



Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

GCSE COMBINED SCIENCE: TRILOGY

H

Higher Tier

Chemistry Paper 2H

Specimen 2018 (set 2)

Time allowed: 1 hour 15 minutes

Materials

For this paper you must have:

- a ruler
- a calculator
- the periodic table (enclosed).

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

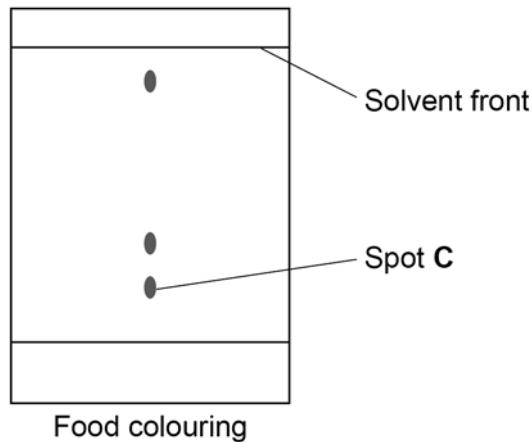
For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	

Information

- The maximum mark for this paper is 70.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

0 | 1

Figure 1 shows a chromatogram for a food colouring.

Figure 1**0 | 1 | 1**

How does the chromatogram show that the food colouring is a mixture?

[1 mark]

0 | 1 . 2 A student makes measurements for spot C.

Table 1 shows the student's results.

Table 1

	Distance in mm
Distance moved by spot C	7
Distance moved by solvent	39

Calculate the R_f value for spot C.

Give your answer to 2 significant figures.

Use the results in **Table 1**.

[3 marks]

R_f value = _____

Question 1 continues on the next page

Turn over ►

0 | 1 . 3 Plan a chromatography experiment to investigate the colours in an ink.

[6 marks]

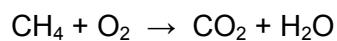
10

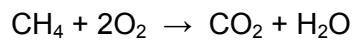
0 | 2 | . | 1 Methane is burned in a plentiful supply of oxygen.

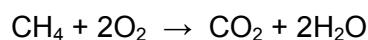
Which is the correct balanced chemical equation?

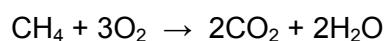
Tick **one** box.

[1 mark]









0 | 2 | . | 2 Burning fuels causes atmospheric pollution.

Write **one** effect for each pollutant in **Table 2**.

[3 marks]

Table 2

Pollutant	Effect
Carbon monoxide	
Sulfur dioxide	
Particulates	

Question 2 continues on the next page

Turn over ►

0 2 . 3 Methane, petrol and coal are fuels.

Table 3 shows information about these fuels.

Table 3

Fuel	State	Energy content in kJ per g	Mass in mg of CO ₂ produced for one kJ of energy released
Methane	Gas	52	53
Petrol	Liquid	43	71
Coal	Solid	24	93

Evaluate the use of the fuels.

Use in the information in **Table 3** and your knowledge.

[6 marks]

10

0 | 3

This question is about copper and its compounds.

0 3 . 1

Table 4 shows information about bioleaching and phytomining.

Bioleaching and phytomining are used to extract copper from low grade ores.

Table 4

	Bioleaching	Phytomining
Metal extracted from	Waste from quarrying	Contaminated ground
Speed of process	Very slow	Slow, made more efficient using quick-growing plants
Pollution	Produces a solution of toxic chemicals which may run off into rivers Takes a long time to stop the process if river pollution occurs	Involves combustion of plants but decontaminates polluted ground

Compare phytomining and bioleaching.

Use the information in **Table 4**.

[4 marks]

Question 3 continues on the next page

Turn over ►

- 0 | 3 . 2** Describe how copper sulfate solution is obtained from the plants used in phytomining.
[2 marks]

- 0 | 3 . 3** Copper is displaced from a solution of copper sulfate using iron.

Write a balanced symbol equation for this reaction.

[2 marks]

- 0 | 3 . 4** How does this displacement reaction take place?

[1 mark]

Tick **one** box.

Electron sharing

Electron transfer

Proton transfer

0 3 . 5 Describe how copper conducts electricity.

[2 marks]

0 3 . 6 Suggest how anhydrous copper sulfate is used to test for water.

