Please check the examination details below before entering your candidate information

Candidate surname	Other names

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

Centre Number | Candidate Number

Time 1 hour 10 minutes

Paper reference **1SC0/2CF**

Combined Science

PAPER 5

Foundation Tier

You must have:
Calculator, ruler

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.
- There is a periodic table on the back cover of the paper.

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.
- Good luck with your examination.

Turn over ▶

P66628A

1/1/1/

P 6 6 6 2 8 A 0 1 2 0

Pearson

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 Magnesium reacts with dilute sulfuric acid to form magnesium sulfate and hydrogen gas.

A student wants to find out the effect of temperature on the rate of this reaction.

The student used the following method.

step 1 pour 25 cm^3 of dilute sulfuric acid into a conical flask
step 2 warm the acid until its temperature is 30 °C
step 3 add a piece of magnesium to the acid
step 4 start a stopwatch
step 5 wait until the reaction has finished
step 6 stop the stopwatch
step 7 repeat steps 1–6 but at 50 °C.

(a) The student kept the volume of sulfuric acid the same when they repeated the method at 50 °C.

State two other variables that should be kept the same.

(2)

1 concentration of acid (1)

2 {size / shape / surface area / length} area of magnesium ribbon (1)

(b) Which piece of equipment can be used to find the volume of 25 cm^3 of sulfuric acid?

(1)

☒ **A** balance

☒ **B** measuring cylinder

☒ **C** ruler

☒ **D** thermometer

(c) State how the student will know that the reaction has finished.

(1)

magnesium has gone / no more bubbles

(d) The reaction at 50 °C was faster than the reaction at 30 °C.

Give **one** reason, in terms of particles, why the reaction at 50 °C was faster than the reaction at 30 °C.

(1)

(particles) have more energy / (particles) collide more frequently / more successful collisions

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

(e) At 50 °C, 15.0 cm^3 of gas was produced during the first 60 seconds of the reaction.

Calculate the average rate of reaction, in $cm^3\ s^{-1}$, for the first 60 seconds of the reaction.

(2)

15.0 (1)
60.0

= 0.25 (1) (cm3 s-1)

average rate of reaction = 0.25 $cm^3\ s^{-1}$

(Total for Question 1 = 7 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 noble gases.

(a) (i) State, in terms of outer shell electrons, why the noble gases are unreactive.

(1)

(outer shell is) full/ complete

(ii) Figure 1 shows an airship, filled with helium, floating above the ground.

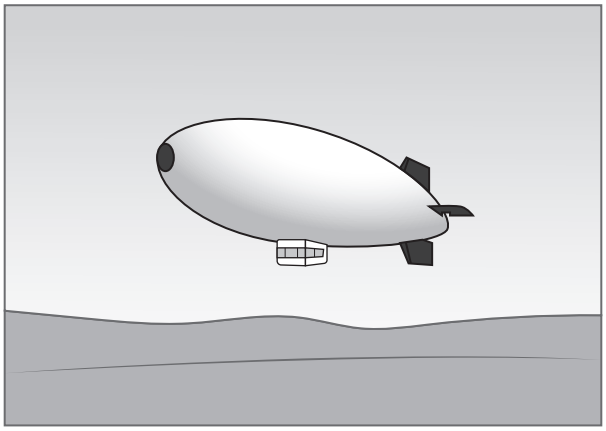


Figure 1

Helium, hydrogen and krypton are gases.
Figure 2 shows the reactivity and density, at room temperature and pressure, of helium, hydrogen and krypton.

gas	reactivity	density in g cm^{-3}
helium	unreactive	0.00018
hydrogen	very reactive	0.00009
krypton	unreactive	0.00380

Figure 2

The density of air is 0.001225 g cm^{-3}.

Helium is used in airships.

Explain why hydrogen and why krypton are **not** used in airships.

(3)

hydrogen is flammable / could ignite (1)

• krypton is more dense than air (1)

• (so krypton) air ship would not float (1)

(b) Mendeleev produced one of the earliest periodic tables.

State why he could **not** include any of the noble gases in his periodic table.

