

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 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 1 shows part of the apparatus used in the experiment.

Complete Figure 1 by drawing and labelling apparatus that could be used to collect and measure the volume of the carbon dioxide gas.

(2)

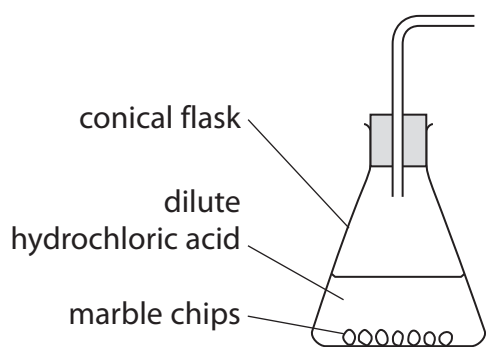


Figure 1



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(b) Figure 2 shows a graph of the results of the experiment.

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

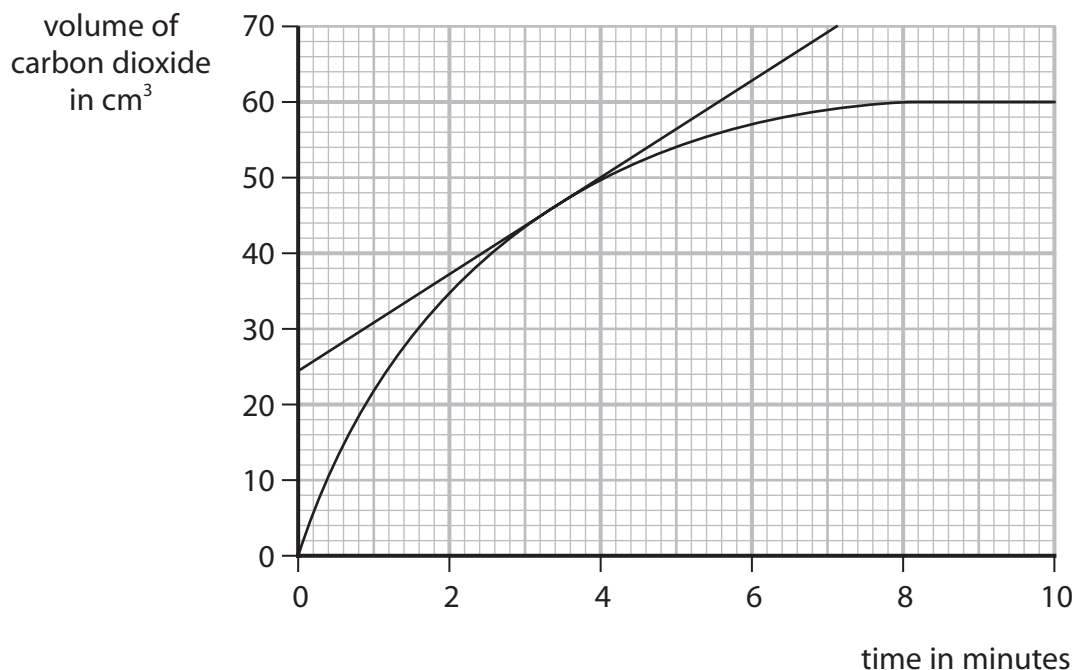


Figure 2

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

(1)

volume = cm³

(ii) Using the tangent, calculate the rate of reaction at 3.5 minutes in cm³ per minute.

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

(3)

.....

.....

.....

.....

rate = cm³ 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

(Total for Question 1 = 9 marks)



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

2 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



P 7 4 4 4 5 A 0 5 2 0

(d) Carbon dioxide is removed from the atmosphere by plants and stored in plants and soil as carbon compounds.

Figure 3 shows the relative amounts of carbon stored in plants and soils in different environments.

