NOTICE TO CUSTOMER:

The sale of this product is intended for use of the original purchaser only and for use only on a single computer system. Duplicating, selling, or otherwise distributing this product is a violation of the law ; your license of the product will be terminated at any moment if you are selling or distributing the products.

mock papers 1-foundation

1. Elements are either metals or non-metals.

(a) Put a cross (☒) to show the correct words to complete the sentences.

(i) A sample of magnesium conducts electricity.

This shows magnesium is a

metal ☐

non-metal ☐

solid ☐

(1)

(ii) A sample of carbon in the form of graphite conducts electricity.

This shows that graphite

is a metal ☐

contains free electrons ☐

is a solid ☐

(1)

(iii) One of the following describes a metal.

The metal is

Buckminsterfullerene ☐

the element that is the main part of steel ☐

an element found on the right hand side of the periodic table ☐

(1)

(b) Two elements, a metal and a non-metal react to form the compound with the formula NaCl.
Identify the **two** elements that react.

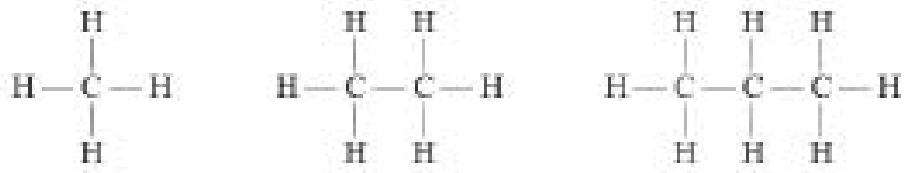
..... and .....

(2)

(Total 5 marks)

Q1

2. The structures of molecules of methane, ethane and propane are



methane ethane propane

(a) Are these substances alkanes, alkenes or polymers?

Put a cross (☒) in the correct box.

alkanes ☐

alkenes ☐

polymers ☐

(1)

(b) What is the formula of a molecule of ethane?

Put a cross (☒) in the correct box.

C_2H_4 ☐

C_2H_6 ☐

C_3H_8 ☐

(1)

(c) Carbon forms many more stable compounds than any other element.
What is the best reason for this?

Put a cross (☒) in the correct box.

each carbon atom forms four stable bonds ☐

carbon is a non-metal ☐

carbon exists as diamond and graphite ☐

(1)

(d) Calculate the relative formula mass of methane, CH_4.
(Relative atomic masses: H = 1, C = 12)

.....

(1)

(e) Bromine water is used to test for alkenes.

(i) What colour is bromine water?

.....

(1)

(ii) When propane gas is bubbled into bromine water, no colour change occurs. Explain why.

.....

.....

(1)

Q2

(Total 6 marks)

3. Luke and Cian were investigating the rate of the reaction of marble chips with dilute hydrochloric acid.
Luke added one marble chip to 50 cm^3 dilute hydrochloric acid at room temperature. He measured the time taken for the reaction to finish.
Cian repeated the experiment, except that he used marble powder instead of a marble chip. The mass of marble was the same in both experiments.

(a) Cian's reaction occurred faster.
Explain why.

.....

.....

(2)

(b) How can Cian make his reaction even faster?

.....

.....

(1)

(c) Potatoes are a common food.

(i) When a potato is eaten, chemical reactions involving enzymes occur as it is digested.
What is an enzyme?

.....

(1)

(ii) Potatoes can be grown using natural fertilisers.
Give an advantage and a disadvantage of using natural fertilisers.

advantage .....

.....

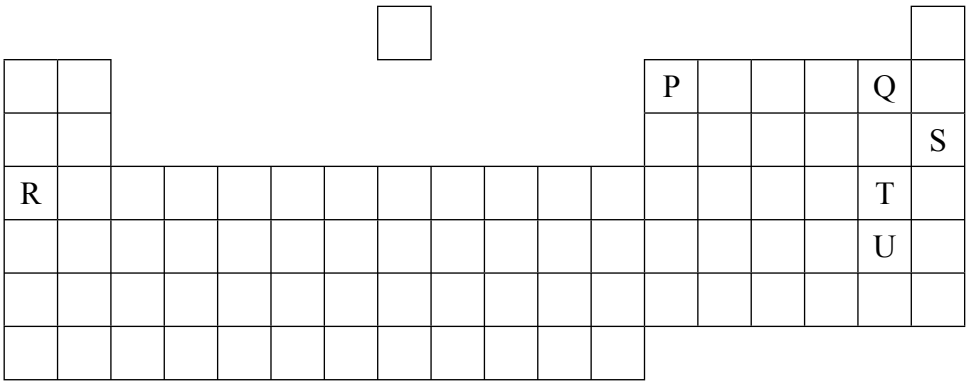
disadvantage .....

.....

(2) **Q3**

(Total 6 marks)

4. The letters P, Q, R, S, T and U show the positions of six elements in the periodic table. The letters are not the atomic symbols of the elements.



Answer each of the following questions by giving one of the letters.
Each letter may be used once, more than once, or not at all.

(a) An element with 3 electrons in the outer shell of its atom .....

(1)

(b) A noble gas .....

(1)

(c) An element whose atom has the electronic configuration 2.8.8.1 .....

(1)

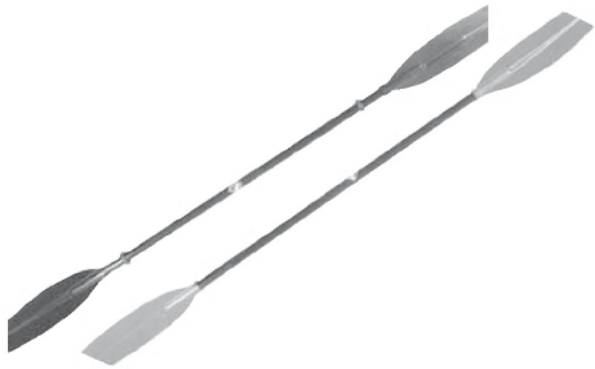
(d) The most reactive element of Q, T and U .....

(1) **Q4**

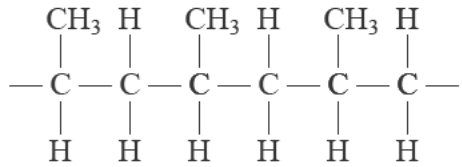
(Total 4 marks)

Leave blank

5. Poly(propene) is an addition polymer with many uses.
Canoe paddles are often made of poly(propene).



Poly(propene) is formed from propene, C_3H_6.
A section of a poly(propene) chain which is formed from three propene molecules is shown.



(a) (i) What is a polymer?

.....

.....

(1)

(ii) Why is poly(propene) described as an **addition** polymer?

.....

.....

(1)

(b) Draw the structure of a propene molecule, C_3H_6, showing all covalent bonds.

(2)

Leave blank

(c) In terms of the covalent bonds, explain how molecules of propene combine to form a poly(propene) molecule.

.....

.....

.....

(2)

(d) Poly(propene) is a thermoplastic.

If the canoe paddle is heated, but not to a temperature at which it burns, its shape changes.
Explain, in terms of its structure, why this happens.

.....

.....

.....

(2)

(e) The following symbol appears on the canoe paddle to show that the poly(propene) can be recycled.

Give one reason why recycling is important.

.....

.....

(1) Q5

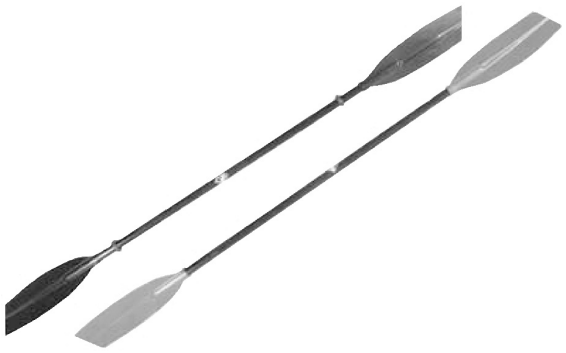
(Total 9 marks)

TOTAL FOR PAPER: 30 MARKS

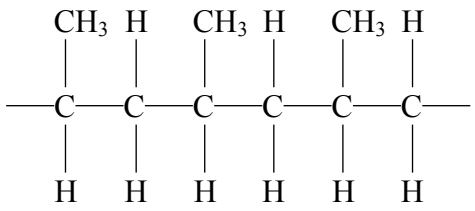
END

mock papers 2-higher

1. Poly(propene) is an addition polymer with many uses.
Canoe paddles are often made of poly(propene).



Poly(propene) is formed from propene, C_3H_6.
A section of a poly(propene) chain which is formed from three propene molecules is shown.



(a) (i) What is a polymer?

.....

.....

(1)

(ii) Why is poly(propene) described as an **addition** polymer?

