Please write clearly in block capitals.

F

Centre number ☐☐☐☐☐ Candidate number ☐☐☐☐

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

GCSE

COMBINED SCIENCE: TRILOGY

Foundation Tier Chemistry Paper 2

Practice Paper Series – Set 2

Time allowed: 1 hour 15 minutes

Materials

For this paper you must have:

- a ruler
- a scientific calculator
- the periodic table (printed at the back of this booklet).

Instructions

- Use black ink or black ball-point pen.
- Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do not write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- 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.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 70.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- When answering question 08.1 you need to make sure that your answer:
  - is clear, logical, sensibly structured
  - fully developed
  - shows how the points that you make are related or follow on from each other where appropriate.

For Examiner's Use

Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	

This is an original practice paper written for sciencegcse.co.uk to match the style and demand of AQA GCSE Combined Science: Trilogy (8464) Chemistry Paper 2 (Foundation Tier). It is not an AQA examination paper and has not been produced or endorsed by AQA. It is not a prediction of a future examination.

0 1 Crude oil is a mixture of a very large number of compounds.

Most of the compounds in crude oil are hydrocarbons.

0 1 . 1 Crude oil was formed over millions of years. [1 mark]

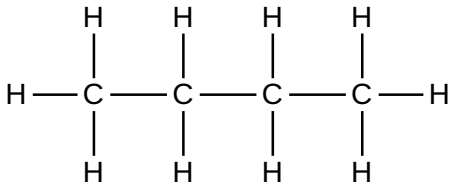
What was crude oil formed from?

Tick (✓) **one** box.

- Gases from ancient volcanoes ☐
- Rocks that melted deep underground ☐
- Salt left when ancient seas evaporated ☐
- The remains of ancient plankton buried in mud ☐

Figure 1 shows the displayed formula of an alkane.

Figure 1



0 1 . 2 Give the molecular formula of the alkane in **Figure 1**. [1 mark]

Molecular formula = ...

0 1 . 3 What is the name of the alkane in **Figure 1**? [1 mark]

Tick (✓) **one** box.

- Butane ☐
- Ethane ☐
- Methane ☐
- Propane ☐

0 1 . 4 The general formula of the alkanes is C_nH_{2n+2} [1 mark]

An alkane has 12 carbon atoms in each molecule.

Give the molecular formula of this alkane.

Molecular formula = ...

Question 1 continues on the next page

Do not write outside the box

sciencegcse.co.uk

Crude oil is separated into fractions.

Table 1 shows information about some of the fractions.

Table 1

Fraction	Number of carbon atoms in each molecule	Relative viscosity
Petrol	5–10	0.5
Kerosene	10–16	2
Diesel oil	14–20	4
Lubricating oil	20–35	100
Fuel oil	30–40	400

0 1 . 5 Fuel oil must be heated before it can be pumped through pipes. [1 mark]

Suggest why.

Use **Table 1**.

.....

.....

0 1 . 6 The engine of a car needs an oil with a relative viscosity between 50 and 200 [2 marks]

Which fraction in **Table 1** should be used in the engine?

Give a reason for your answer.

Fraction .....

Reason

.....

.....

0 1 . 7 Some fractions are used as feedstock to make other useful substances. [1 mark]

Give **one** useful substance, other than a fuel or a lubricant, that is made from crude oil.

.....

Turn over for the next question

Do not write outside the box

0 2 Chemical tests are used to identify gases.

0 2 . 1 Draw **one** line from each gas to the result of the test for that gas. [3 marks]

Gas	Result of test
Carbon dioxide	Bleaches damp litmus paper
Chlorine	Burns with a squeaky pop
Oxygen	Relights a glowing splint
	Turns limewater milky

0 2 . 2 Chlorine is toxic. [1 mark]

Give **one** safety precaution that should be taken when testing for chlorine.

.....

.....