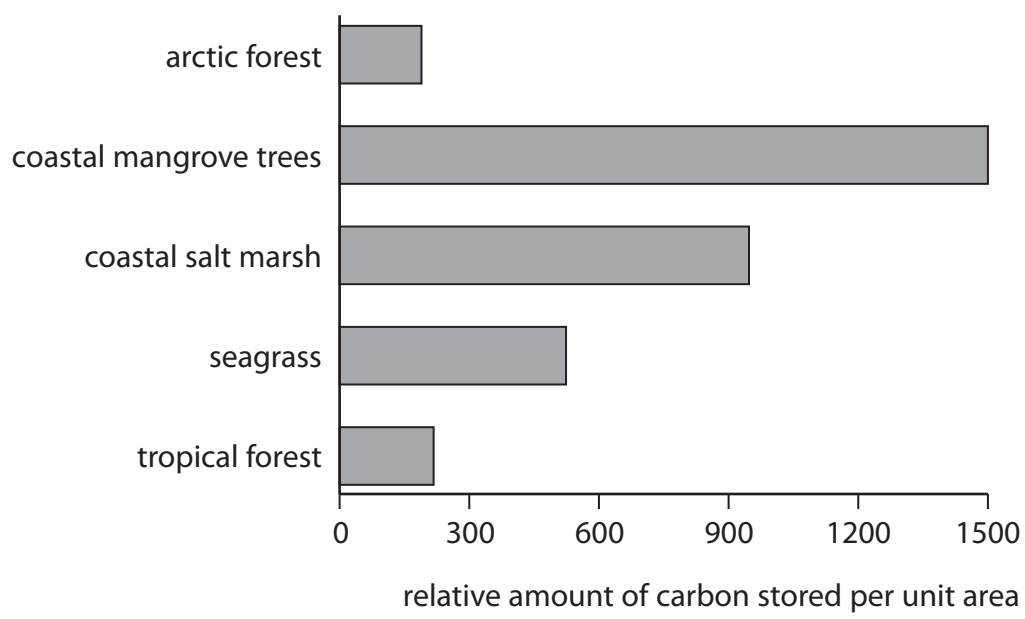


Figure 3

It has been suggested that preserving coastal ecosystems is more effective than reforestation in the mitigation of climate change.

Describe how the data in Figure 3 supports this suggestion.

(2)

.....

.....

.....

.....

(Total for Question 2 = 9 marks)



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

BLANK PAGE



3 (a) (i) Most hydrocarbons found in fossil fuels are members of the alkane homologous series.

State **two** features of an homologous series.

(2)

1

2

(ii) Which molecule is in the same homologous series as CH_4 ?

(1)

A C_5H_{20}

B C_6H_{12}

C C_8H_{18}

D C_9H_{16}

(b) A fossil fuel contains carbon and sulfur.

Explain how the products of the complete combustion of this fossil fuel would affect the environment.

(4)

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

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



(c) Incomplete combustion of fuels may produce carbon monoxide.

Write the balanced equation for the incomplete combustion of heptane, C_7H_{16} , where all of the carbon atoms form carbon monoxide.

(2)

(Total for Question 3 = 9 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



- 4 (a) Damp iron wool reacts with oxygen in the air.
A student uses the apparatus in Figure 4 to investigate the percentage of oxygen in the atmosphere.

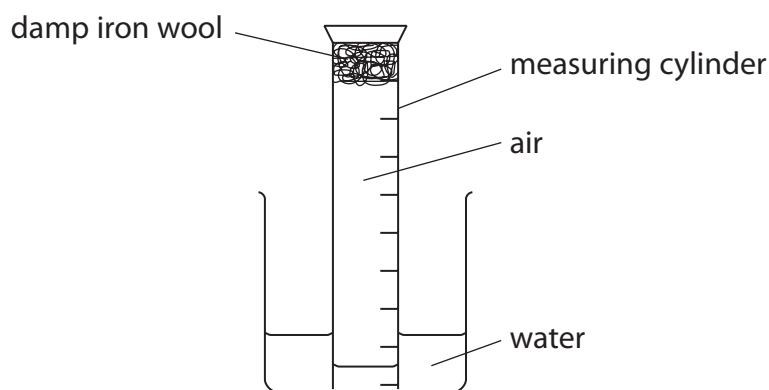


Figure 4

- (i) The initial volume of air in the measuring cylinder was 18.0 cm^3 .

The student left the apparatus overnight.

The volume of gas in the measuring cylinder the next day was 14.5 cm^3 .

To the nearest whole number, what percentage of the air has reacted with the iron wool?

(1)

- A 19%
- B 21%
- C 24%
- D 81%

- (ii) Describe **one** improvement the student could make to this method to ensure that all of the oxygen in the measuring cylinder has reacted.

(2)

.....

.....

.....

.....

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

- (b) (i) When hydrocarbon fuels are burned, the products are water and carbon dioxide.

Describe what needs to be done to the apparatus in Figure 5 to collect the water and show that carbon dioxide has been produced.