[2 marks]

13

Turn over for the next question

0 4

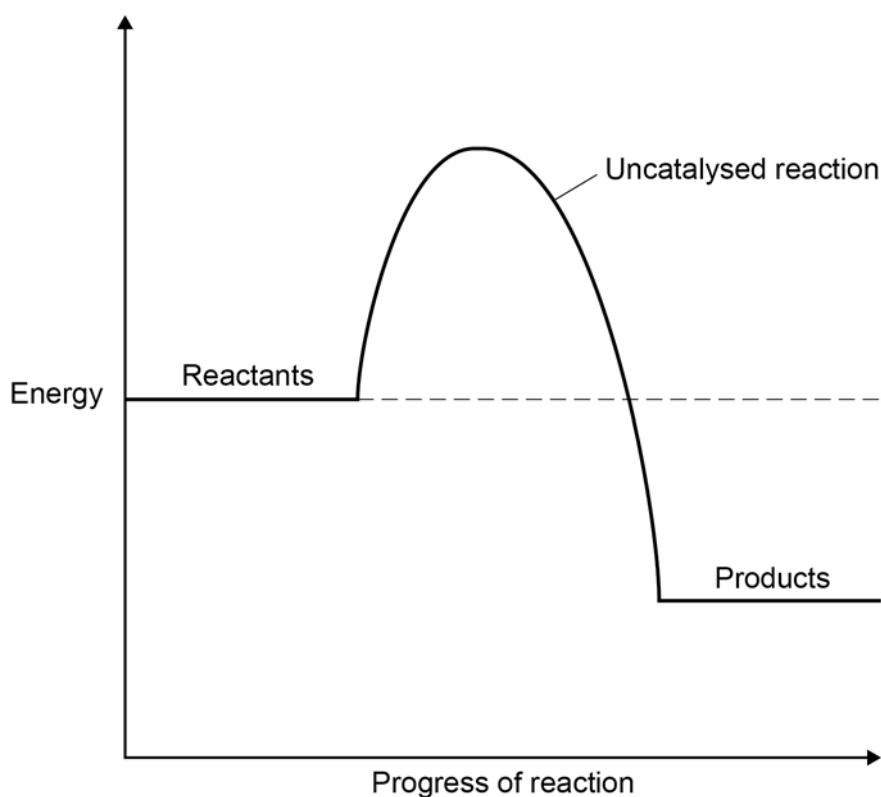
This question is about catalysts.

0 4 . 1

Why are catalysts used in reactions?

[1 mark]

Figure 2 shows the reaction profile for a reaction without a catalyst.

Figure 2**0 4 . 2**

Label the activation energy (E_A) for the reaction on **Figure 2**.

[1 mark]**0 4 . 3**

Label the energy change for the reaction on **Figure 2**.

[1 mark]**0 4 . 4**

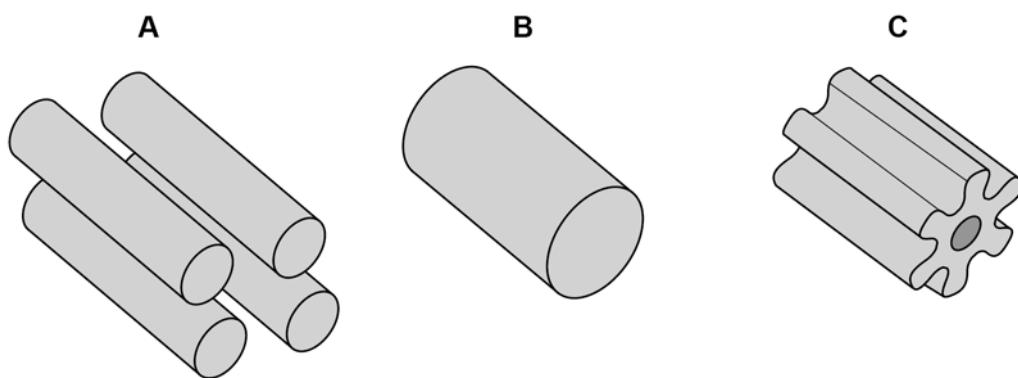
Draw the reaction profile for the reaction **with a catalyst** on **Figure 2**.

[2 marks]

0 | 4 . 5 **Figure 3** shows three different shapes of the same catalyst.

Each catalyst has the same volume.

Figure 3



Evaluate the effectiveness of the shapes of the catalyst in **Figure 3**.

[3 marks]

8

Turn over for the next question

Turn over ►

0 | 5

A student investigated the rate of the reaction between sodium thiosulfate solution and dilute hydrochloric acid.