(1)

had yet to be discovered / unknown / did not know about them

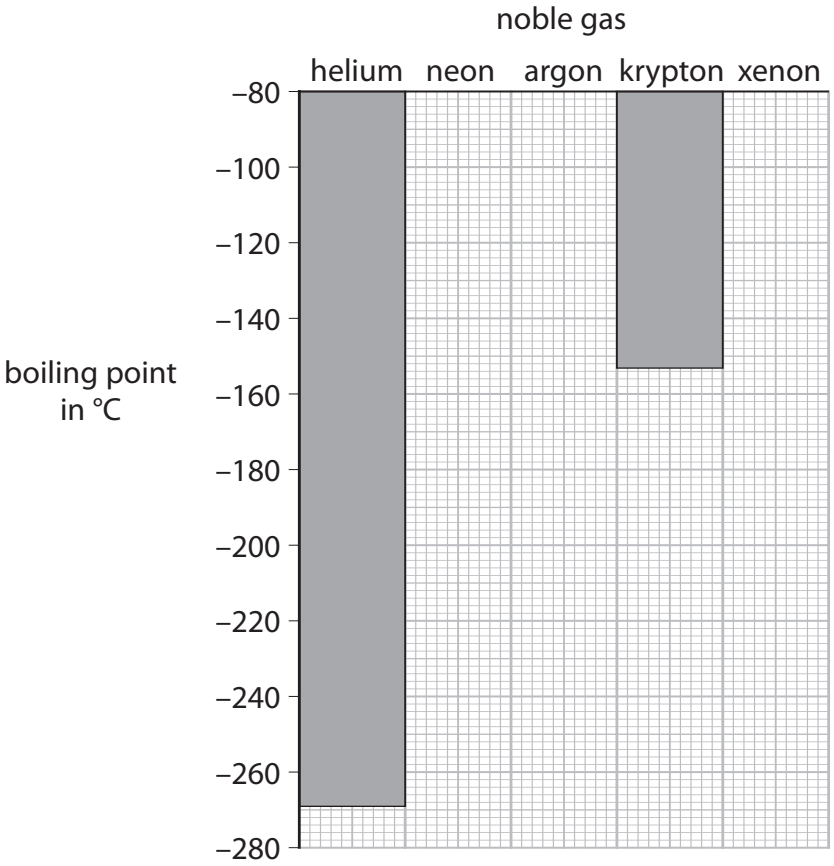
(c) Figure 3 shows the boiling points of some of the noble gases.

noble gas	boiling point in °C
helium	–269
neon	–246
argon	–186
krypton	–153
xenon	

Figure 3

(i) Complete the bar chart to show the boiling points of neon and argon.

(2)



neon bar correct (1)

argon bar correct (1)

(ii) Predict the boiling point of xenon.

(1)

boiling point of xenon = -152 to -90 °C

(Total for Question 2 = 8 marks)

3 Fluorine, chlorine, bromine and iodine are elements in group 7 of the periodic table.

(a) (i) State the name given to the group 7 elements.

(1)

Halogens

(ii) Name one other element that is in group 7.
Use the periodic table on the back of this exam paper to help you.

(1)

astatine

(iii) Which element is liquid at room temperature and pressure?

(1)

- ☒ **A** fluorine
- ☒ **B** chlorine
- ☒ **C** bromine
- ☒ **D** iodine

(iv) Which element is dark grey in colour at room temperature and pressure?

(1)

- ☒ **A** fluorine
- ☒ **B** chlorine
- ☒ **C** bromine
- ☒ **D** iodine

(b) Tin reacts with chlorine to form tin chloride.
A sample of tin chloride contains 1.19 g of tin and 1.42 g of chlorine.

Calculate the empirical formula of this tin chloride.

(relative atomic masses: Cl = 35.5, Sn = 119.0)

You must show your working.

(3)

$\frac{1.19}{119}$ and $\frac{1.42}{35.5}$ (1)

0.01 : 0.04 (1)

SnCl4 (1)

empirical formula of this tin chloride = SnCl4

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(c) Tin also reacts with fluorine.
The reaction between fluorine and tin is much more vigorous than the reaction between chlorine and tin.

