

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)

Tuesday 11 June 2024

Morning (Time: 1 hour 10 minutes)

Paper reference

1SC0/2CF

Combined Science

PAPER 5

Foundation 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.

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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 This question is about the metals and non-metals in period 3 of the periodic table.

(a) Figure 1 shows some data about some of the elements in period 3.

| symbol | atomic number | melting point in °C |
|--------|---------------|---------------------|
| Na | 11 | 98 |
| Mg | 12 | 650 |
| Al | 13 | 660 |
| Si | 14 | 1410 |
| P | 15 | 44 |
| Cl | 17 | -101 |
| Ar | 18 | -189 |

Figure 1

Use the periodic table to answer these questions.

(i) Give the **name** of the element in period 3 that is not shown in Figure 1.

(1)

.....

(ii) Give the relative atomic mass of silicon.

(1)

.....

(iii) State which metal and which non-metal in Figure 1 have the lowest melting points.

(2)

metal with lowest melting point

.....

non-metal with lowest melting point

.....



(b) Alkali metals react with water to produce an alkaline solution and hydrogen gas.

A test tube of gas can be tested to see if the gas is hydrogen by putting a lighted splint at the top of the test tube.

A student suggests the following method to show that an alkaline solution and hydrogen gas are produced in this reaction.

step 1 pour 150 cm³ water into the container shown in Figure 2

step 2 add a small piece of lithium to the water in the container shown in Figure 2

step 3 hold a lighted splint above the container

step 4 hold some damp red litmus paper above the mixture in the container

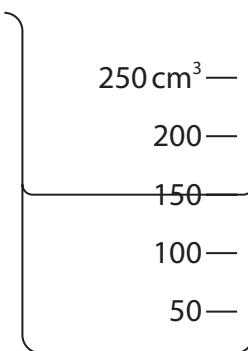


Figure 2

(i) Give the name of the container shown in Figure 2.

(1)

(ii) A teacher says that step 3 and step 4 will **not** work to show that hydrogen gas and an alkaline solution are produced in the reaction.

Explain **one** change that could be made in each step to make the method work.

(3)

step 3.....

.....

.....

step 4.....

.....

(Total for Question 1 = 8 marks)

2 (a) In one reaction the temperature of the reaction mixture decreases.

Which word describes this type of reaction?

(1)

- A displacement
- B endothermic
- C exothermic
- D neutralisation

(b) In an experiment, a salt is dissolved in water.

The temperature change is measured.

Figure 3 shows the apparatus that is used.

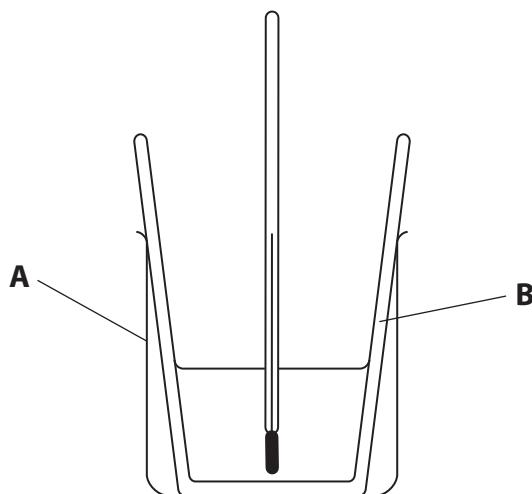


Figure 3

(i) State what is used to measure the temperature change in Figure 3.

(1)

.....

(ii) State **one** reason for using the piece of equipment A in Figure 3.

(1)

.....

.....

.....



(iii) A student suggests putting a lid on piece of equipment **B**.

State why this would help to give a more accurate value for the temperature change.

(1)

.....
.....
.....

(iv) Four different salts, **P**, **Q**, **R** and **S**, are dissolved in water.

Figure 4 shows the starting temperature of the water and the final temperature of the solution after the salt dissolves.

| | salt P | salt Q | salt R | salt S |
|---|--------|--------|--------|--------|
| starting temperature in °C | 20.0 | 20.0 | 20.0 | 20.0 |
| final temperature in °C | 22.4 | 19.5 | 23.0 | 18.5 |
| temperature change in °C | +2.4 | -0.5 | | |
| salt that absorbed most heat energy when it dissolved | | | | |

Figure 4

Complete the table

- to show the temperature changes when salt **R** and salt **S** dissolve
- by placing a tick (✓) in the box, on the bottom row, for the salt that **absorbs** the most heat energy when it dissolves.