.....

.....

(1)

(b) Draw the structure of a propene molecule, C_3H_6, showing all covalent bonds.

(2)

(c) In terms of the covalent bonds, explain how molecules of propene combine to form a poly(propene) molecule.

.....

.....

.....

(2)

(d) Poly(propene) is a thermoplastic.

If the canoe paddle is heated, but not to a temperature at which it burns, its shape changes.
Explain, in terms of its structure, why this happens.

.....

.....

.....

(2)

(e) The following symbol appears on the canoe paddle to show that the poly(propene) can be recycled.

Give **one** reason why recycling is important.

.....

.....

(1)

(Total 9 marks)

Q1

2. Sodium and chlorine react to form sodium chloride.

(a) A sodium atom has a mass number of 23 and an atomic number of 11.
Use this information to complete the table to show the number of protons, neutrons and electrons in this atom.
The information for a chlorine atom, mass number 35, atomic number 17, has been provided.

atom	number of protons	number of neutrons	number of electrons
chlorine	17	18	17
sodium			

(2)

(b) (i) Describe, in terms of electron transfer, how a sodium atom and a chlorine atom react to form particles in sodium chloride.

.....

.....

.....

(2)

(ii) Give the name of the type of bonding in sodium chloride.

.....

(1)

(c) Sodium chloride has a high melting point of 801 °C.
Explain why sodium chloride has a high melting point.

.....

.....

.....

(2) **Q2**

(Total 7 marks)

3. The noble gases are in group 0 of the periodic table.

(a) Argon is the most abundant noble gas.
It has been used for many years in lightbulbs.

(i) The atomic number of argon is 18.

Give the electronic structure of an argon atom.

.....

(1)

(ii) State and explain, in terms of the electronic structure, why argon is used in lightbulbs.

.....

.....

.....

(2)

(b) Neon exists as two isotopes.

isotope	atomic number	mass number	abundance (%)
neon-20	10	20	90.9
neon-22	10	22	9.10

Calculate the relative atomic mass of neon to 3 significant figures.

Answer = ...

(2)

Q3

(Total 5 marks)

4. Ammonia, NH_3, is made from nitrogen and hydrogen gases, by the Haber process.
The reaction can reach equilibrium.
The equation for the reaction is

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$

The conditions are a pressure of 150 atmospheres and an iron catalyst at 450 °C.

(a) The boiling point of nitrogen is –196 °C.
Explain why nitrogen has a very low boiling point.

.....

.....

.....

(2)

(b) Draw the dot and cross diagram of a molecule of ammonia, NH_3.
Show the outer shell electrons only.

(2)

(c) The forward reaction is exothermic.

State and explain what would happen to the equilibrium yield of ammonia if a higher temperature of 600 °C were used.

.....

.....

.....

.....

(2)

(d) Explain why a catalyst is used in the process.

.....

.....

.....

(1)

(e) Ammonia reacts with nitric acid to form ammonium nitrate.
Write the balanced equation for this reaction.

.....

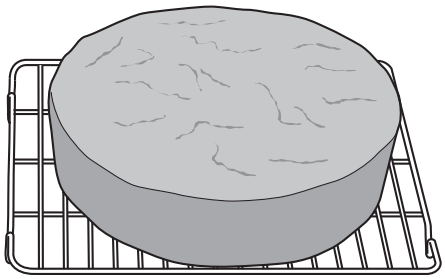
(2) **Q4**

(Total 9 marks)

TOTAL FOR PAPER: 30 MARKS

END

1 Colin baked this cake in an oven.



(a) Baking a cake is a chemical change.

Describe **one** change that happens during a chemical change.

.....

..... **[1]**

(b) Baking powder is added to a cake mixture before it is put in the oven.

Baking powder contains sodium hydrogencarbonate.

Sodium hydrogencarbonate breaks down when heated.

It makes sodium carbonate, carbon dioxide and water.

(i) Write down the **word** equation for the breakdown of sodium hydrogencarbonate.

.....	→	.....	+	.....	+	.....
.....		.....		.....		.....
.....		.....		.....		.....

[1]

(ii) Why is baking powder added to a cake mixture?

..... **[1]**

(iii) Write down how you would test for carbon dioxide gas.

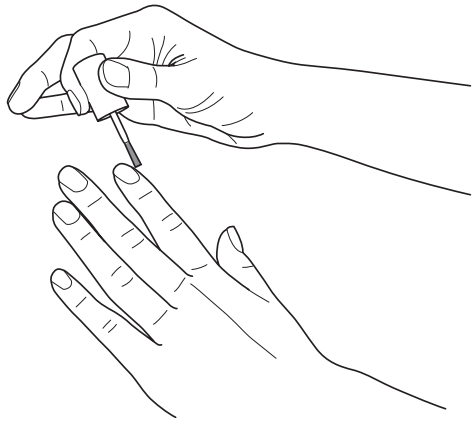
.....

.....

..... **[2]**

[Total: 5]

2 Terri's nails are covered with nail varnish.



She wants to remove the nail varnish.

She uses nail varnish remover.

(a) Complete the following sentences.

Choose words from the list.

dissolve

soluble

solution

solvent

insoluble

solute

Nail varnish is …… in water.

Nail varnish remover contains a …… which dissolves the nail varnish.

[2]

(b) Cosmetic products, like nail varnish, have to be thoroughly tested before they can be used by people.

Explain why.

.....

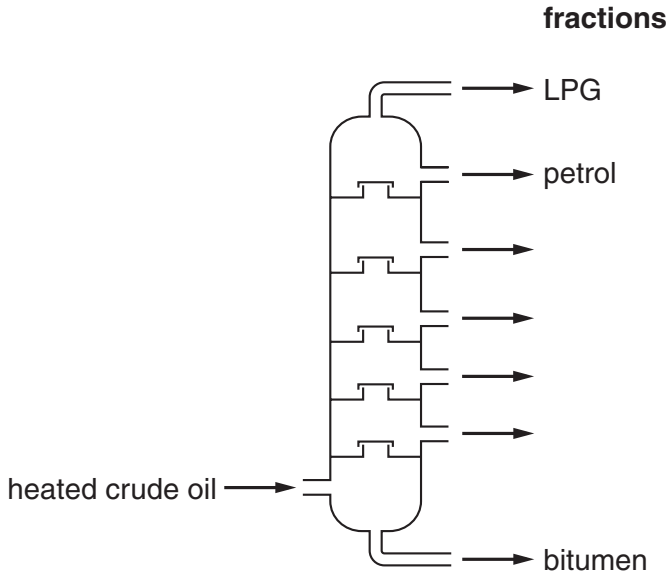
..... **[1]**

[Total: 3]

3 Petrol is separated from crude oil by fractional distillation.

Look at the diagram.

It shows a fractionating column.



(a) Look at the diagram.

LPG, petrol and bitumen are fractions made from crude oil.

Write down the name of **one** other fraction.

..... **[1]**

(b) Complete the sentence.

Petrol separates from other fractions when crude oil is heated.

This is because petrol has a different …… . **[1]**

(c) Fractional distillation does not produce enough petrol.

More petrol needs to be made.

What is the name of the chemical reaction which makes more petrol?

Put a (ring) around the correct answer.

combustion

cracking

decomposition

neutralisation

polymerisation

[1]

(d) Look at the table.

It gives information about the amount of energy released when some fuels burn.

fuel	energy released by one gram of fuel in kJ
biofuels (ethanol)	44.3
hydrogen	143.0
methane	55.6
methanol	22.3
petrol	48.3

One gram of each fuel is burnt.

Which fuel releases the **most** energy?

Use the information in the table.

..... **[1]**

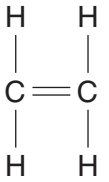
(e) One factor to think about in choosing a fuel is the energy released.

Write down **one** other factor.

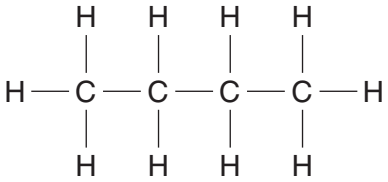
..... **[1]**

[Total: 5]

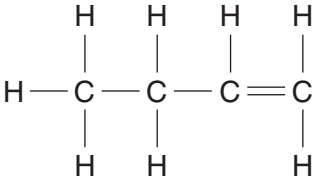
4 Look at the displayed formulas of some compounds.



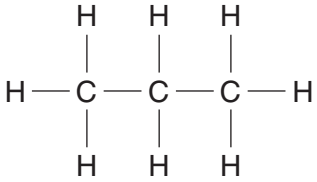
compound **A**



compound **B**



compound **C**



compound **D**

(a) One of the compounds has a molecule with 11 atoms.