Figure 4 shows the electronic configurations of fluorine and chlorine.

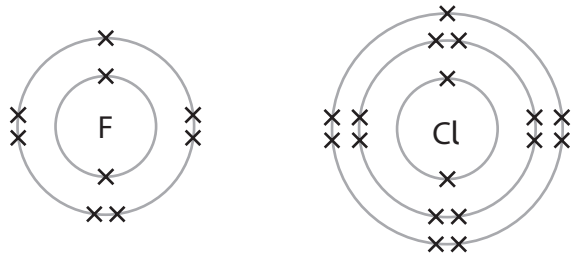


Figure 4

Explain, in terms of their electronic configurations, why fluorine reacts with tin more vigorously than chlorine reacts with tin.

(2)

An explanation linking

fluorine has fewer electron shells
(1)

(so) electron more easily attracted to nucleus (1)

(Total for Question 3 = 9 marks)

BLANK PAGE

4 Figure 5 shows a sample of hydrogen peroxide solution decomposing to form water and oxygen gas.

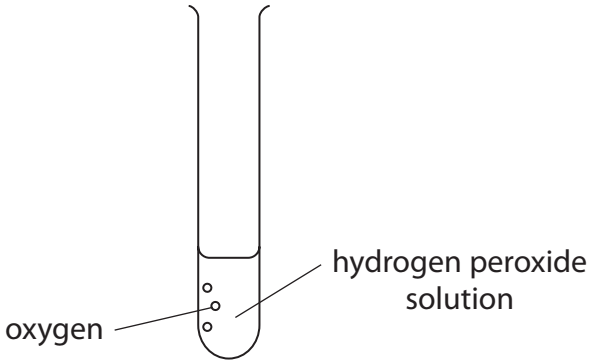


Figure 5

(a) (i) Write the word equation for hydrogen peroxide solution decomposing.

(1)

hydrogen peroxide → water + oxygen

(ii) In this reaction hydrogen peroxide is a solution, water is a liquid and oxygen is a gas.

Draw one straight line from each substance to its correct state symbol.

(2)

substance	state symbol
hydrogen peroxide solution	(aq)
liquid water	(g)
oxygen gas	(l)

(b) Describe the test to show the gas produced is oxygen.

(2)

A description to include glowing splint (1) relights (1)

(c) Figure 6 shows the electron arrangement for an atom of hydrogen and an atom of oxygen.

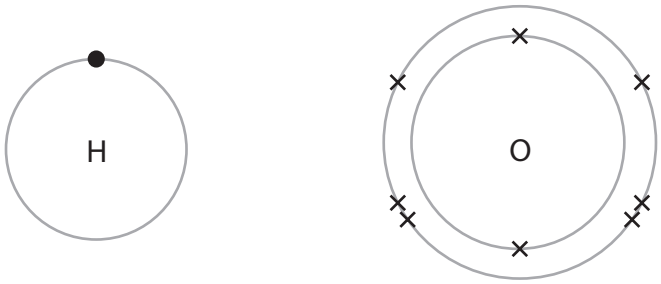


Figure 6

Complete the dot and cross diagram in Figure 7 for a molecule of water, H_2O.

Draw outer shell electrons only.

(2)

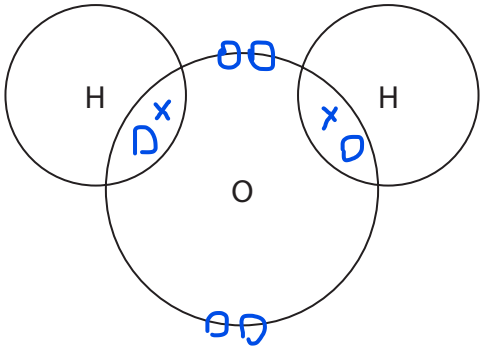


Figure 7

(d) Liver contains the enzyme catalase.

A piece of liver was added to another sample of hydrogen peroxide solution.

Figure 8 shows the results.