(4)

(v) One of the salts dissolved is barium chloride, BaCl_2 .

Barium chloride contains the chloride ion, Cl^- .

Give the **formula** of the barium ion in barium chloride.

(1)

.....
(Total for Question 2 = 9 marks)



P 7 4 4 4 3 A 0 5 2 0

3 (a) Figure 5 shows the structure of one molecule of three different compounds, **X**, **Y** and **Z**.

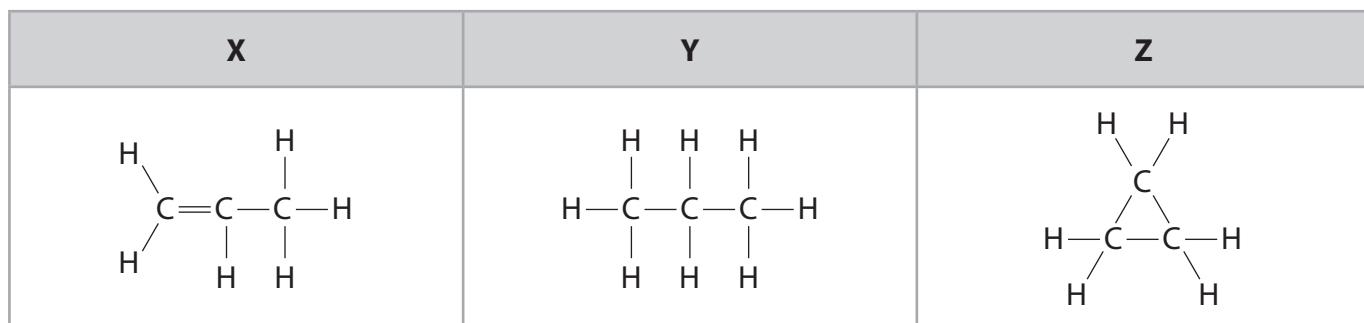


Figure 5

The molecules of the compounds shown in Figure 5 all contain the same number of carbon atoms.

(i) Give the number of carbon atoms in a molecule of compound **X**.

(1)

.....

(ii) Compound **X** contains carbon and one other element.

Give the **name** of the other element in compound **X**.

(1)

.....

(iii) Which of the compounds in Figure 5 is a hydrocarbon?

(1)

- A** **X** only
- B** **Y** only
- C** **X** and **Y** only
- D** **X**, **Y** and **Z**

(iv) Which of the compounds in Figure 5 have the same molecular formula?

(1)

- A** none of them
- B** **X** and **Y** only
- C** **X** and **Z** only
- D** **X**, **Y** and **Z**



(b) Figure 6 shows where fractions are produced in the fractional distillation of crude oil.

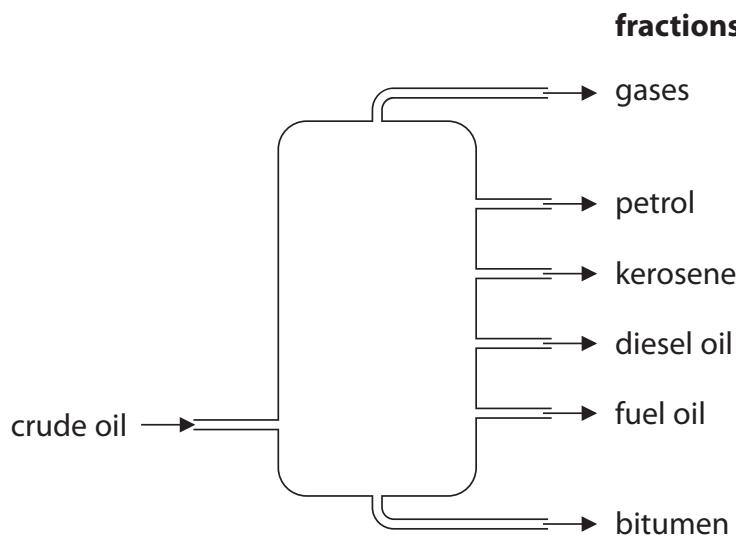


Figure 6

Complete the sentences about fractions obtained from crude oil.

(3)

The fraction with the smallest molecules is called

Compared to petrol, the boiling point of kerosene is

When petrol burns, one product is

(c) When some impure hydrocarbon fuels are burned, sulfur dioxide is one of the products.