Which one?

Choose from **A**, **B**, **C** or **D**.

answer ..... **[1]**

(b) One of the compounds has the molecular formula $\mathbf{C_4H_8}$.

Which one?

Choose from **A**, **B**, **C** or **D**.

answer ..... **[1]**

(c) **A**, **B**, **C** and **D** are hydrocarbons.

Write down the **names** of the two elements in hydrocarbons.

..... and ..... **[1]**

[Total: 3]

5 This question is about polymers.

(a) Look at the table.

The table lists some monomers and polymers.

Complete the table.

Write the name of the monomer or polymer in the space provided.

monomer	polymer
ethene	poly(ethene)
……	poly(propene)
chloroethene	……
styrene	poly(styrene)

[2]

(b) Poly(ethene) is made from ethene in a reaction called polymerisation.

Write about **polymerisation**.

Your answer should include:

- what happens to the ethene molecules
- the conditions needed for polymerisation.

.....

.....

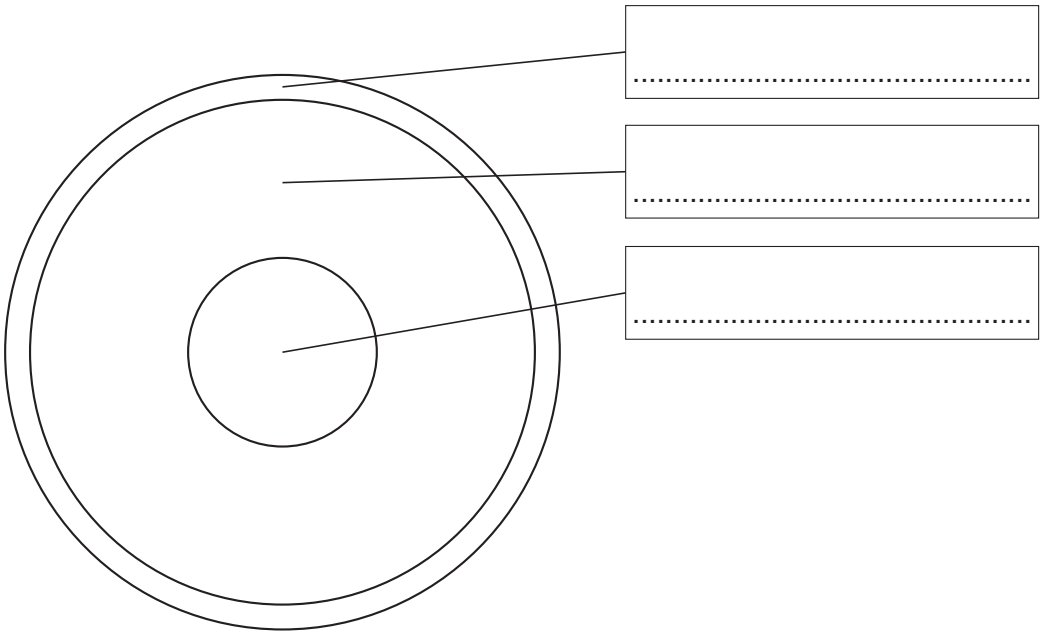
..... **[2]**

[Total: 4]

6 This question is about the Earth.

(a) Look at the diagram.

It shows the structure of the Earth.



Complete the diagram by writing in the correct layers of the Earth.

Choose from the list.

core **crust** **limestone** **mantle** **marble**

[3]

(b) Volcanoes erupt when molten rock escapes through the Earth's surface.

(i) This molten rock is called lava when it is on the Earth's surface.

What is molten rock called when it is **below** the Earth's surface?

..... **[1]**

(ii) It can be very dangerous living near a volcano.

Suggest **one** reason why people **choose** to live near a volcano.

.....

..... **[1]**

[Total: 5]

7 This question is about metals and alloys.

(a) Steel and solder are examples of alloys.

What is an alloy?

.....

..... **[1]**

(b) Write down the names of the **two** main metals in **solder**.

..... and ..... **[2]**

(c) **(i)** Describe an important use of amalgam.

..... **[1]**

(ii) Describe an important use of brass.

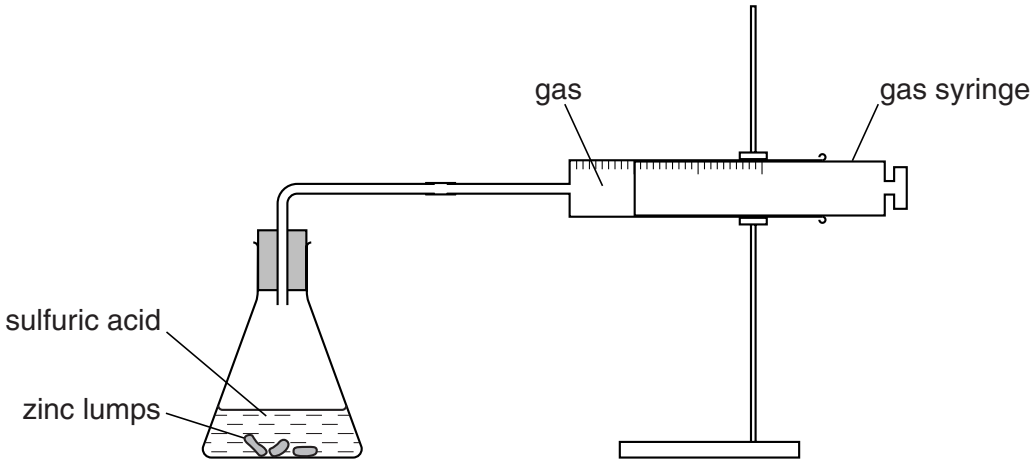
..... **[1]**

[Total: 5]

8 Paul investigates the reaction between sulfuric acid and zinc metal.

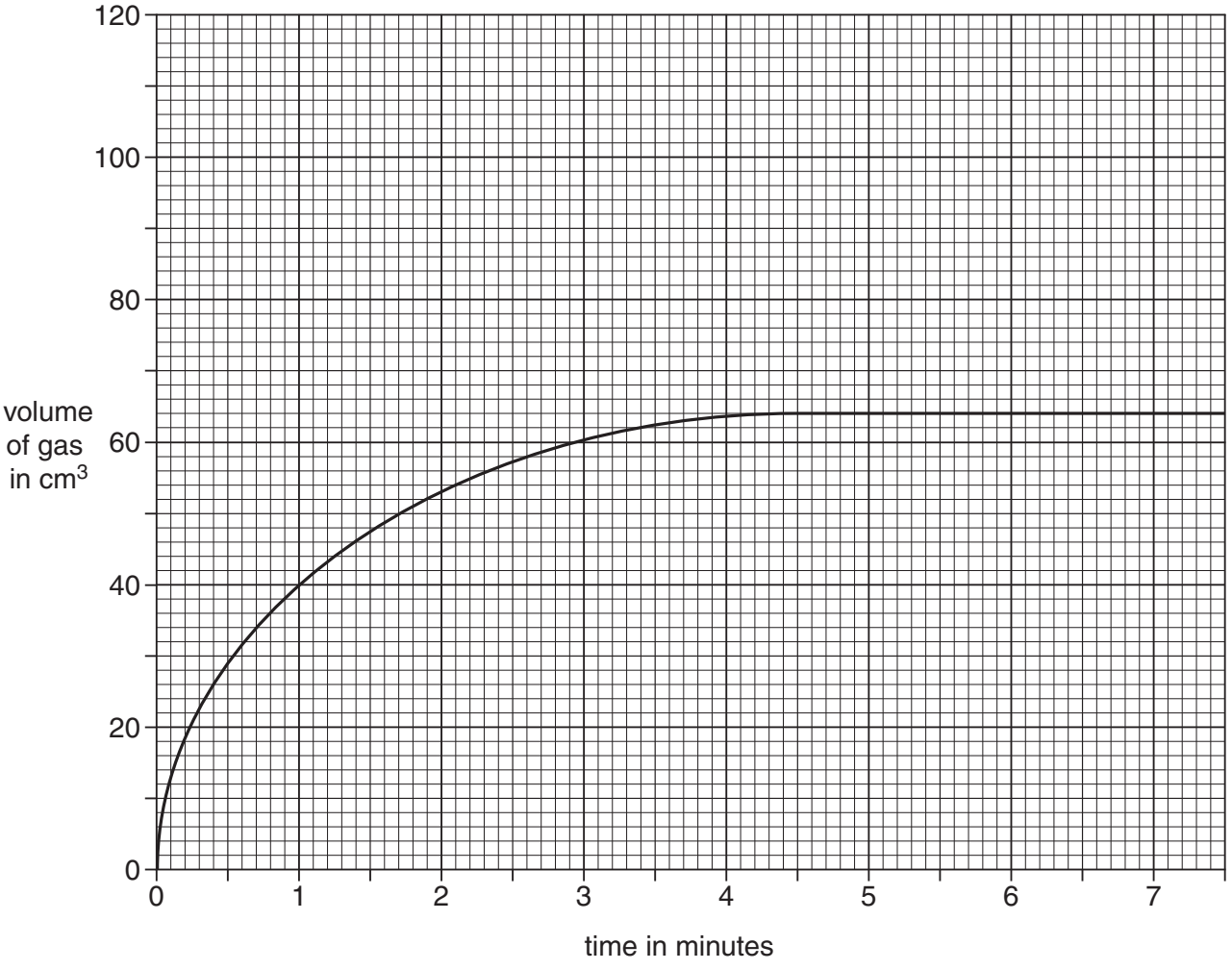
Hydrogen gas and zinc sulfate are made.