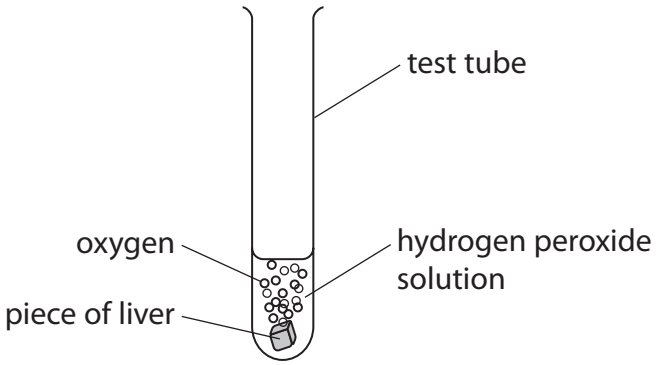


Figure 8

Figure 9 shows a graph of the volume of oxygen produced from the hydrogen peroxide with and without liver.

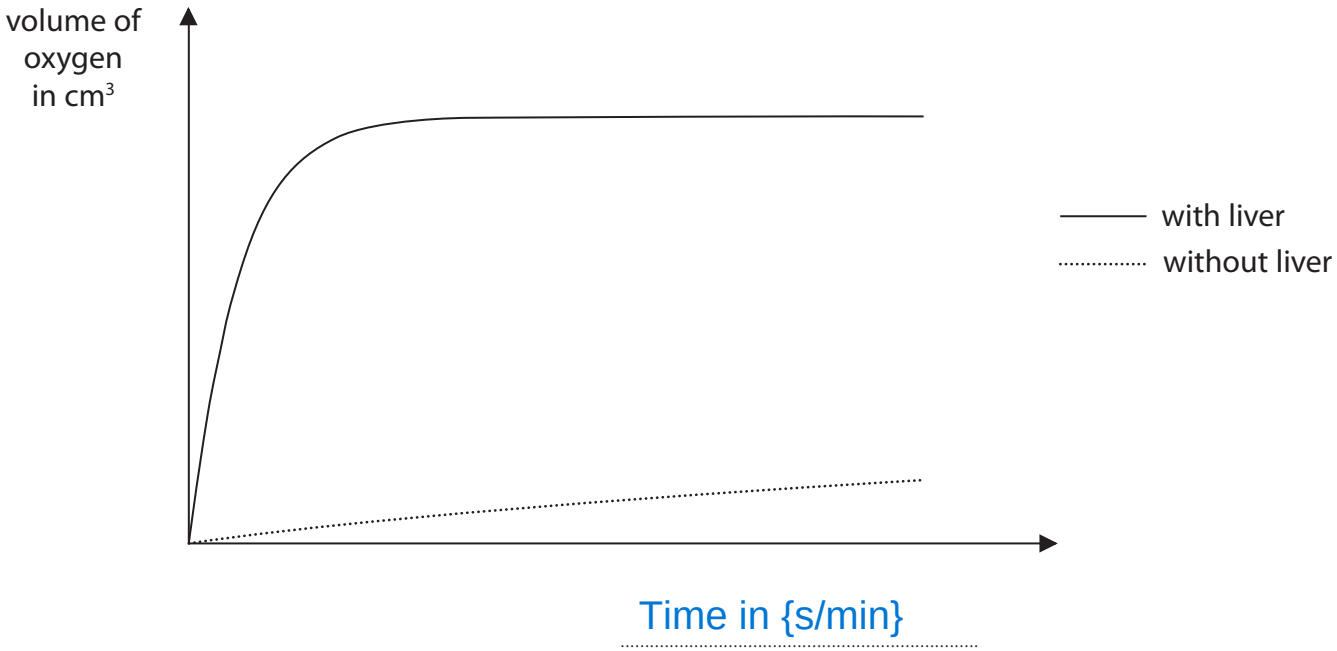


Figure 9

(i) Complete the missing label on the axis of the graph.

(1)

(ii) Describe what the graph shows about the difference in decomposition of hydrogen peroxide with and without liver.