0 2 . 3 A student tested an unknown gas. [2 marks]

- The gas did **not** relight a glowing splint.
- The gas did **not** bleach damp litmus paper.

The student concluded:

'The gas must be hydrogen.'

Explain why the student's conclusion may not be correct.

Give the test the student should do to find out if the gas is hydrogen.

.....

.....

.....

.....

Turn over for the next question

Do not write outside the box

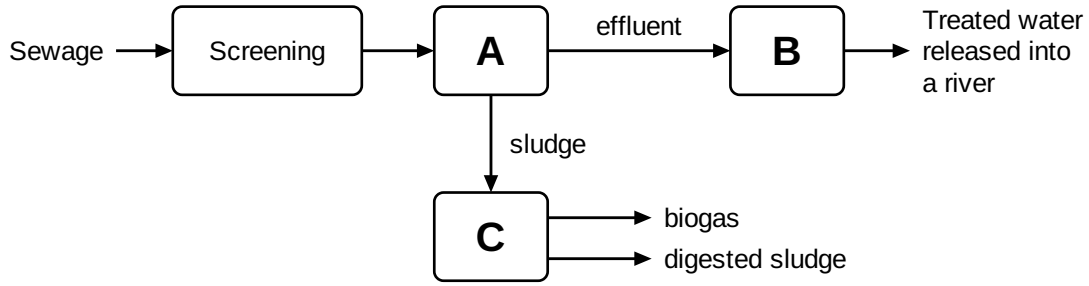
sciencegcse.co.uk

0 3 Sewage is waste water from homes.

Sewage is treated before the water is released into rivers.

Figure 2 shows the stages in a sewage treatment works.

Figure 2



0 3 . 1 What does screening remove from sewage? [1 mark]

Tick (✓) **one** box.

- Dissolved salts ☐
- Harmful microorganisms ☐
- Large objects such as plastic and rags ☐
- Methane gas ☐

0 3 . 2 In stage **A** the sewage stands in a large tank, and the solids settle to the bottom of the tank. [1 mark]

Name the process in stage **A**.

.....

0 3 . 3 In stage **B** air is bubbled through the effluent. [2 marks]

Explain why.

.....

.....

.....

.....

0 3 . 4 In stage **C** the sludge is broken down by anaerobic digestion. [1 mark]

What does **anaerobic** mean?

.....

Question 3 continues on the next page

Do not write outside the box

0 3 . 5 The biogas produced in stage **C** contains methane. [1 mark]

Suggest **one** use for the biogas at the sewage treatment works.

.....

0 3 . 6 It is easier to produce potable water from ground water than from sewage. [1 mark]

Give **one** reason why.

.....

.....

0 3 . 7 The treated water released into the river looks clear. [2 marks]

A student said:

'The treated water is safe to drink.'

Explain why the student may **not** be correct.

.....

.....

.....

.....

0 4 Diesel is a fuel used in some cars.

Burning diesel in a car engine produces pollutants.

0 4 . 1 Complete the sentences. [2 marks]

Choose answers from the box. Each word may be used once, more than once or not at all.

carbon dioxide	carbon monoxide	complete	incomplete	water

If there is not enough oxygen, the diesel undergoes ..... combustion.

This produces a toxic gas called ..... .

Question 4 continues on the next page

Do not write outside the box

sciencegcse.co.uk

0 4 . 2 Diesel does not contain nitrogen. [2 marks]

The exhaust gases from the car contain oxides of nitrogen.

Explain why.

.....

.....

.....

.....

0 4 . 3 Diesel engines also produce particulates. [1 mark]

Give **one** effect of particulates.

.....

.....

A filter was fitted to the exhaust of the car. The filter traps solid particles.

Table 2 shows the mass of each pollutant produced by the car without the filter and with the filter.