Figure 4 shows the apparatus.

Figure 4

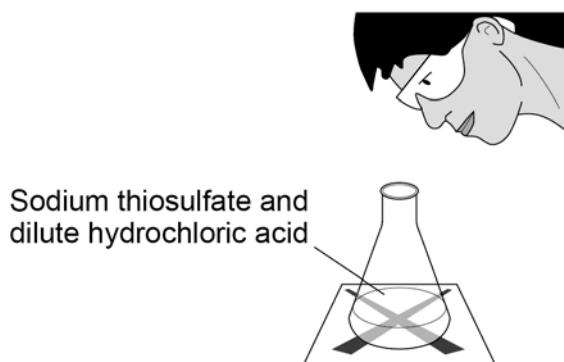


Table 5 shows the time taken for the student to no longer see the cross at different temperatures.

Table 5

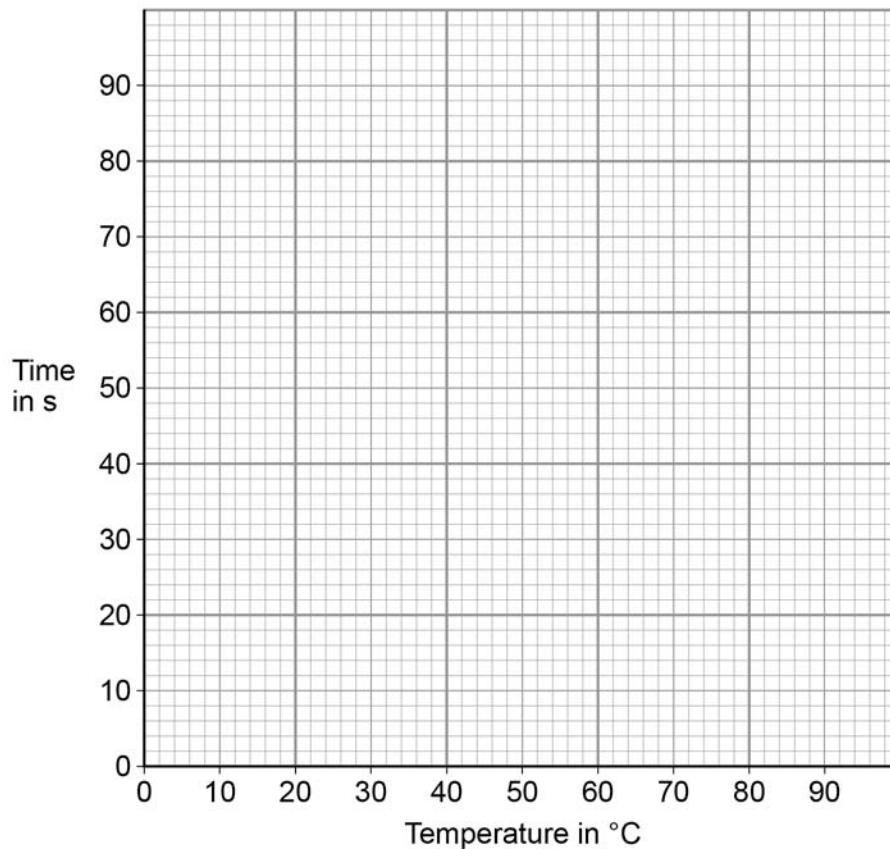
Temperature in °C	Time in seconds
25	89
32	62
44	33
55	17
64	8
75	5
85	4

0 5 . 1 Plot the data from **Table 5** on **Figure 5**.

Draw a line of best fit.

[3 marks]

Figure 5



0 5 . 2 Describe the trend in **Figure 5**.

Use values from **Figure 5**.

[3 marks]