(2)

A description to include reaction is faster with liver (1)

more {gas/oxygen} produced with liver (1)

(iii) Describe how the apparatus in Figure 8 could be modified to find the volume of gas produced when the liver is added to the hydrogen peroxide.

(2)

A description to include

bung and delivery tube (1)

connected to {a gas syringe / upturned burette / upturned measuring cylinder} (1)

(Total for Question 4 = 12 marks)

5 (a) The concentration of a solution can be calculated using the equation

$$\text{concentration of solution} = \frac{\text{mass of solid}}{\text{volume of solution}}$$

A student dissolved 9.25 g of ammonium chloride in water and made up the solution to a volume of 200 cm^3.

Use the equation to calculate the concentration of this solution in g dm^{-3}.

(2)

$\frac{9.25}{200}$ = (0.04625) (1)

0.04625 x 1000 = 46.25 (1)

concentration = 46.25 g dm^{-3}

(b) Dissolving ammonium chloride in water is an endothermic process.
Figure 10 shows part of the reaction profile for this process.

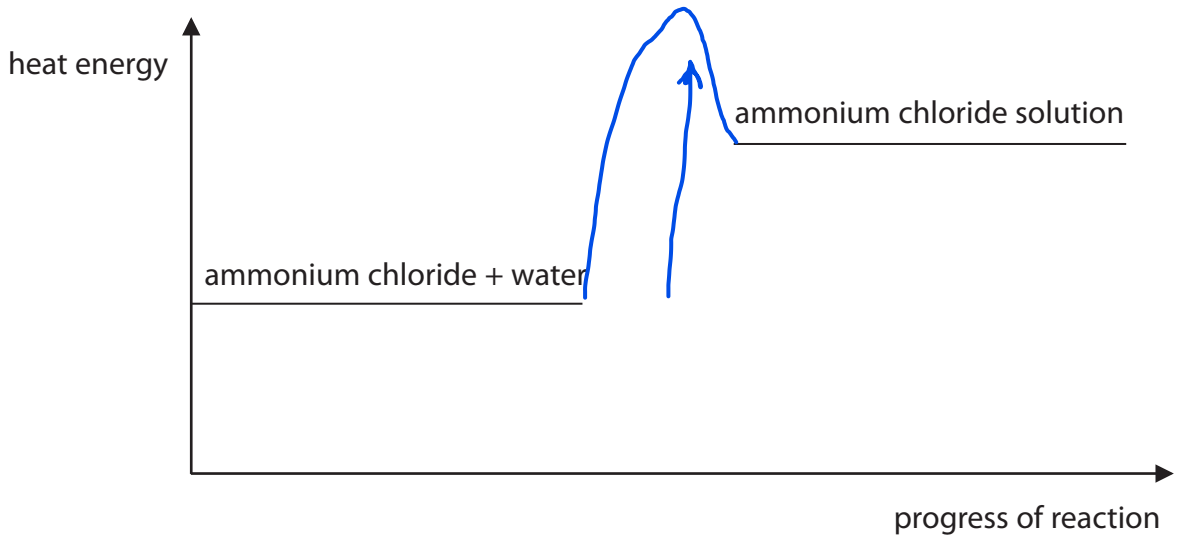


Figure 10

(i) Explain how Figure 10 shows that dissolving ammonium chloride in water is an endothermic process.

(2)

{ammonium chloride solution/product} has more energy than {ammonium chloride solid and water/reactant} / ORA (1)

• heat (energy) has increased / energy change is positive (1)

• (therefore) heat energy has been {absorbed/taken in} (1)

(ii) Complete the reaction profile in Figure 10 and label the activation energy.

(2)

(c) A student used the equipment in Figure 11 to investigate whether electricity can pass through solid ammonium chloride and through ammonium chloride solution.