Table 2

Pollutant	Mass produced in mg per km	
	Without the filter	With the filter
Carbon monoxide	450	450
Oxides of nitrogen	160	160
Particulates	40	2

0 4 . 4 Calculate the percentage decrease in the mass of particulates produced when the filter was fitted. [2 marks]

Percentage decrease = ... %

0 4 . 5 The filter did **not** change the mass of carbon monoxide produced. [1 mark]

Suggest why.

.....

.....

Turn over for the next question

Do not write outside the box

sciencegcse.co.uk

0 5 Ammonium chloride is a white solid.

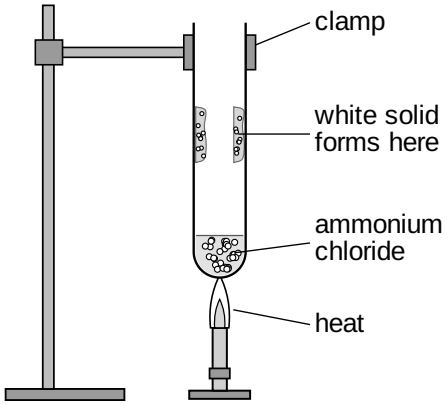
When ammonium chloride is heated, it decomposes.

The equation for the reaction is:

ammonium chloride ⇌ ammonia + hydrogen chloride

Figure 3 shows the apparatus a teacher used.

Figure 3



0 5 . 1 Complete the sentence. [1 mark]

Choose the answer from the box.

combustion	neutralisation	oxidation	reversible

The decomposition of ammonium chloride is a ..... reaction.

0 5 . 2 Ammonia and hydrogen chloride are both gases. [2 marks]

A white solid forms near the top of the test tube.

Explain why.

.....

.....

.....

.....

0 5 . 3 When 53.5 g of ammonium chloride decomposes, 176 kJ of energy is taken in. [1 mark]

Complete the sentence.

When 53.5 g of ammonium chloride is formed from ammonia and hydrogen chloride,

..... kJ of energy is ..... .

Question 5 continues on the next page

Do not write outside the box

sciencegcse.co.uk

0 5 . 4 Equilibrium is **not** reached in the test tube. [1 mark]

Suggest why.

.....

.....

0 6 Aluminium is used to make drinks cans.

Aluminium is extracted from its ore by electrolysis.

0 6 . 1 Recycling aluminium cans is part of sustainable development. [1 mark]

What is meant by **sustainable development**?

Tick (✓) **one** box.

- Development that does not use any energy ☐
- Development that meets the needs of people today without stopping future generations meeting their own needs ☐
- Development that only uses resources from the sea ☐
- Development that uses up resources as quickly as possible ☐

0 6 . 2 Give **two** reasons why recycling aluminium is better for the environment than extracting aluminium from its ore. [2 marks]

1

.....

.....

2

.....

.....

0 6 . 3 A recycling plant sorts 1000 kg of used metal cans. [2 marks]

- 40% of the mass of the cans is aluminium.
- The plant recovers 75% of this aluminium.

Calculate the mass of aluminium recovered.

Mass of aluminium = ... kg

Question 6 continues on the next page

Do not write outside the box

sciencegcse.co.uk

Table 3 shows the energy needed to produce aluminium.

Table 3

	Energy needed to produce 1 kg of aluminium in MJ
From aluminium ore	200
By recycling aluminium	10

0 6 . 4 Calculate how many times as much energy is needed to produce 1 kg of aluminium from its ore as by recycling. [1 mark]

..... times

0 6 . 5 Calculate the energy saved when the aluminium recovered in Question 06.3 is produced by recycling instead of from its ore. [2 marks]

Energy saved = ... MJ

0 6 . 6 An advertisement said: [2 marks]

'Recycling aluminium has no effect on the environment.'

Explain why this statement is **not** correct.

.....

.....

.....

.....

0 7 This question is about pure substances and formulations.

0 7 . 1 The label on a jar of honey says '100% pure'. [2 marks]

This means that nothing has been added to the honey.

