

Please check the examination details below before entering your candidate information

Candidate surname		Other names	
Centre Number		Candidate Number	

Pearson Edexcel Level 1/Level 2 GCSE (9–1)

Friday 13 June 2025

Morning (Time: 1 hour 10 minutes) **Paper reference** **1SC0/2CH**

Combined Science

PAPER 5

Higher Tier

You must have:
Calculator, ruler, Periodic Table (enclosed)

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- Calculators may be used.
- Any diagrams may NOT be accurately drawn, unless otherwise indicated.
- You must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*
- In questions marked with an **asterisk** (*), marks will be awarded for your ability to structure your answer logically, showing how the points that you make are related or follow on from each other where appropriate.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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Answer ALL questions. Write your answers in the spaces provided.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

- 1 When solutions **P** and **Q** are mixed together, a purple mixture forms.
This mixture slowly becomes colourless.
- (a) A student pours 25 cm^3 of solution **P** into a conical flask and then adds 25 cm^3 of solution **Q**.

The student uses a beaker to measure out these volumes.

Name a piece of apparatus that could be used to measure these volumes more accurately.

(1)

- (b) The student investigates this reaction using the apparatus shown in Figure 1.
The student measures the time taken for the cross to become visible.
The experiment is repeated at different temperatures.

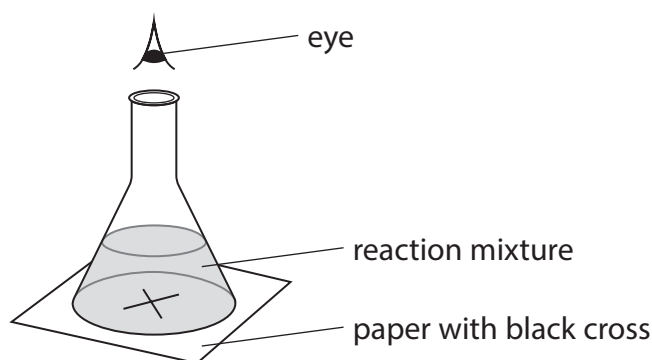


Figure 1

Figure 2 shows the results.

temperature in $^{\circ}\text{C}$	time in s
20	45
40	19
60	10

Figure 2



- (i) The concentrations of the solutions are kept constant in each experiment.

State **one** other variable that should be kept constant.

(1)

- (ii) State, and explain in terms of particles, how the time taken for the cross to become visible would change if a temperature of 80 °C was used.

(3)

- (c) The concentration of solution **Q** is 26.8 g dm⁻³.

Calculate the mass of solid **Q** present in 25 cm³ of solution **Q**.

$$\text{concentration (g dm}^{-3}\text{)} = \frac{\text{mass of solid (g)}}{\text{volume of solution (dm}^3\text{)}}$$

(2)

mass of solid **Q** = g

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(d) The student repeats the experiment at 20°C, with the addition of a catalyst.

Explain how the addition of a catalyst will affect the rate of reaction.

(2)

(Total for Question 1 = 9 marks)



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2 Crude oil is a mixture of hydrocarbons.

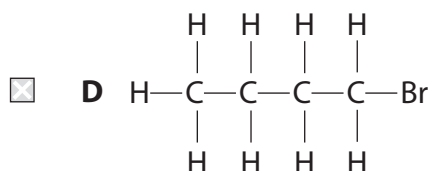
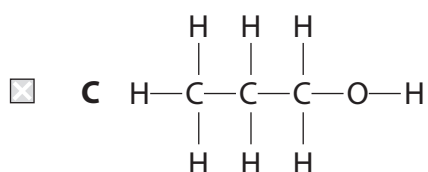
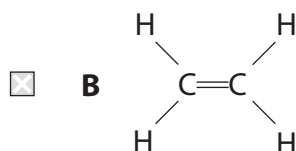
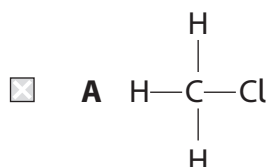
(a) (i) The majority of hydrocarbons in crude oil belong to one homologous series.

Give the name of this series.

(1)

(ii) Which structure represents a molecule of a hydrocarbon?

(1)



- (b) When hydrocarbons undergo combustion, water is produced.

Draw a dot and cross diagram of a molecule of water.

(2)

- (c) One compound in crude oil contains 0.96 g of carbon atoms combined with 0.32 g of hydrogen atoms.

Calculate the empirical formula of this compound.

(relative atomic masses: C = 12, H = 1.0)

(3)

empirical formula of this compound =

(Total for Question 2 = 7 marks)

3 Group 1 elements are known as the alkali metals.

(a) Which row gives two physical properties of the alkali metals?

(1)

		hardness	melting point
☐	A	hard	low
☐	B	hard	high
☐	C	soft	low
☐	D	soft	high

(b) The alkali metals react with water.

(i) A teacher adds a small piece of potassium to water.

Give **two** observations that would be seen.

(2)

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(ii) The reaction of lithium with water is much less vigorous than the reaction of potassium with water.