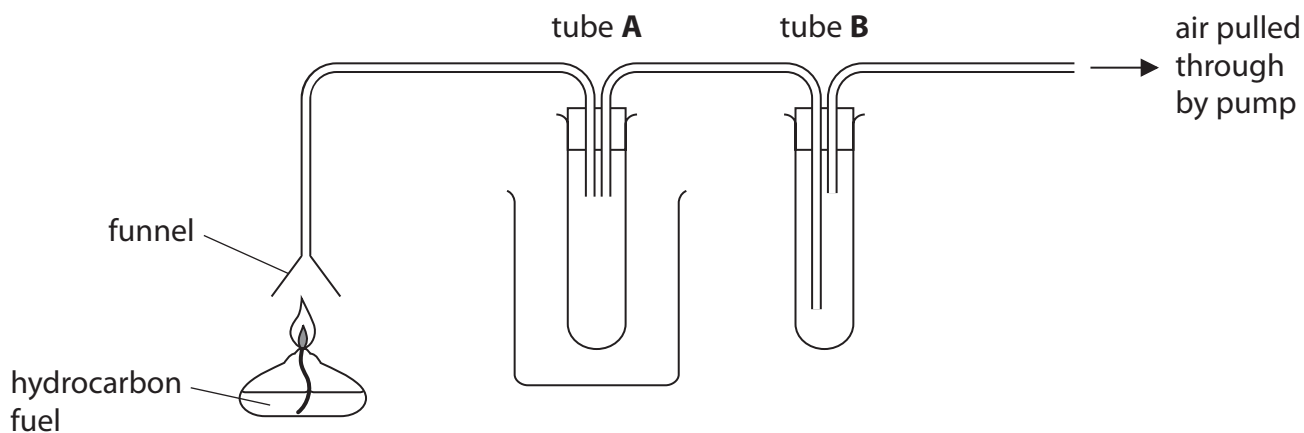


Figure 5

(2)

.....

.....

.....

.....

- (ii) A hydrocarbon, C_xH_y , is burned in excess oxygen, forming 26.4 g of carbon dioxide and 5.4 g of water.

The relative formula mass of C_xH_y is 78.

Calculate the molecular formula of the hydrocarbon C_xH_y .

(relative atomic masses: H = 1.0, C = 12;
relative formula masses: $H_2O = 18$, $CO_2 = 44$)

(4)

.....

.....

.....

.....

.....

molecular formula =

(Total for Question 4 = 9 marks)



- 5 (a) The relative atomic mass of argon is 40 and the relative atomic mass of potassium is 39 but potassium appears after argon in the periodic table.

State why potassium appears after argon in the periodic table.

(1)

- (b) Potassium reacts with water to form two products.

- (i) Give the formulae of both products.

(1)

..... **and**

- (ii) The reaction of potassium with water is exothermic.

On Figure 6, draw and label the reaction profile diagram for this reaction, labelling the activation energy.

(2)

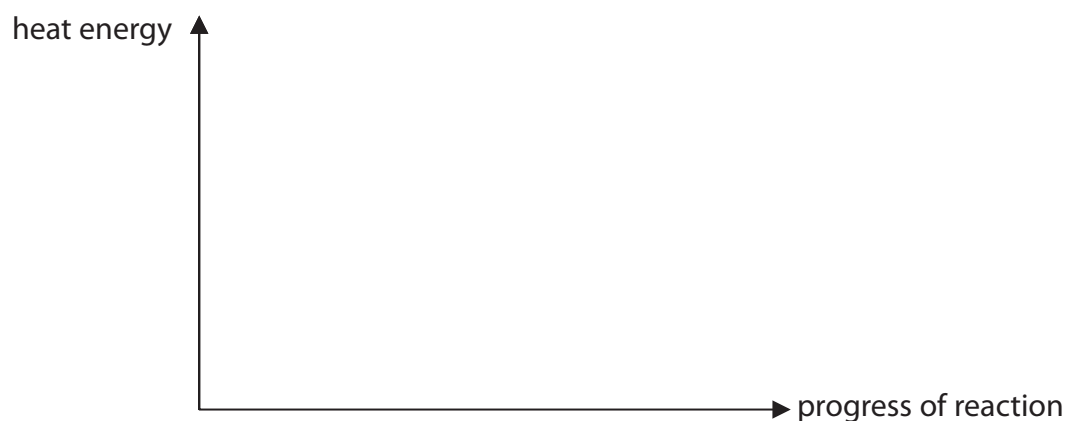


Figure 6



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(c) Some reactions are endothermic.

Explain, in terms of bond breaking and bond forming, why some reactions are endothermic.

(3)

.....

.....

.....

.....

.....

.....



(d) Ethene reacts with hydrogen chloride.