Look at the diagram. It shows the apparatus he uses.



He measures the volume of gas in the gas syringe every minute.

Look at the graph. It shows his results.



(a) At what time did the reaction finish?

..... minutes **[1]**

(b) Paul uses a catalyst to speed up the reaction.

He does not change anything else.

Sketch **on the graph** what his new results may look like. **[2]**

(c) This reaction can also be speeded up by using zinc **powder** instead of zinc **lumps**.

Explain why.

.....

..... **[1]**

(d) Paul wants to make the reaction go faster.

This time he does **not** want to use a catalyst or zinc powder.

Describe one **other** way he can make the reaction go faster.

..... **[1]**

[Total: 5]

9 This question is about paints.

(a) Write about some of the reasons why we use paint.

.....

.....

..... **[2]**

(b) Scientists can now make special paints.

Some paints glow in the dark.

Some paints change colour when heated.

Look at the list.

dyes

pigments

phosphorescent

thermochromic

Complete these sentences.

Choose words from the list.

(i) Paints that glow in the dark are …… . **[1]**

(ii) Paints that change colour when heated are …… . **[1]**

(c) Most paints contain a solvent.

What does the solvent do?

..... **[1]**

[Total: 5]

10 Substances have different physical properties.

Draw a straight line to join each **substance** to its correct **physical properties**.

substance	physical properties
carbon dioxide	a grey solid with a high melting point and a good conductor of heat
iron	a colourless gas with a low melting point
sodium chloride	a colourless liquid with a low melting point
water	a white solid that dissolves in water and has a high melting point

[3]

[Total: 3]

11 This question is about the elements in Group 7.

Elements in Group 7 are called halogens.

Chlorine and iodine are two of the elements in Group 7.

(a) Write down the name or symbol of **one other** element in Group 7.

Use the Periodic Table on the back page to help you.

..... **[1]**

(b) One of the halogens is an orange liquid at room temperature.

Which one?

..... **[1]**

(c) One of the halogens is used to sterilise cuts and wounds.

Which one?

..... **[1]**

(d) Look at the balanced symbol equation.

It shows the reaction between sodium and chlorine.

$$2Na + Cl_2 \rightarrow 2NaCl$$

Write down the **name** of the **product** of this reaction.

..... **[1]**

(e) Chlorine will react with a solution of potassium iodide to make potassium chloride.

This is a displacement reaction.

Complete the **word** equation for this displacement reaction.

chlorine	+	potassium iodide	→	....	+	....

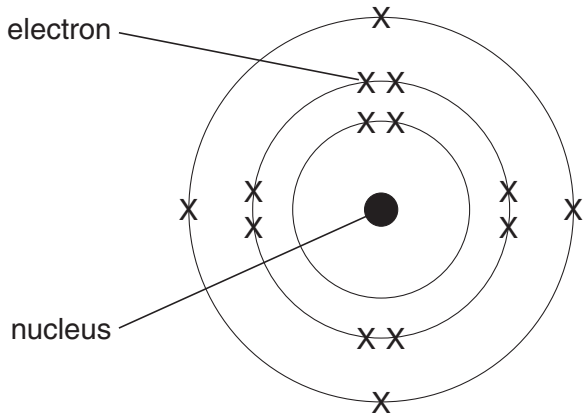
[1]

[Total: 5]

12 This question is about atomic structure.

Look at the diagram.

It shows the electronic structure of an atom.



(a) Atoms contain electrons.

(i) How many electrons are there in this atom?

..... **[1]**

(ii) What is the electrical charge on an electron?

Choose from:

negative **neutral** **positive**

answer ..... **[1]**

(b) The nucleus contains **two** types of particles.

(i) What are the names of these **two** particles?

..... and ..... **[1]**

(ii) What is the electrical charge on the nucleus?

..... **[1]**

(c) Look at the diagram of the electronic structure of an atom.

An element contains atoms with this electronic structure.

Which **group** of the Periodic Table is this element in?

..... **[1]**

[Total: 5]

13 Metals have useful properties.

Look at the table.

It shows some of the properties of five metals.

metal	density in g/cm^3	melting point in °C	relative hardness	relative electrical conductivity	relative thermal conductivity
chromium	7.2	1857	8.5	0.8	0.9
cobalt	8.9	1495	5.0	1.7	1.0
copper	9.0	1085	3.0	6.0	4.1
nickel	8.9	1453	4.0	1.4	0.9
zinc	7.1	420	2.5	1.7	1.2

(a) Which metal has the **lowest** density?

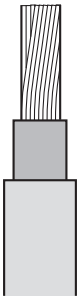
Choose from the table.

..... **[1]**

(b) What is the relative thermal conductivity of **cobalt**?

..... **[1]**

(c) Look at the diagram. It shows an electrical wire.



Copper is the most suitable metal from the table to make electrical wires.

Explain why.

Use information from the table.

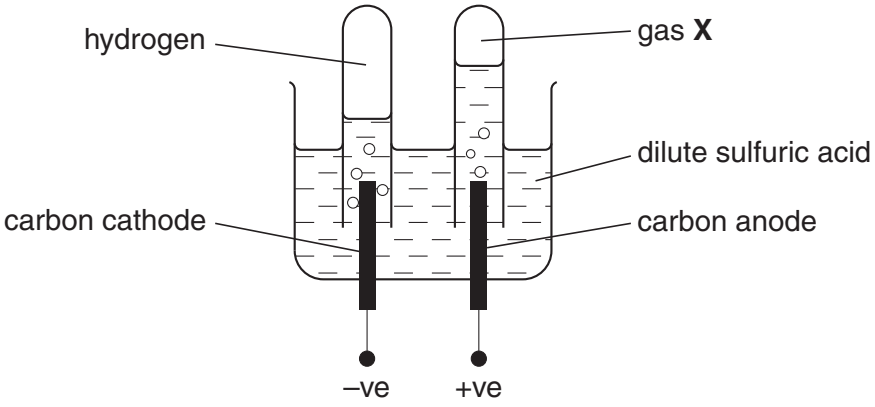
.....

..... **[1]**

[Total: 3]

14 Alwin investigates the electrolysis of dilute sulfuric acid.

Look at the apparatus he uses.



(a) Look at the list. It shows the particles in dilute sulfuric acid.

H^+

H_2O

OH^-

SO_4^{2-}

Choose a particle which is an anion and attracted to the carbon anode.

Choose from the list.

answer ..... **[1]**

(b) The electrolysis of sulfuric acid makes two gases.

One gas is hydrogen. The other is gas **X**.

Write about how you can test for these two gases.

Include in your answer

- the name of gas **X**
- how you would test for hydrogen and for gas **X**.

.....

.....

.....

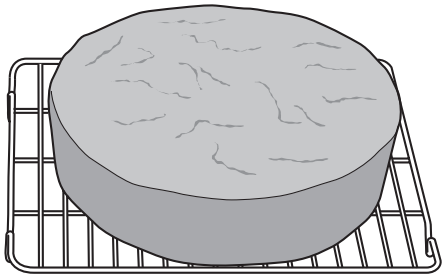
.....

..... **[3]**

[Total: 4]

END OF QUESTION PAPER

1 Colin baked this cake in an oven.



Baking powder is added to a cake mixture before it is put in the oven.

Baking powder contains sodium hydrogencarbonate.

Sodium hydrogencarbonate breaks down when heated.

It makes sodium carbonate, carbon dioxide and water.

(a) Write down the **word** equation for the breakdown of sodium hydrogencarbonate.

.....	→	.....	+	.....	+	.....
.....		.....		.....		.....
.....		.....		.....		.....

[1]

(b) Write down how you would test for carbon dioxide gas.