Explain why, in terms of their electronic configurations.

(3)

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(iii) When sodium reacts with water, a solution of sodium hydroxide is formed.

When the solution is left in air, the hydroxide ions react with carbon dioxide, forming carbonate ions, CO_3^{2-} , and one other product.

Complete the ionic equation for this reaction.

(2)



(c) The relative atomic mass of caesium is 132.905.

Calculate the average mass of one atom of caesium

(Avogadro constant = 6.02×10^{23})

(2)

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mass = g

(Total for Question 3 = 10 marks)

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4 This question is about the noble gas xenon.

(a) Xenon is unreactive.

Explain, in terms of its electronic configuration, why xenon is unreactive.

(2)

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(b) Under extreme conditions, xenon can be made to react with fluorine to form xenon tetrafluoride, XeF_4 .

(i) Write the balanced equation for this reaction.

(1)

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(ii) Some information about xenon tetrafluoride is shown in Figure 3.

colour of solid	melting point in $^{\circ}\text{C}$	conductor of electricity?
colourless	117	no

Figure 3

State and explain, with reasons, the type of structure and bonding in xenon tetrafluoride.

(3)

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(c) Under extreme conditions, xenon reacts with fluorine to form xenon hexafluoride.

The reaction is exothermic.

The energy change for the reaction is -400 kJ mol^{-1} .

On Figure 4

- add a label to the y-axis
- draw the reaction profile for this reaction
- label the energy change and the activation energy for the reaction.

(3)

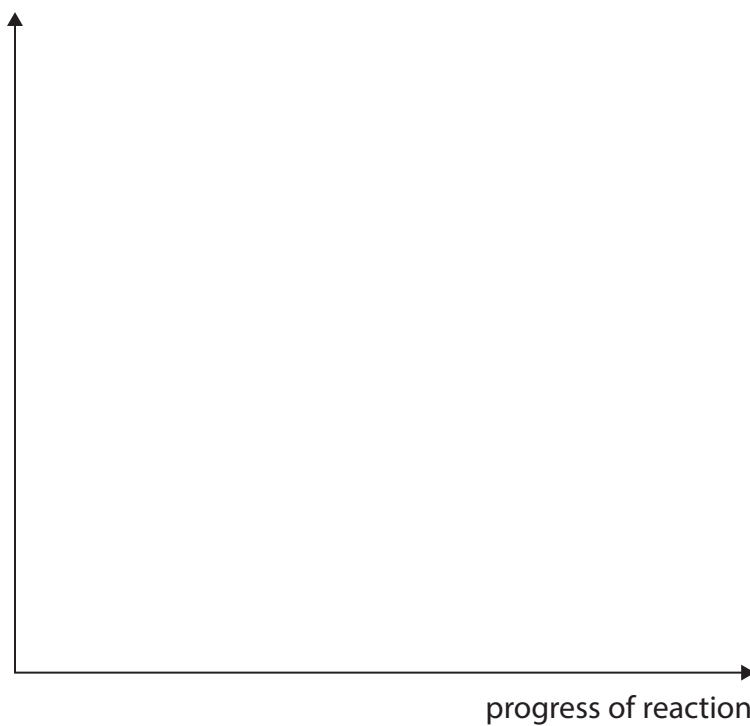


Figure 4

(Total for Question 4 = 9 marks)

5 This question is about carbon and some carbon compounds.

(a) Two forms of pure carbon are graphite and Buckminsterfullerene.

(i) Explain why graphite is used as a lubricant.

(2)

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(ii) Calculate the mass, in kg, of five moles of Buckminsterfullerene, C_{60} .

(relative atomic mass: $C = 12$)

(2)

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mass = kg

(b) A molecule in an homologous series has the formula $C_9H_{21}N$.

What is the formula of the next molecule in this homologous series?

(1)

☐ **A** $C_{10}H_{21}N$

☐ **B** $C_{10}H_{23}N$

☐ **C** $C_{10}H_{21}N_2$

☐ **D** $C_{10}H_{23}N_2$



(c) A Bunsen burner burns methane gas, CH_4 .

A student investigates the time taken to heat up a beaker of water using this Bunsen burner.

Figure 5 shows the apparatus used.

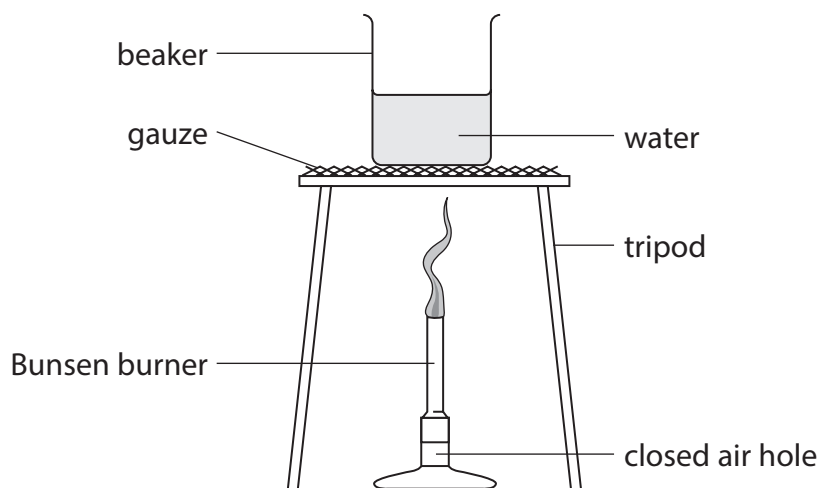


Figure 5

The student sees that a large amount of carbon forms as a black solid on the underside of the gauze.

