

The alloy is less hard than the pure metal. ☐

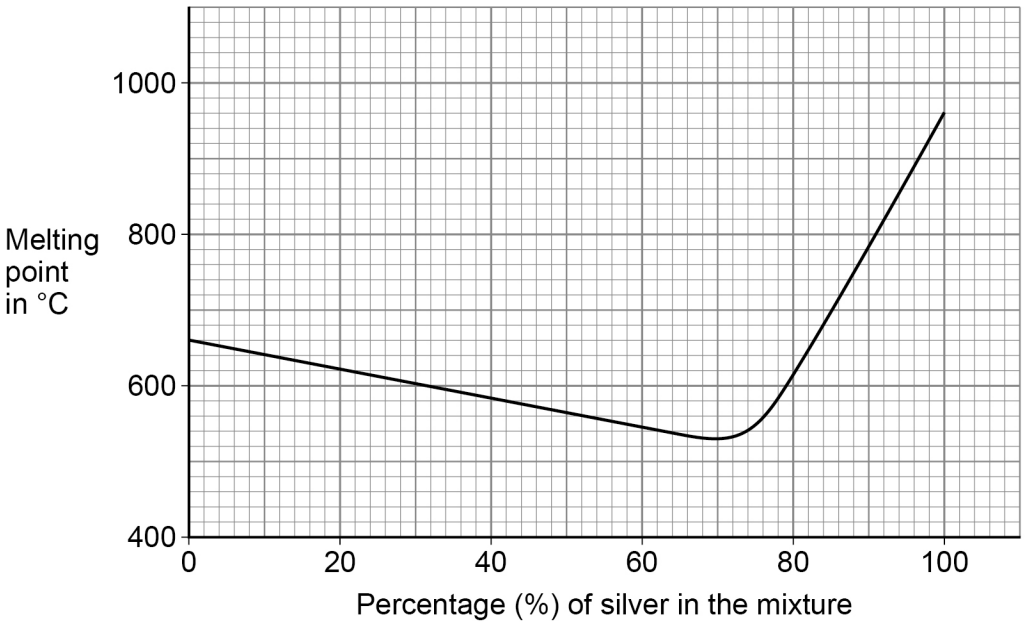
5.1.1.2 Mixtures

Question 24 · continued

0 4 . 6 Aluminium can form an alloy with silver.

Figure 9 shows how the melting point of the alloy changes with the percentage (%) of silver in the mixture.

Figure 9



Describe how the melting point of the alloy changes as the percentage of silver in the mixture increases.

Use data from **Figure 9**.

[3 marks]

8

5.1.1.2 Mixtures

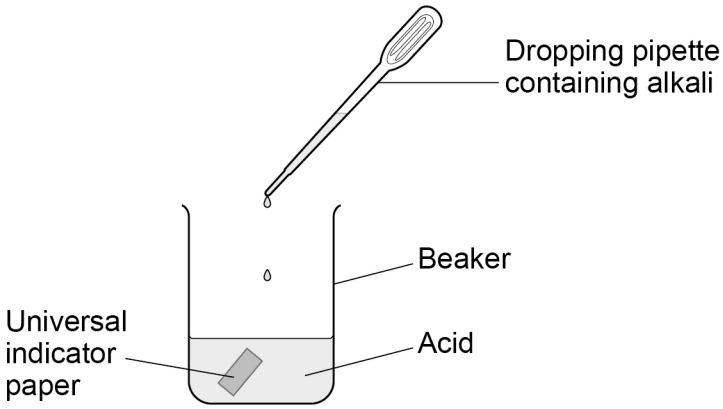
Question 25

0 5 This question is about acids.

A student investigated the volume of an alkali needed to react completely with 25 cm^3 of an acid.

Figure 10 shows the apparatus.

Figure 10



This is the method used.

1. Add 25 cm^3 of the acid to a beaker.
2. Add a piece of universal indicator paper to the acid.
3. Add the alkali drop by drop to the acid until the universal indicator paper changes colour to green.
4. Record the number of drops of alkali added.

0 5 . 1 The method does **not** give an accurate volume of alkali needed to react completely with the acid.

Suggest **two** improvements to the method.

[2 marks]

1 _____

_____

2 _____

_____

5.1.1.2 Mixtures

Question 25 · continued

0 5 . 2 What is the pH of the solution when the universal indicator paper turns green?

[1 mark]

Tick (✓) **one** box.

1 ☐ 5 ☐ 7 ☐ 9 ☐

0 5 . 3 What name is given to the reaction between an acid and an alkali?

[1 mark]

Tick (✓) **one** box.

Combustion ☐

Displacement ☐

Neutralisation ☐

0 5 . 4 Which ion do all acids contain?

[1 mark]

Tick (✓) **one** box.

Cl^- ☐ H^+ ☐ Na^+ ☐

0 5 . 5 Name the acid that reacts with sodium hydroxide to produce sodium nitrate.