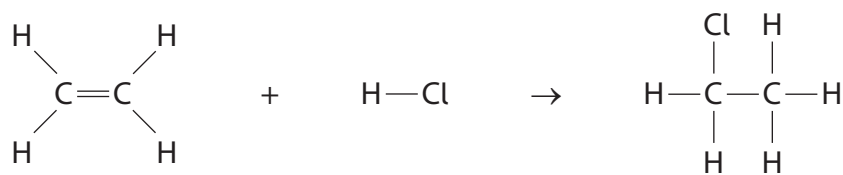


Figure 7 shows the bond energies for the different bonds in the three molecules in the reaction.

bond	bond energy in kJ mol^{-1}
C—H	412
C=C	612
C—C	348
H—Cl	431
C—Cl	338

Figure 7

Calculate the energy change for this reaction.

(4)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

energy change = kJ mol^{-1}

(Total for Question 5 = 11 marks)



6 The elements in group 7 of the periodic table are the halogens.

(a) Which row shows the colour and physical state of iodine at room temperature?

(1)

	colour	physical state
<input type="checkbox"/> A	dark grey	solid
<input type="checkbox"/> B	red brown	liquid
<input type="checkbox"/> C	green	solid
<input type="checkbox"/> D	purple	gas

(b) Iron wool is heated with bromine vapour as shown in Figure 8.

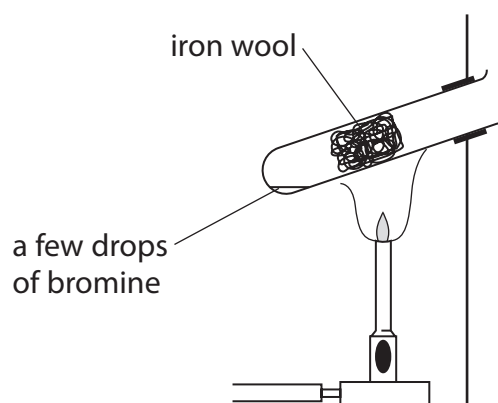


Figure 8

At the end of the reaction, a solid forms at the top of the test tube.

Identify the solid.

(1)

(c) Aluminium reacts with bromine.

Write the balanced equation for the reaction between aluminium and bromine.

(3)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Large writing area with horizontal dotted lines.



P 7 4 4 4 5 A 0 1 7 2 0

(ii) Explain why the displacement reactions of halogens are redox reactions.

(2)

.....

.....

.....

.....

(Total for Question 6 = 13 marks)

TOTAL FOR PAPER = 60 MARKS

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

BLANK PAGE



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

BLANK PAGE



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

Tuesday 11 June 2024

Paper
reference

1SC0/2CH

Combined Science

PAPER 5

Higher Tier

Periodic Table Insert

Do not return this Insert with the question paper.

Turn over ►

P74445A

©2024 Pearson Education Ltd.
F:1/1/1/1/1/1/1/



P 7 4 4 4 5 A



Pearson

The periodic table of the elements

1	2	3	4	5	6	7	0										
7 Li lithium 3	9 Be beryllium 4	11 Na sodium 11	12 Mg magnesium 12	13 Al aluminium 13	14 Si silicon 14	15 P phosphorus 15	16 S sulfur 16	17 Cl chlorine 17	18 Ar argon 18								
19 K potassium 19	20 Ca calcium 20	21 Sc scandium 21	22 Ti titanium 22	23 V vanadium 23	24 Cr chromium 24	25 Mn manganese 25	26 Fe iron 26	27 Co cobalt 27	28 Ni nickel 28	29 Cu copper 29	30 Zn zinc 30	31 Ga gallium 31	32 Ge germanium 32	33 As arsenic 33	34 Se selenium 34	35 Br bromine 35	36 Kr krypton 36
37 Rb rubidium 37	38 Sr strontium 38	39 Y yttrium 39	40 Zr zirconium 40	41 Nb niobium 41	42 Mo molybdenum 42	[98] Tc technetium 43	44 Ru ruthenium 44	45 Rh rhodium 45	46 Pd palladium 46	47 Ag silver 47	48 Cd cadmium 48	49 In indium 49	50 Sn tin 50	51 Sb antimony 51	52 Te tellurium 52	53 I iodine 53	54 Xe xenon 54
55 Cs caesium 55	56 Ba barium 56	57 La* lanthanum 57	72 Hf hafnium 72	73 Ta tantalum 73	74 W tungsten 74	75 Re rhenium 75	76 Os osmium 76	77 Ir iridium 77	78 Pt platinum 78	79 Au gold 79	80 Hg mercury 80	81 Tl thallium 81	82 Pb lead 82	83 Bi bismuth 83	84 Po polonium 84	85 At astatine 85	86 Rn radon 86

1	H hydrogen 1
---	---------------------------

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.