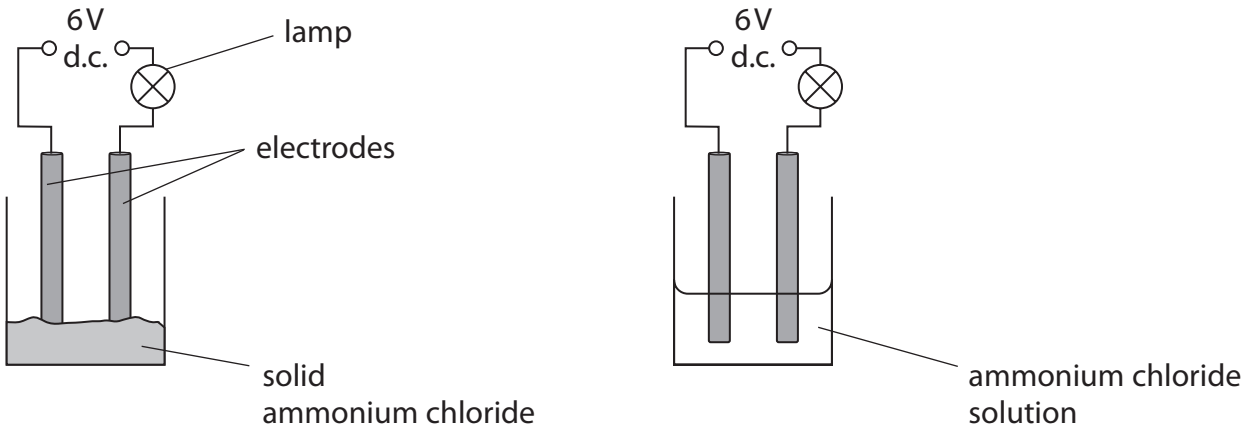


Figure 11

If an electrical current flows in the circuit, the lamp will light up.

Figure 12 shows the results of the investigation.

substance	lamp
solid ammonium chloride	did not light up
ammonium chloride solution	lit up brightly

Figure 12

Explain the results of the investigation.

(3)

An explanation linking

• ammonium chloride solution conducts electricity and solid ammonium chloride does not conduct electricity (1)

• ammonium chloride contains ions (1)

• in solution ions can move / in solid ions cannot move (1)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(d) Ammonia gas is toxic.

(i) Which symbol should be placed on a container of a toxic gas?

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(ii) Give **one** safety precaution that should be taken when working with toxic gases in the laboratory.

(1)

use a fume cupboard

(Total for Question 5 = 11 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

6 Diesel oil is a mixture of hydrocarbons that can be obtained from crude oil.

(a) State the name of the process used to separate diesel oil from crude oil.

(1)

fractional distillation / fractionation (1)

(b) Diesel oil contains alkanes.
These alkanes are part of an homologous series.

Which statement about compounds in this homologous series is true?

(1)

☒ **A** they have the same chemical formula

☒ **B** they have the same empirical formula

☒ **C** they have the same general formula

☒ **D** they have the same molecular formula

(c) When fuels such as diesel oil are burned, the high temperatures produced can cause nitrogen and oxygen in the air to form the pollutant nitrogen dioxide.

Complete the balanced equation for the reaction.

(2)

$N_2 + 2O_2 \rightarrow$ 2NO2

(d) Explain how the greenhouse effect is caused by the gases produced by the complete combustion of diesel oil.

(3)

An explanation linking

• {carbon dioxide / water} produced (1)

• (the gases) absorb heat radiated from earth (1)

re-radiate heat back into the atmosphere (1)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

*(e) Diesel oil can contain impurities of sulfur.
Burning diesel oil containing impurities of sulfur can result in acid rain.
Acid rain is harmful to the environment.

Explain how acid rain is formed and the harm it can do.

(6)

sulfur burns at the same time as the hydrocarbon
- sulfur reacts with oxygen
- sulfur dioxide gas is formed
- sulfur dioxide is an acidic gas
- sulfur dioxide dissolves in clouds
- to form sulfurous acid
- which is then oxidised to form sulfuric acid
- rain water becomes acidic
- acid rain damages buildings / statues
- damages plants/trees
- runs into rivers / waterways
- makes rivers/waterways acidic
- kills fish/insects/waterlife
- increases corrosion of metals

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(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

BLANK PAGE

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

BLANK PAGE

The periodic table of the elements

1	2											3	4	5	6	7	0
							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

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.