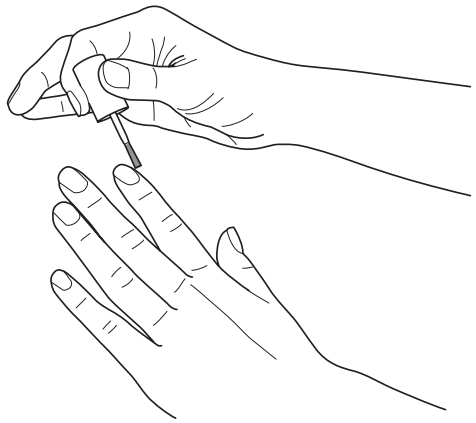
.....

.....

..... **[2]**

[Total: 3]

2 Terri's nails are covered with nail varnish.



She wants to remove the nail varnish.

She uses nail varnish remover.

(a) Water will **not** dissolve the nail varnish.

Explain why.

Use ideas about forces between molecules of nail varnish and molecules of water.

A labelled diagram may help your answer.

.....

.....

.....

..... **[2]**

(b) Cosmetic products like nail varnish have to be tested before they can be used by people.

Describe one **advantage** and one **disadvantage** of using animals for testing.

advantage .....

.....

disadvantage .....

..... **[2]**

[Total: 4]

3 Look at the table.

It gives information about the amount of energy released when some fuels burn.

It also lists some of the products of burning.

fuel	energy released by one gram of fuel in kJ	products of burning
biofuels (ethanol)	44.3	carbon dioxide and water
hydrogen	143.0	water
methane	55.6	carbon dioxide and water
methanol	22.3	carbon dioxide and water
petrol	48.3	carbon dioxide, water and other gases

(a) (i) Petrol can be used to power a car.

Choose **another** fuel from the table that can be used to power a car.

Explain your choice.

Use the information in the table.

name of fuel .....

explanation .....

..... **[1]**

(ii) Two factors to think about in choosing a fuel are the energy released and the products of burning.

Write down **one** other factor.

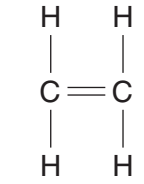
..... **[1]**

(b) Write a balanced **symbol** equation for the complete combustion of methane, CH_4, with oxygen, O_2.

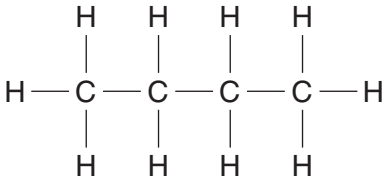
..... **[2]**

[Total: 4]

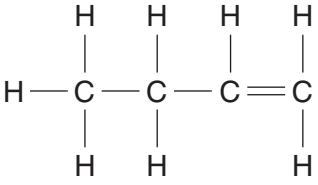
4 Look at the displayed formulas of some compounds.



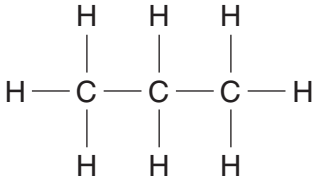
compound **A**



compound **B**



compound **C**



compound **D**

(a) (i) One of the compounds has the molecular formula C_4H_8.

Which one?

Choose from **A**, **B**, **C** or **D**.

answer ..... **[1]**

(ii) Compounds **B** and **D** are described as **alkanes**.

Use the displayed formulas to explain why.

..... **[1]**

(b) Bromine water is used to test for **unsaturation**.

Compound **C** is bubbled through bromine water.

Write down what happens to the orange colour of bromine water.

.....

..... **[1]**

(c) Compound **A** is ethene.

Poly(ethene) is made from ethene in a reaction called polymerisation.

Write about two **conditions** needed for polymerisation.

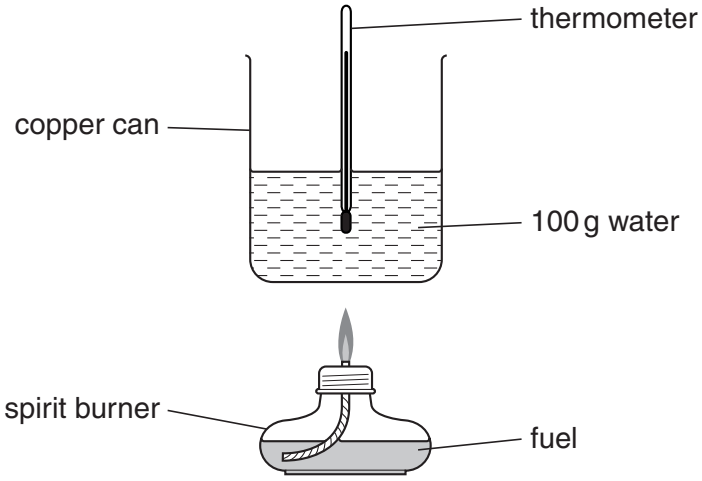
1 .....

2 ..... **[2]**

[Total: 5]

5 Michael and Alison investigate a fuel.

Look at the diagram. It shows the apparatus they use.



(a) They burn 1.0 gram of the fuel.

The temperature of the water increased by 10 °C.

Calculate the energy given out by the fuel.

(Specific heat capacity of water is 4.2 J/g °C.)

energy = mass × specific heat capacity × temperature change

.....

.....

.....

answer ..... J **[2]**

(b) Bond making is an exothermic process.

Exothermic reactions transfer energy to the surroundings as heat.

The burning of fuels is an exothermic reaction.

Explain why.

Use ideas about bond breaking and bond making.

.....

.....

..... **[2]**

[Total: 4]

6 Paul investigates the reaction between sulfuric acid and zinc metal.

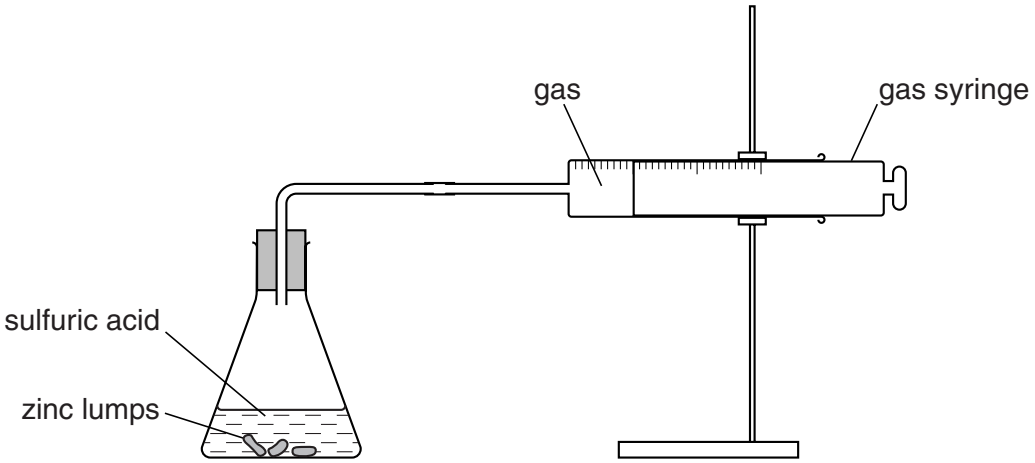
Hydrogen gas and zinc sulfate are made.

(a) Write a **word** equation for the reaction.