Some sulfur dioxide gas is dissolved in water to form solution **W**.

When solution **W** is added to sodium hydroxide solution of pH 12

- the pH changes
- the temperature increases.

Explain how the pH changes and why the temperature increases.

(3)

(Total for Question 3 = 10 marks)



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4 This question is about bromine.

(a) Give the colour and physical state of bromine at room temperature.

(2)

colour

physical state

(b) Bromine reacts with hydrogen to form hydrogen bromide.

(i) Write the word equation for this reaction.

(2)

..... + \rightarrow

(ii) Hydrogen bromide dissolves in water to form a solution.

This solution of hydrogen bromide reacts with alkalis.

State the type of reaction that occurs when a solution of hydrogen bromide reacts with an alkali.

(1)

.....
.....



(c) Bromine and the other halogens react with hot iron wool.

Figure 7 shows the relative speed of some of these reactions.

| halogen | relative speed of reaction |
|----------|----------------------------|
| fluorine | |
| chlorine | reacts very quickly |
| bromine | reacts quickly |
| iodine | reacts slowly |

Figure 7

Fluorine also reacts with hot iron wool.

Use Figure 7 to predict the relative speed of this reaction.

(1)

(d) Potassium bromide contains 32.8% potassium by mass.

Calculate the mass of potassium and the mass of bromine in 500 g potassium bromide.

(3)

mass of potassium = g

mass of bromine = g

(Total for Question 4 = 9 marks)



5 A student investigates the reaction between marble chips and dilute hydrochloric acid.

The student measures the total volume of carbon dioxide gas produced each minute, for 10 minutes.

(a) Figure 8 shows part of the apparatus used in the experiment.

Complete Figure 8 by drawing and labelling apparatus that could be used to collect and measure the volume of the carbon dioxide gas.

(2)

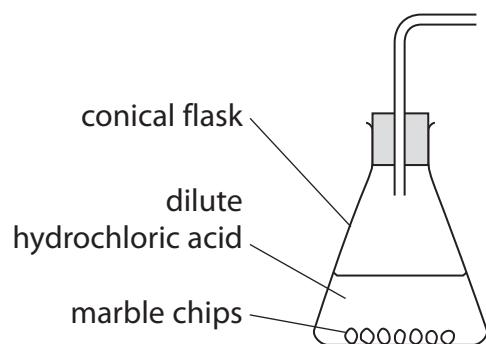


Figure 8

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(b) Figure 9 shows a graph of the results of the experiment.

A tangent has been drawn on the curve at a time of 3.5 minutes.