Explain why a chemist would **not** describe honey as pure.

.....

.....

.....

.....

Question 7 continues on the next page

Do not write outside the box

Pure paracetamol melts at 169 °C

A student measured the melting points of two samples of paracetamol, **A** and **B**.

Table 4 shows the results.

Table 4

Sample	**A**	**B**
Melting point in °C	169	158–164

0 7 . 2 Which sample, **A** or **B**, is impure? [2 marks]

Give a reason for your answer.

Sample .....

Reason

.....

.....

0 7 . 3 Paracetamol tablets are formulations. [1 mark]

Give **one** other example of a formulation.

.....

Table 5 shows the substances in one paracetamol tablet.

Table 5

Substance	**Purpose**	**Mass in one tablet in mg**
Paracetamol	the medicine (a painkiller)	500
Starch	helps the tablet break up in the stomach	45
Povidone	binder that holds the powder together	12
Magnesium stearate	stops the tablet sticking to the machine	3

0 7 . 4 Calculate the percentage by mass of paracetamol in the tablet. [2 marks]

Percentage of paracetamol = ... %

Question 7 continues on the next page

Do not write outside the box

sciencegcse.co.uk

0 7 . 5 A student said: [2 marks]

'If the mass of the binder in each tablet was doubled, the tablets would work in the same way, because they would still contain the same substances.'

Explain why the student is wrong.

.....

.....

.....

.....

0 8 Sodium thiosulfate solution reacts with dilute hydrochloric acid.

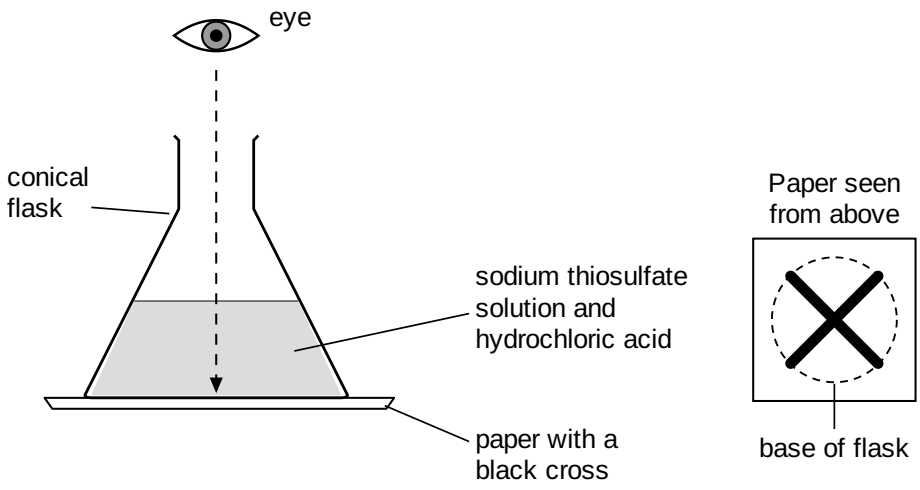
A yellow precipitate of sulfur forms, so the mixture slowly turns cloudy.

A student investigated how the concentration of sodium thiosulfate solution affects the rate of this reaction.

The student timed how long it took for a cross on a piece of paper to disappear from view.

Figure 4 shows the apparatus.

Figure 4



The student had sodium thiosulfate solution with a concentration of 50 g/dm^3, dilute hydrochloric acid, water, measuring cylinders and a stopwatch.

Question 8 continues on the next page

Do not write outside the box

sciencegcse.co.uk

0 8 . 1 Describe a method the student could use to investigate how the concentration of sodium thiosulfate solution affects the time taken for the cross to disappear. [6 marks]

Do not write outside the box

Table 6 shows the student's results.

The total volume of sodium thiosulfate solution and water was 50 cm^3 in each experiment.