The teacher said that the investigation would be improved if no carbon forms.

Explain what the student should do to stop carbon forming on the underside of the gauze.

(2)

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- *(d) Natural processes and human activities change the amount of carbon dioxide in the atmosphere.

Figure 6 shows the concentration of carbon dioxide in the atmosphere measured in one location and the mean global temperature from 1960 to 2000.

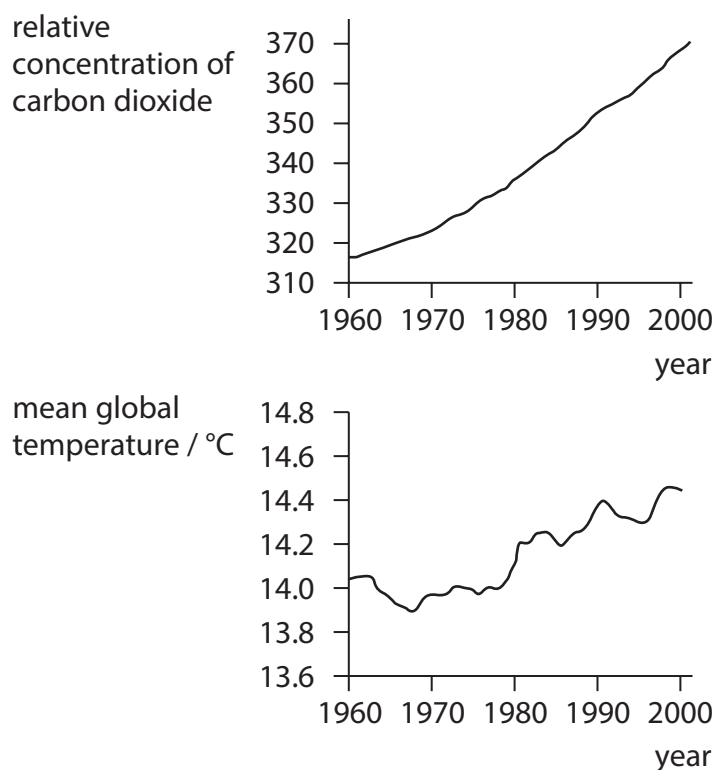


Figure 6

Evaluate whether the data in Figure 6 shows that the change in the amount of carbon dioxide is leading to climate change.

Your answer should include

- the natural processes that change the amount of carbon dioxide in the atmosphere
- the human activities that change the amount of carbon dioxide in the atmosphere
- how carbon dioxide contributes to the greenhouse effect and climate change.

(6)

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(Total for Question 5 = 13 marks)



6 This question is about molecules containing two atoms.

(a) In an experiment, hydrochloric acid is reacted with zinc.

The volume of gas produced is measured by collecting the gas in an upturned measuring cylinder over water.

Give a method of collecting and measuring the gas that would give a more accurate volume of gas.

(1)

(b) Iodine has an atomic number of 53 and a mass number of 127.

How many electrons are there in an iodine molecule, I_2 ?

(1)

☐ **A** 53

☐ **B** 106

☐ **C** 127

☐ **D** 180

(c) Iodine reacts with hydrogen to form hydrogen iodide, HI.

Explain whether or not a solution of hydrogen iodide in water conducts electricity.

(2)

(d) Chlorine gas is bubbled through a colourless solution of potassium bromide, KBr.
The mixture turns orange.

(i) Give the name of the substance that causes the orange colour.

(1)

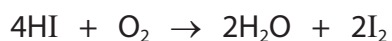


(ii) Write the balanced equation for this reaction.

(3)

(e) Hydrogen iodide reacts with oxygen to form water and iodine.

The equation for this reaction is



Calculate the energy change for this reaction using the bond energies in Figure 7.

bond	bond energy in kJ mol^{-1}
H—I	299
O=O	495
H—O	464
I—I	151

Figure 7

Include a sign and unit in your answer.

(4)

energy change =

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS



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Paper
reference

1SC0/2CH

Combined Science

PAPER 5

Higher Tier

Periodic Table Insert

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The periodic table of the elements

1	2	Key										3	4	5	6	7	0
		relative atomic mass atomic symbol name atomic (proton) number															
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

1
H
hydrogen
1

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

* The elements with atomic numbers from 58 to 71 are omitted from this part of the periodic table.

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.