..... **[1]**

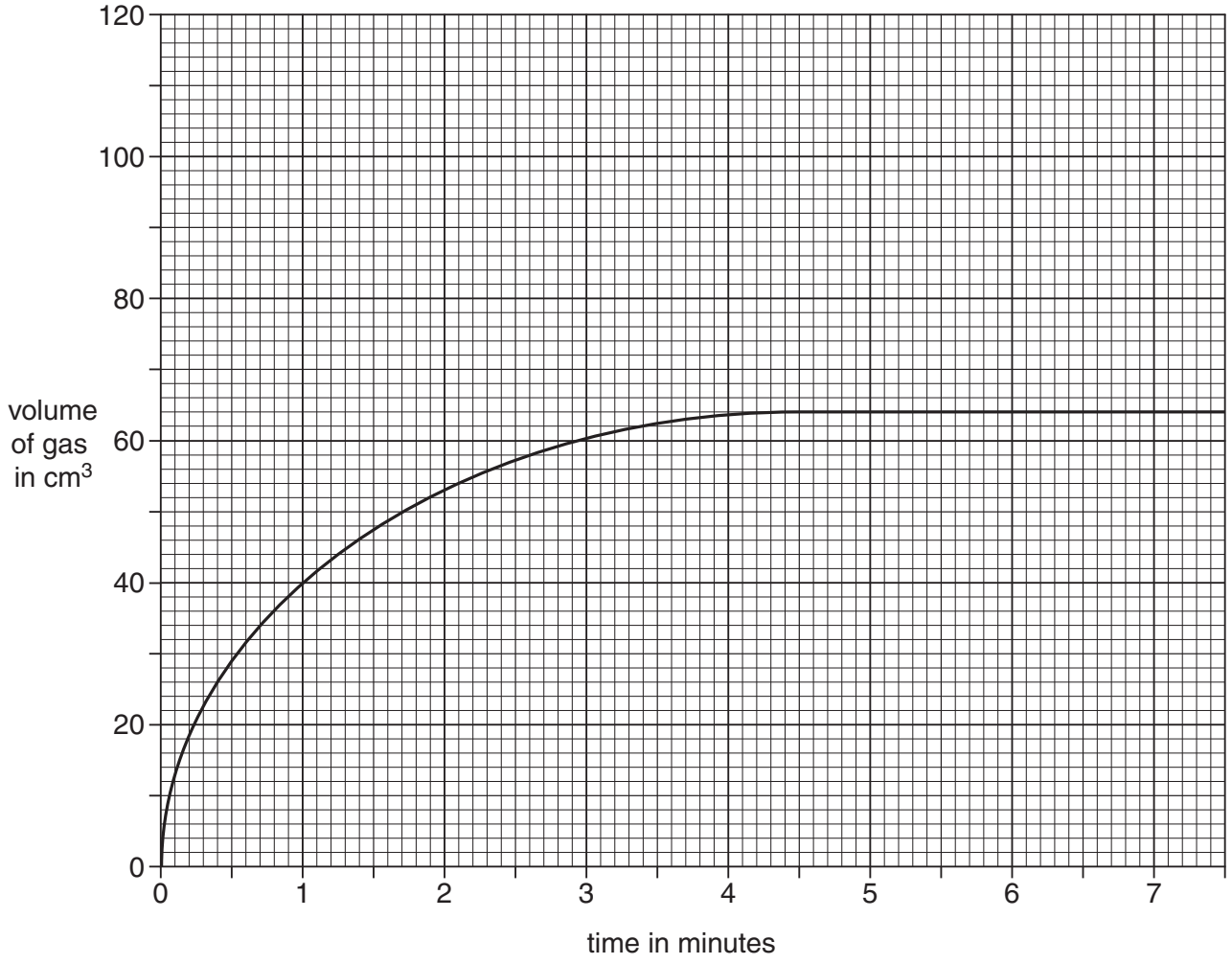
(b) Look at the diagram.

It shows the apparatus he uses.



He measures the volume of gas in the gas syringe every minute.

Look at the graph. It shows his results.



(i) At what time did the reaction finish?

..... minutes **[1]**

(ii) Paul uses a catalyst to speed up the reaction.

He does not change anything else.

Sketch **on the graph** what his new results may look like. **[2]**

(c) This reaction can also be speeded up by using zinc **powder** instead of zinc **lumps**.

Explain why.

.....

..... **[1]**

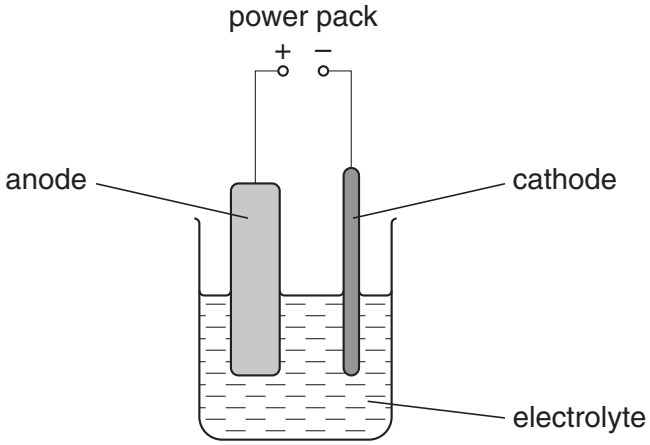
[Total: 5]

7 This question is about copper and alloys.

(a) Impure copper can be purified using electrolysis.

Look at the diagram.

It shows the apparatus used to purify impure copper.



(i) Write down the name of the electrolyte.

..... **[1]**

(ii) What are the electrodes made of?

anode .....

cathode ..... **[1]**

(iii) Describe what happens at each electrode.

.....

..... **[1]**

(b) Copper can be recycled and used in alloys and copper pipes.

Describe one of the problems of recycling copper.

..... **[1]**

(c) Solder is an alloy.

Write down the names of the **two** main metals in solder.

..... and ..... **[2]**

[Total: 6]

8 This question is about the atmosphere.

(a) The air that we breathe is a mixture of gases.

Complete the table to show the percentage composition of the air.

gas	percentage
carbon dioxide	0.04
nitrogen	
other gases	1.0
oxygen	

[2]

(b) Human activity may affect the composition of the air.

(i) Describe how deforestation may change the composition of the air.

.....

..... **[1]**

(ii) Describe how the increased burning of fossil fuels may change the composition of the air.

.....

..... **[1]**

(c) Some scientists believe that many millions of years ago the atmosphere contained mainly ammonia and carbon dioxide.

This atmosphere changed over time to give the composition of the air we have today.

Describe a possible theory to show how this happened.

.....

.....

.....

..... **[3]**

[Total: 7]

9 This question is about oil paints.

Oil paints take a long time to dry.

Explain how oil paints dry.

Use ideas about

- what happens to the solvent
- what happens to the oil molecules.

.....

.....

..... **[2]**

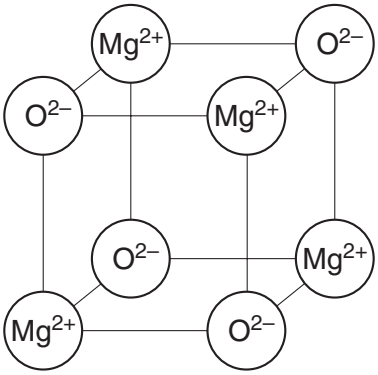
[Total: 2]

10 The physical properties of a substance are related to its structure and bonding.

Magnesium oxide has a high melting point.

Carbon dioxide has a low melting point.

(a) Look at this diagram. It shows part of the giant ionic lattice of magnesium oxide.



Magnesium oxide has a high melting point.

Explain why.

.....

..... **[1]**

(b) Look at this diagram. It shows the displayed formula of carbon dioxide.

$$O = C = O$$

Draw a 'dot and cross' diagram for carbon dioxide.

The electronic structure for carbon is 2, 4 and for oxygen is 2, 6.

[2]

(c) Carbon dioxide has a low melting point.

Explain why.

Use ideas about

- structure
- intermolecular forces.

.....

.....

.....

..... **[2]**

[Total: 5]

11 This question is about the elements in Group 7.

Elements in Group 7 are called halogens.

Two examples of elements in Group 7 are chlorine and iodine.

(a) One of the halogens is an orange liquid at room temperature.

Which one?

..... **[1]**

(b) Look at the balanced symbol equation.

It shows the reaction between sodium and chlorine.

$$2Na + Cl_2 \rightarrow 2NaCl$$

Write down the **name** of the **product** of this reaction.

..... **[1]**

(c) Chlorine will react with a solution of potassium iodide to make potassium chloride.

This is a displacement reaction.

Complete the **word** equation for this displacement reaction.

chlorine	+	potassium iodide	→	....	+	....

[1]

(d) Astatine, At, is another halogen.

It is highly radioactive and so is very difficult to investigate in a laboratory.

A scientist predicts astatine will react with sodium.

Write the balanced **symbol** equation for this reaction.

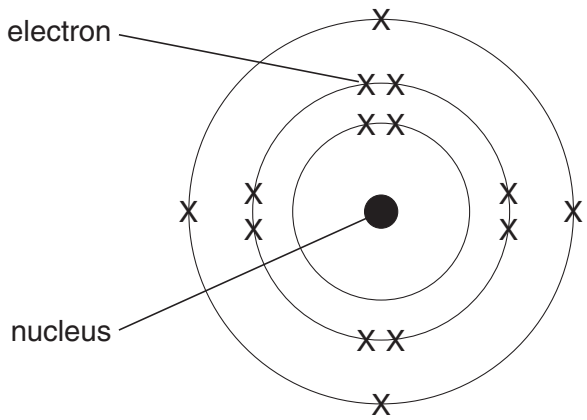
..... **[2]**

[Total: 5]

12 This question is about atomic structure.

Look at the diagram.

It shows the electronic structure of an atom.



(a) The nucleus contains **two** types of particles.

What are the names of these **two** particles?

..... and ..... **[1]**

(b) What is the **atomic number** of this element?

..... **[1]**

(c) Look at the diagram of the electronic structure of an atom.

An element contains atoms with this electronic structure.

(i) Which **group** of the Periodic Table is this element in?