[1 mark]

_____

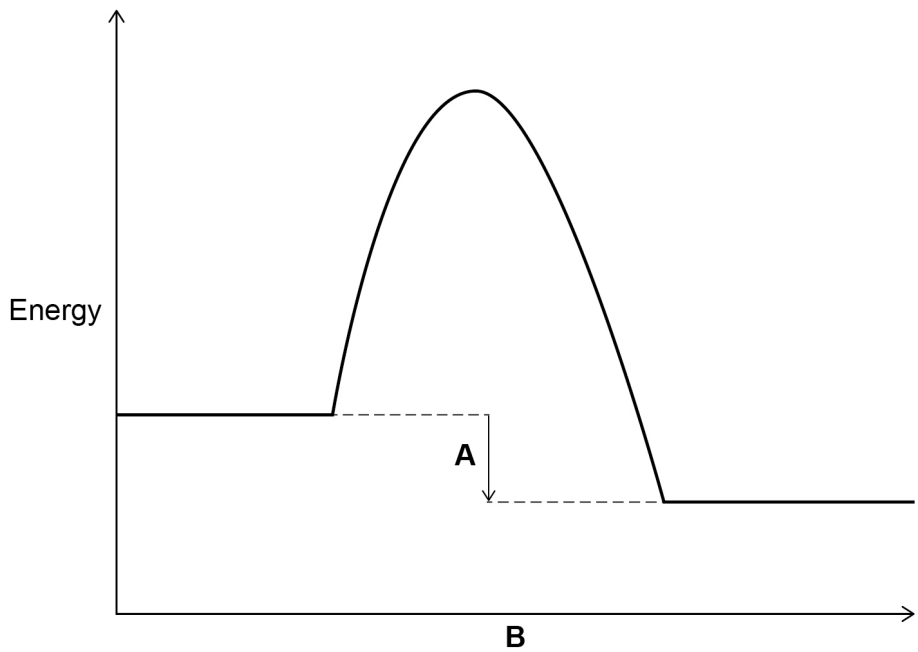
Question 5 continues on the next page

5.1.1.2 Mixtures

Question 25 · continued

0 5 . 6 **Figure 11** shows a reaction profile for the reaction between an acid and an alkali.

Figure 11



What do labels **A** and **B** represent on **Figure 11**?

Choose the answers from the box.

[2 marks]

activation energy	**overall energy change**	**products**
progress of reaction	**reactants**	

A _____

B _____

5.1.1.2 Mixtures

Question 25 · continued

Acids also react with insoluble solid substances to produce salt solutions.

0 5 . 7 When making a salt solution, excess solid is added to the acid.

Draw the apparatus used to separate the excess solid from the salt solution by filtration.

The apparatus should collect:

- the excess solid
- the salt solution.

[2 marks]

0 5 . 8 Solid **X** reacts with hydrochloric acid to produce zinc chloride and hydrogen gas.

Name solid **X**.

[1 mark]

11

5.1.1.2 Mixtures

Question 26

June 2025 | 8464/C/1F | Original Q7

0 7 A student investigated an exothermic reaction.

The student reacted solid calcium oxide with water to produce calcium hydroxide.

0 7 . 1 What is meant by an 'exothermic' reaction?

[1 mark]

0 7 . 2 The formula of calcium hydroxide is $Ca(OH)_2$

Calculate the percentage by mass of oxygen in calcium hydroxide.

Relative atomic mass (A_r): O = 16

Relative formula mass (M_r): $Ca(OH)_2$ = 74

[3 marks]

Percentage = _____ %

Question 7 continues on the next page

5.1.1.2 Mixtures

Question 26 · continued

0 7 . 3 When solid calcium oxide is added to water, the temperature of the reaction mixture changes.

Plan a method to investigate how changing the mass of calcium oxide affects the temperature change of the reaction mixture.

[6 marks]

Extra space

10

5.1.1.2 Mixtures

Question 27

June 2025 | 8464/C/2F | Original Q3

0 3 Screenwash is a mixture designed to keep car windscreens clean.

The components in screenwash include glycerol, methanol and water.

0 3 . 1 Screenwash is made by mixing the components in carefully measured quantities so that the product has the required properties.

What name is given to this type of mixture?

[1 mark]

Tick (✓) **one** box.

Catalyst ☐

Formulation ☐

Polymer ☐

0 3 . 2 Glycerol has the formula $C_3H_8O_3$

How many atoms are there in one molecule of glycerol?

[1 mark]

Tick (✓) **one** box.

3 ☐ 8 ☐ 11 ☐ 14 ☐

Question 3 continues on the next page

5.1.1.2 Mixtures

Question 27 · continued

0 3 . 3 Incomplete combustion happens when glycerol burns in limited oxygen.

Incomplete combustion produces carbon monoxide gas.

Why can the production of carbon monoxide gas be a problem?

[1 mark]

Tick (✓) **one** box.

Carbon monoxide is a greenhouse gas. ☐

Carbon monoxide is a toxic gas. ☐

Carbon monoxide is an acidic gas. ☐

0 3 . 4 Complete combustion happens when methanol (CH_4O) burns in excess oxygen.

Balance the equation for the reaction.

[1 mark]

$$2\,CH_4O + 3\,O_2 \rightarrow ____ CO_2 + 4\,H_2O$$

Question 27 · continued

Methanol can be produced by the reaction of carbon dioxide with hydrogen.

0 3 . 5 Describe the test for hydrogen gas.

Give the result of the test.

[2 marks]

Test _____

_____

Result _____

_____

0 3 . 6 Carbon dioxide is a greenhouse gas.

An increase in greenhouse gases in the atmosphere has led to an increase in average global temperature.

The increase in average global temperature has caused global climate change.

Give **two** effects of global climate change.

[2 marks]

1 _____

_____

2 _____

_____

Question 3 continues on the next page

5.1.1.2 Mixtures

Question 27 · continued

Anhydrous cobalt chloride can be used to test for water.

The word equation for the reaction is:

anhydrous cobalt chloride (blue) + water ⇌ hydrated cobalt chloride (pink)

0 3 . 7 Suggest **one** observation that could be made when water is added to anhydrous cobalt chloride.

[1 mark]

0 3 . 8 The reaction between anhydrous cobalt chloride and water is exothermic.

What type of reaction is the reverse reaction?

[1 mark]

10