Table 6

Concentration of sodium thiosulfate in g/dm^3	Time for the cross to disappear in s			
	Trial 1	Trial 2	Trial 3	Mean
10	123	127	125	125
20	61	59	60	60
30	42	40	41	41
40	29	31	38	**X**
50	26	24	25	25

0 8 . 2 Calculate mean **X**. [2 marks]

Do **not** include the anomalous result.

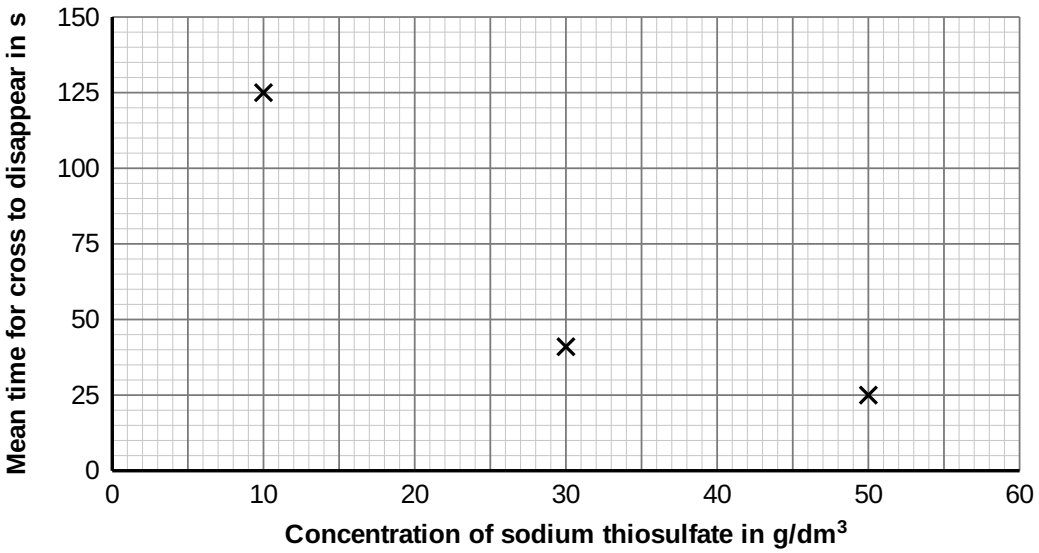
X = ... s

0 8 . 3 **Figure 5** shows some of the results. [3 marks]

Complete **Figure 5**:

- plot the mean times for 20 g/dm^3 and 40 g/dm^3
- draw a line of best fit.

Figure 5



Do not write outside the box

sciencegcse.co.uk

0 8 . 4 The time taken for the cross to disappear decreased as the concentration of sodium thiosulfate increased. [2 marks]

Explain why, in terms of particles.

0 8 . 5 A student said: [2 marks]

'The reaction is faster with 50 g/dm^3 sodium thiosulfate solution than with 40 g/dm^3 sodium thiosulfate solution.'

Do the results in **Table 6** support this statement?

Explain your answer.

END OF QUESTIONS

Do not write outside the box

Additional page, if required.

Write the question numbers in the left-hand margin.

Do not write outside the box

Additional page, if required.

Write the question numbers in the left-hand margin.

Do not write outside the box

There are no more questions in this paper. Original practice paper © sciencegcse.co.uk – free to use for non-commercial education. Not an AQA paper.

The Periodic Table of Elements

1	2											3	4	5	6	7	0
		relative atomic mass **atomic symbol** name atomic (proton) number **Key**				1 **H** hydrogen 1											4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	[285] **Cn** copernicium 112	[286] **Nh** nihonium 113	[289] **Fl** flerovium 114	[289] **Mc** moscovium 115	[293] **Lv** livermorium 116	[294] **Ts** tennessine 117	[294] **Og** oganesson 118

* The lanthanides (atomic numbers 58–71) and the actinides (atomic numbers 90–103) have been omitted. Relative atomic masses for Cu and Cl have not been rounded to the nearest whole number.