..... **[1]**

(ii) Explain how you can tell that this element is in **Period 3** of the Periodic Table.

.....

..... **[1]**

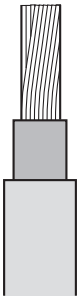
[Total: 4]

13 Metals have useful properties.

Look at the table. It shows some of the properties of five metals.

metal	density in g/cm^3	melting point in °C	relative hardness	relative electrical conductivity	relative thermal conductivity
chromium	7.2	1857	8.5	0.8	0.9
cobalt	8.9	1495	5.0	1.7	1.0
copper	9.0	1085	3.0	6.0	4.1
nickel	8.9	1453	4.0	1.4	0.9
zinc	7.1	420	2.5	1.7	1.2

(a) Look at the diagram. It shows an electrical wire.



Copper is the most suitable metal from the table to make electrical wires.

Explain why.

Use information from the table.

.....

..... **[1]**

(b) Look at the diagram.

This drill bit is used to make holes in metal.

Which metal would be most suitable to make a drill bit?

Choose from the table. Explain your answer.

.....

.....

..... **[2]**

(c) Metals are good electrical conductors.

This is because a charged particle can move.

What is the name of this charged particle?

Choose from:

anion

atom

cation

electron

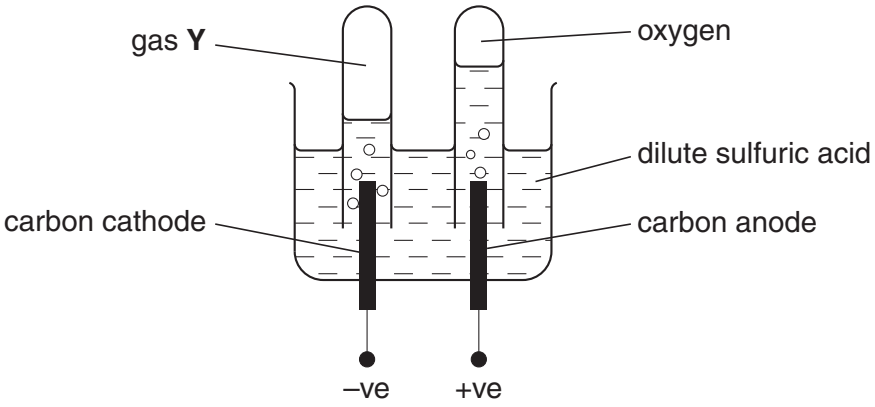
molecule

answer ..... **[1]**

[Total: 4]

14 Alwin investigates the electrolysis of dilute sulfuric acid.

Look at the apparatus he uses.



(a) What is the name of gas **Y** made at the cathode?

..... **[1]**

(b) Look at the list.

It shows the particles in dilute sulfuric acid.

H^+

H_2O

OH^-

SO_4^{2-}

Which particle reacts at the anode to make oxygen?

Choose from the list.

answer ..... **[1]**

[Total: 2]

END OF QUESTION PAPER

1. Many everyday items are made of metals.

(a) Most metals have a high density.

Tick (✓) **two** boxes to show **two** other properties of most metals.

brittle	
good conductor of heat	
low melting point	
shiny	

(2)

(b) The bodies of aircraft are made of aluminium alloys rather than pure aluminium.

(i) What is an alloy?

.....

.....

(1)

(ii) Suggest why the bodies of aircraft are made of aluminium alloys rather than pure aluminium.

.....

.....

(1)

(c) Copper is used to make electrical cables.
Give **two** reasons why copper is used to make electrical cables.

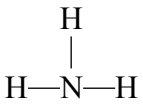
(i) .....

(ii) .....

(2) **Q1**

(Total 6 marks)

2. The diagram shows a molecule of ammonia.



(a) (i) Atoms of two different elements are combined in the molecule of ammonia.
Name one of these elements.

.....

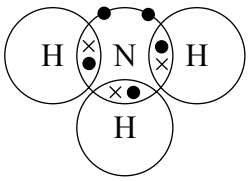
(1)

(ii) What is the molecular formula of ammonia?

.....

(1)

(b) The atoms in the molecule are bonded together by shared pairs of electrons.
The dots and crosses represent electrons.



What type of bond joins atoms in the molecule?

Put a cross (☒) in the correct box to show your answer.

covalent ☒

double ☒

ionic ☒

metallic ☒

(1)

(c) Liquid ammonia has a low boiling point of –33 °C.
Why does ammonia have a low boiling point?

Put a cross (☒) in the correct box to show your answer.

The bonds between the atoms in ammonia are very strong ☒

The bonds between the atoms in ammonia are very weak ☒

The forces between ammonia molecules are strong ☒

The forces between ammonia molecules are weak ☒

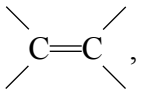
(1) **Q2**

(Total 4 marks)

3. Below is a picture of a tub of low-fat spread.

(a) The low-fat spread contains saturated, monounsaturated and polyunsaturated fats.

Complete the following statements by putting a cross (☒) in the correct box to show your answer.

(i) Fats are classified by the number of carbon-carbon double bonds,  , in one of their molecules.

The number of carbon-carbon double bonds in one molecule of a

	more than one	☒
monounsaturated fat is	one	☒
	zero	☒

(ii) Polyunsaturated fats are less viscous than saturated fats.

This means that, compared with saturated fats,

	are more runny	☒
polyunsaturated fats	have higher melting points	☒
	are more difficult to spread	☒

(iii) A polyunsaturated fat is changed into a saturated fat by reacting it with

hydrogen	☒
nitrogen	☒
oxygen	☒

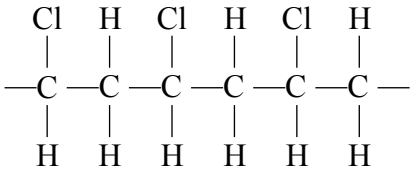
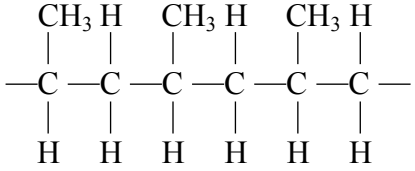
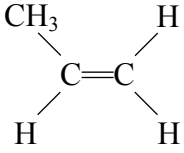
(3)

(b) The tub is made of two polymers.
The bottom part is made of poly(propene) and the lid is made of poly(chloroethene).

A polymer is a large molecule.
A polymer is made when many small molecules of a substance join together.
This substance is called the monomer.

The table below shows information about the two polymers and the small monomer molecules used to make them.

Complete the table.

name of polymer	**structure of polymer**	**name of monomer**	**structure of monomer molecule**
poly(chloroethene)		chloroethene	.....
poly(propene)		.....	

(2)

(c) Describe why problems are caused by plastic tubs in landfill sites.

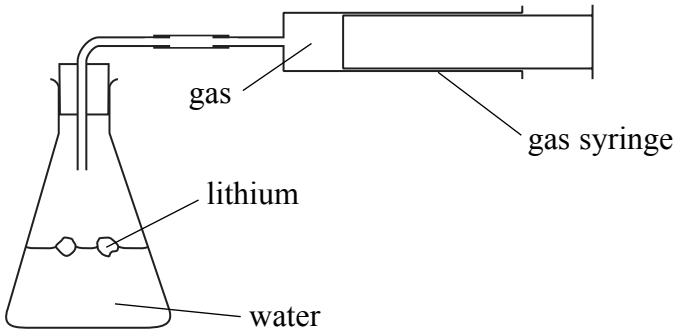
.....

.....

(1) **Q3**

(Total 6 marks)

4. Sarah was investigating the rate of reaction between lithium and water.
She measured out 50 cm^3 of water and poured it into a conical flask.
She dropped two pieces of lithium into the water and connected a gas syringe.