Question 5 continues on the next page

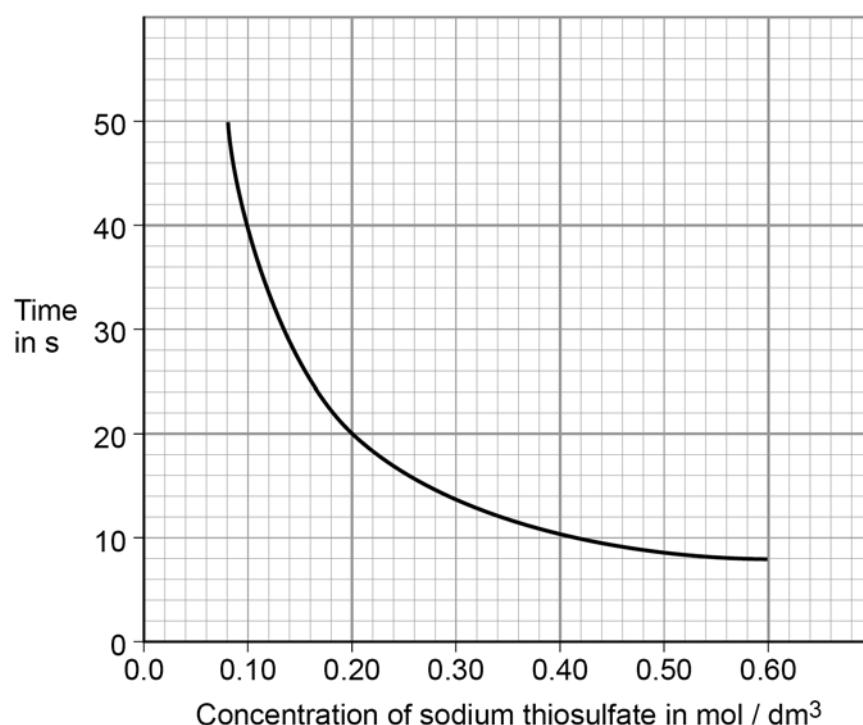
Turn over ►

0 5 . 3

The student also investigated the effect of concentration on the time taken for the reaction.

Figure 6 shows the student's results.

Figure 6



Draw a tangent to the curve at 0.20 mol/dm³

Calculate the gradient (slope) of the tangent at 0.20 mol/dm³

Give the unit.

[4 marks]

Gradient = _____ Unit _____

0 5 . 4

Explain why the rate decreases during a reaction between sodium thiosulfate and dilute hydrochloric acid.

Write about particles in your answer.

[2 marks]

12

Turn over for the next question

Turn over ►

0 6

This question is about crude oil.

0 6 . 1

Table 6 shows information about crude oil fractions.

Table 6

Crude oil fraction	Number of carbon atoms	Approximate percentage (%) in crude oil	Approximate percentage (%) demand
Gas	1–4	3	4
Petrol	5–10	9	23
Naphtha	8–12	10	5
Kerosene	9–16	14	8
Diesel	15–25	16	22
Residue	20–30+	48	38

Explain the advantage of cracking hydrocarbons.

Give **one** example from **Table 6**.

[3 marks]

0 | 6 . 2 Ethene is a product of cracking.

Relative formula mass (M_r) of ethene = 28

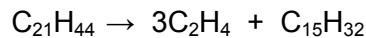
Calculate the number of moles of ethene (C_2H_4) in 50.4 kg

Give your answer in standard form.

[3 marks]

Numbers of moles = _____

0 | 6 . 3 $C_{21}H_{44}$ can be cracked to produce ethene.



Relative formula mass (M_r) of $C_{21}H_{44}$ = 296

Calculate the mass of $C_{21}H_{44}$ needed to produce 50.4 kg of ethene.

[3 marks]

Mass = _____ kg

9

Turn over ►

0 7

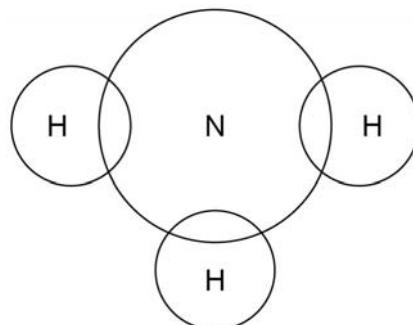
This question is about ammonia (NH_3).

0 7.1

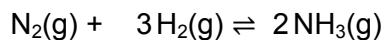
Complete **Figure 7** to show the bonding electrons in ammonia.

[2 marks]

Show the outer electrons only.

Figure 7

Ammonia is produced from nitrogen and hydrogen.



The forward reaction is exothermic.

0 7.2

A low pressure is used.

Explain the effect on the yield of ammonia.

[2 marks]

0 7 . 3 A high temperature is used.

Explain the effect on the yield of ammonia.

[2 marks]

0 7 . 4 Ammonia is removed from the reaction mixture.

Explain the effect on the position of equilibrium.

[2 marks]

8

END OF QUESTIONS

There are no questions printed on this page

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