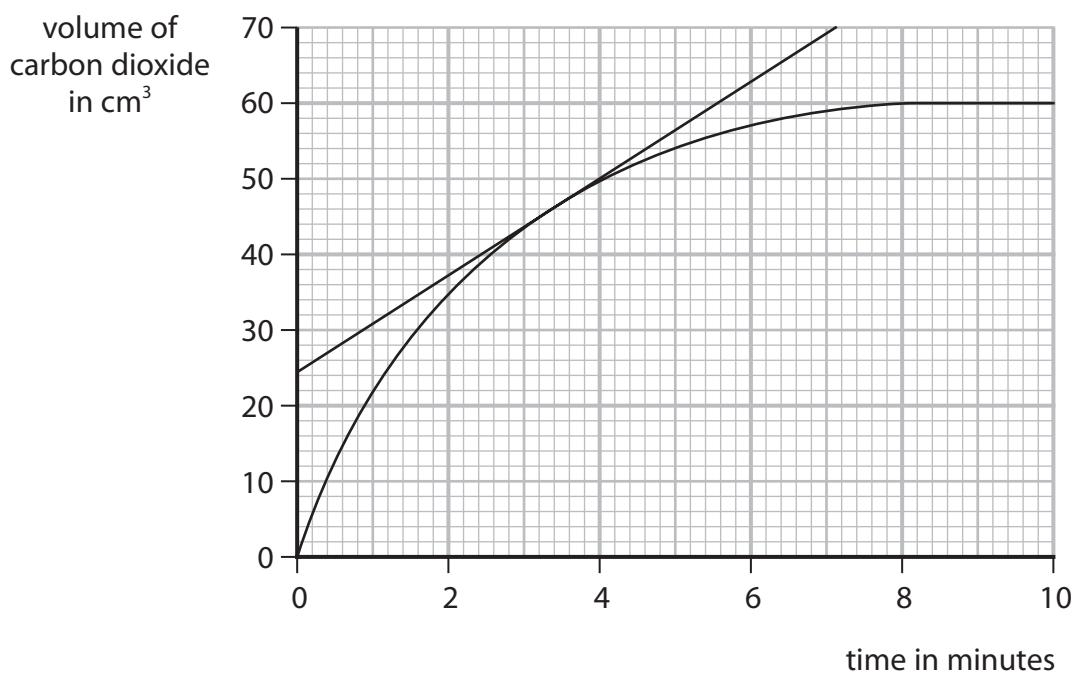


Figure 9

(i) State the total volume of carbon dioxide produced in the first 3.5 minutes.

(1)

$$\text{volume} = \dots \text{cm}^3$$

(ii) Using the tangent, calculate the rate of reaction at 3.5 minutes in cm^3 per minute.

$$\text{rate of reaction} = \frac{\text{change in gas volume}}{\text{change in time}}$$

(3)

$$\text{rate} = \dots \text{cm}^3 \text{ per minute}$$

(c) The student repeats the experiment using the same mass of smaller marble chips.

All other conditions remain the same.

Explain the effect on the rate of reaction of using smaller marble chips.

(2)

.....

.....

.....

.....

.....

(d) Which change would make the rate of reaction slower?

(1)

- A using the same acid at a higher temperature
- B using acid of a lower concentration
- C using a larger flask
- D adding a catalyst

(e) In this experiment the volume of carbon dioxide gas produced is measured.

Give a different way that the amount of carbon dioxide produced can be measured.

(1)

.....

.....

.....

.....

(f) In this experiment there is an excess of dilute hydrochloric acid.

State what you would **see** in the conical flask at the end of the experiment.

(1)

.....

.....

.....

(Total for Question 5 = 11 marks)



6 This question is about the atmosphere.

(a) Describe the test to show that a gas is oxygen.

(2)

(b) Copper reacts with oxygen to form copper oxide.

2.100 g of copper will react completely with 0.529 g of oxygen.

In an experiment, 4.200 g of copper is heated with 50.000 g of oxygen until the reaction is complete.

Calculate the mass of oxygen remaining at the end of the experiment.

(2)

mass of oxygen = g

(c) Helium, neon and argon are all inert.

(i) Explain, in terms of electrons, why these gases are inert.

(2)

(ii) Two pieces of steel can be joined by heating the metal pieces with a very hot flame.

This process is often carried out in an argon atmosphere rather than in air.

Which property makes argon gas suitable for this use?

(1)

- A argon has a low density
- B argon has a low melting point
- C argon is colourless
- D argon is unreactive



*(d) Figure 10 shows how plant life and the atmosphere of Earth have changed over time.

| period of time | plant life | amount of carbon dioxide in atmosphere | amount of oxygen in atmosphere |
|-------------------------------|--|--|--------------------------------|
| the earliest Earth | no plant life | very high | none |
| about 3,500 million years ago | plant life evolved | high | very low |
| about 10,000 years ago | about 60% of land covered by trees | 0.03% | about 21% |
| today | less than 40% of land covered by trees | 0.04% | about 21% |

Figure 10

Explain the effect that plant life has had on the Earth's atmosphere and the temperature of the Earth.

You should refer to the information in Figure 10 including

- the plant life
- the amounts of carbon dioxide
- the amounts of oxygen

(6)



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(Total for Question 6 = 13 marks)

TOTAL FOR PAPER = 60 MARKS



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**Paper
reference**

1SC0/2CF



Combined Science

PAPER 5

Foundation Tier

Periodic Table Insert

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The periodic table of the elements

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 0 |
|--------------------------------|---------------------------------|-----------------------------------|---------------------------------|---------------------------------|----------------------------------|------------------------------------|----------------------------------|
| 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 aluminum 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 |
| 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 |
| 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 | 197 Hg mercury 80 |
| | | | | | | 201 Tl thallium 81 | 204 Pb lead 82 |
| | | | | | | 207 Bi bismuth 83 | 209 Po polonium 84 |
| | | | | | | 210 At astatine 85 | [210] Rn radon 86 |
| | | | | | | | [222] |

Key

| |
|------------------------|
| relative atomic mass |
| atomic symbol |
| 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.