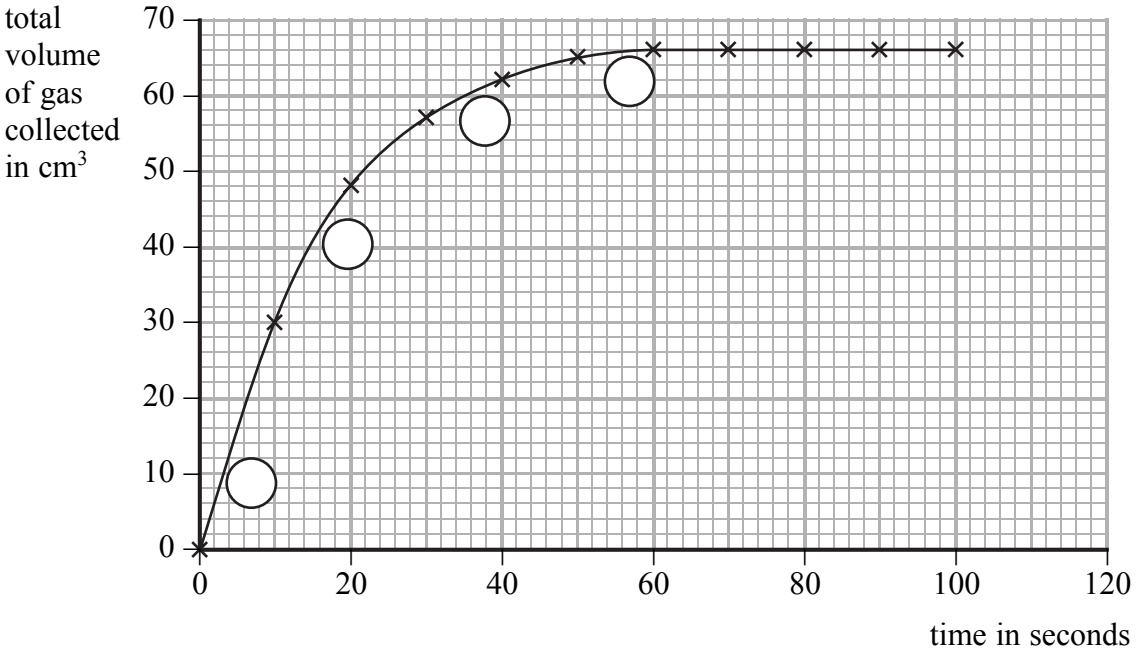
A gas was produced.
Sarah measured the volume of gas collected at various times.

(a) Tick (✓) **two** other pieces of apparatus that Sarah must use in this experiment.

beaker	
measuring cylinder	
stopwatch	
test tube	

(2)

(b) Sarah plotted a graph of her results.



(i) In one of the circles ◯ on the graph, mark 'X' where the reaction was fastest.

(1)

(ii) Sarah took readings for 100 seconds.
Use the graph to find after how long the reaction stopped.

..... seconds

(1)

(c) Sarah wants to make this reaction go faster.
She knows there is no suitable catalyst for the reaction.

State one change that she could make so that the same mass of lithium and the same volume of water would react faster.

.....

.....

(1) **Q4**

(Total 5 marks)

5. Lithium and sodium are reactive metals in the same group of the periodic table.

(a) The lithium atom contains electrons, neutrons and protons.

(i) Describe the position of these particles in the lithium atom.

.....

.....

.....

.....

(2)

(ii) A lithium atom has an atomic number of 3 and a mass number of 7.
State the number of each type of particle in this lithium atom.

..... protons

..... electrons

..... neutrons

(2)

(b) When lithium is heated and put into a gas jar of oxygen, a vigorous reaction takes place.

(i) During the reaction, heat is given out.
What type of reaction is this?

.....

(1)

(ii) The product is lithium oxide.
The lithium oxide contains lithium ions, Li^{+}, and oxide ions, O^{2-}.
Write the formula of lithium oxide.

.....

(1)

(c) The electronic configuration of lithium is 2.1.
Sodium is below lithium in the periodic table and has the electronic configuration 2.8.1.

(i) Describe how the electronic configuration of an atom of an element shows the group and period in which the element appears in the periodic table.

.....

.....

.....

.....

(2)

(ii) Sodium is more reactive than lithium.

Use the electronic configurations of their atoms to explain why.

.....

.....

(1) **Q5**

(Total 9 marks)

TOTAL FOR PAPER: 30 MARKS

END

mock papers 6-higher

1. Lithium and sodium are reactive metals in the same group of the periodic table.

(a) The lithium atom contains electrons, neutrons and protons.

(i) Describe the position of these particles in the lithium atom.

.....

.....

.....

.....

(2)

(ii) A lithium atom has an atomic number of 3 and a mass number of 7.
State the number of each type of particle in this lithium atom.

..... protons

..... electrons

..... neutrons

(2)

(b) When lithium is heated and put into a gas jar of oxygen, a vigorous reaction takes place.

(i) During the reaction, heat is given out.
What type of reaction is this?

.....

(1)

(ii) The product is lithium oxide.
The lithium oxide contains lithium ions, Li^{+}, and oxide ions, O^{2-}.
Write the formula of lithium oxide.

.....

(1)

(c) The electronic configuration of lithium is 2.1.
Sodium is below lithium in the periodic table and has the electronic configuration 2.8.1.

(i) Describe how the electronic configuration of an atom of an element shows the group and period in which the element appears in the periodic table.

.....

.....

.....

.....

.....

(2)

(ii) Sodium is more reactive than lithium.

Use the electronic configurations of their atoms to explain why.

.....

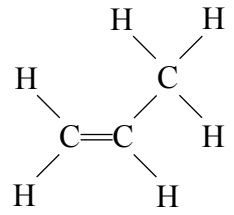
.....

(1)

Q1

(Total 9 marks)

2. The diagram shows one molecule of propene.



(a) What is the molecular formula of propene?

.....

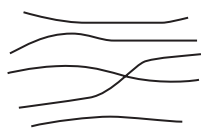
.....

(1)

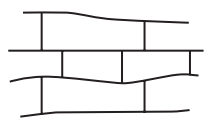
(b) Propene can form the polymer poly(propene).
Draw a diagram to show the part of a poly(propene) chain formed by two propene monomer units.

(2)

(c) The diagrams show the structures of polymer A and polymer B.
One of these is a thermosetting polymer and one is a thermoplastic polymer.



polymer A



polymer B

(i) Identify each polymer as thermosetting or thermoplastic.

Polymer A is .....

Polymer B is .....

(1)

(ii) State how the structure of a thermosetting polymer differs from that of a thermoplastic polymer.

.....

.....

.....

(1)

(d) State one problem caused by disposing of polymers by burning.

.....

.....

.....

(1) **Q2**

(Total 6 marks)

3. Ammonia is manufactured by the Haber process.
The equation for the reaction is

$$N_2 + 3H_2 \rightleftharpoons 2NH_3$$

(a) Calculate the mass of ammonia that would be formed if 1.40 kg of nitrogen reacts completely with excess hydrogen.
(Relative molecular masses: $N_2 = 28.0$; $H_2 = 2.00$, $NH_3 = 17.0$)

.....

.....

.....

Answer = ... kg
(2)

(b) 1.40 kg of nitrogen is left in a sealed container with excess hydrogen.
The container is maintained at a pressure of 200 atm and contains an iron catalyst at 450 °C.
The mixture is left until there is no further increase in the amount of ammonia.
The mass of ammonia formed is much less than the mass calculated in part (a).
Explain why.

.....

.....

.....

.....
(2)

(c) Draw a dot and cross diagram to show the arrangement of electrons in one molecule of ammonia.
Show outer electrons only.

(2)

(d) Ammonia is a simple molecular, covalent substance.
Explain why liquid ammonia has a low boiling point.

.....

.....

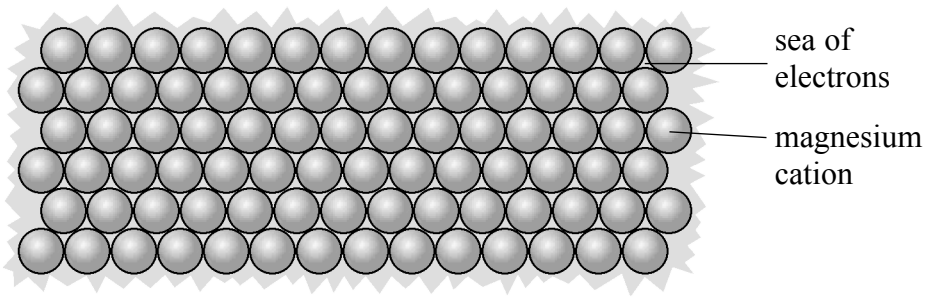
.....

.....

(2) **Q3**

(Total 8 marks)

4. The diagram shows the structure of magnesium metal.



(a) Explain how magnesium metal conducts an electric current.

.....

.....

.....

(1)

(b) When magnesium is added to dilute hydrochloric acid, HCl, it forms hydrogen and a solution of magnesium chloride, $MgCl_2$.

Write the balanced equation for this reaction.

.....

(2)

(c) When the same reaction is repeated but with the acid at a higher temperature, the reaction is faster.

Explain, in terms of particles, why the reaction is faster.

.....

.....

.....

.....

.....

.....

(3)

(d) When molten magnesium chloride is electrolysed, magnesium cations, Mg^{2+}, form magnesium atoms at the cathode.
Complete the half equation for this reaction.

Mg^{2+} + ... ⟶ .....

(1) **Q4**

(Total 7 marks)

TOTAL FOR PAPER: 30 MARKS

END