Q1. Copper is a transition metal.

(a) (i) Where is copper in the periodic table?

Tick (✓) **one** box.

in the central block ☐

in Group 1 ☐

in the noble gas group ☐

(1)

(ii) What is a property of copper?

Tick (✓) **one** box.

breaks easily ☐

conducts electricity ☐

does not conduct heat ☐

(1)

(b) Copper ores are quarried by digging large holes in the ground, as shown in **Figure 1**.

Figure 1



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Give **two** reasons why quarrying is bad for the environment.

.....

.....

.....

.....

(2)

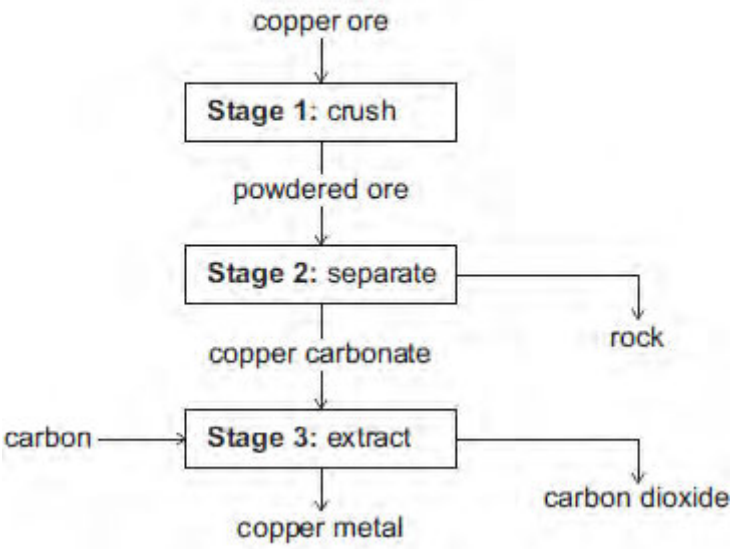
(c) Some copper ores contain only 2% copper.

Most of the ore is rock that is not needed.

In one ore, the main compound is copper carbonate ($CuCO_3$).

Figure 2 shows the stages used in the extraction of copper from this ore.

Figure 2



(i) Why is **Stage 2** important?

.....

.....

(1)

(ii) The equation for the reaction in **Stage 3** is:

$$2\ CuCO_3 + C \longrightarrow 2\ Cu + 3\ CO_2$$

From the symbol equation, a company calculated that 247 tonnes of copper carbonate are needed to produce 127 tonnes of copper and 132 tonnes of carbon dioxide are released.

Calculate the mass of carbon needed to make 127 tonnes of copper.

copper carbonate	+	carbon	⟶	copper	+	carbon dioxide
247 tonnes		..... tonnes		127 tonnes		132 tonnes

.....

.....

(2)

(iii) Suggest **one** reason why it is important for the company to calculate the mass of

reactants in **Stage 3**.

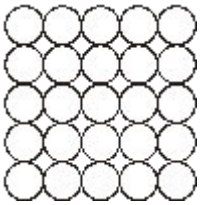
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(1)
(Total 8 marks)

Q2. Iron is the main structural metal used in the world.

(a) The diagram represents the particles in iron, Fe.



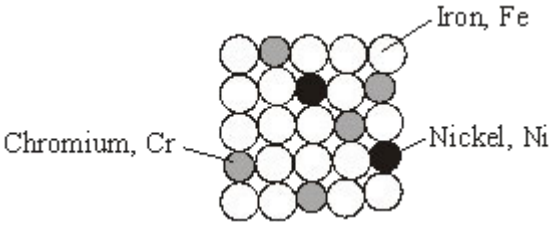
Draw a ring around the correct word in the box to complete the sentence.

Iron is described as an element because all the	atoms compounds metals	are the same.

(1)

(b) Stainless steel is mostly iron.

The diagram represents the particles in stainless steel.



Use the correct words from the box to complete the sentences about alloys.

metal	**mixture**	**molecule**	**polymer**	**smart**	**structure**

Stainless steel is an alloy because it is a ..... of iron, chromium and nickel.

An alloy is made up of more than one type of ..... .

Stainless steel alloys are harder than iron because the different sized atoms added change the ..... .

An alloy that can return to its original shape after being deformed is called a ..... alloy.

(4)

(c) In the UK, we use about 1.8 billion steel cans every year but only 25% are recycled. Used steel cans are worth about £100 per tonne.

Recycling saves raw materials and reduces waste that would end up in landfill. Producing steel by recycling used cans saves 75% of the energy that would be needed to produce steel from iron ore. This also reduces carbon dioxide emissions.

(i) Give **two** reasons, from the information above, to explain why recycling used steel cans is a good idea.

1 .....

.....

2 .....

.....

(2)

(ii) Suggest how the local council could increase the percentage of used steel cans that are recycled.

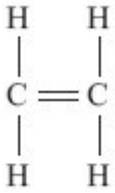
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(1)
(Total 8 marks)

Q3. Crude oil is used to make useful substances such as alkenes and plastics.

(a) The alkene shown is ethene.



(i) Tick (✓) the correct formula for ethene.

Formula	(✓)
CH_4	
C_2H_4	
C_2H_6	

(1)

(ii) Tick (✓) the name of the plastic formed when many ethene molecules join together.

Name of plastic	(✓)
Poly(ethene)	
Poly(ethanol)	
Poly(propene)	

(1)

(b) Read the article about plastics and then answer the questions.

THE PROBLEM WITH PLASTIC WASTE

The UK produces about 3 million tonnes of plastics from crude oil every year.

Most of the litter found on UK beaches is plastic waste.

80% of the plastics produced end up in landfill sites.

The UK recycles only 7% of plastic waste.

(i) Draw a ring around the correct answer in the box to complete the sentence.

Litter that is plastic waste needs to be removed from beaches

because it	decomposes is flammable is not biodegradable	.

(1)

(ii) Suggest a problem caused by 80% of the plastics going to landfill sites.

.....

.....

(1)

(iii) The UK government has set a target to recycle 30% of plastic waste.

How are resources saved by recycling more plastics?

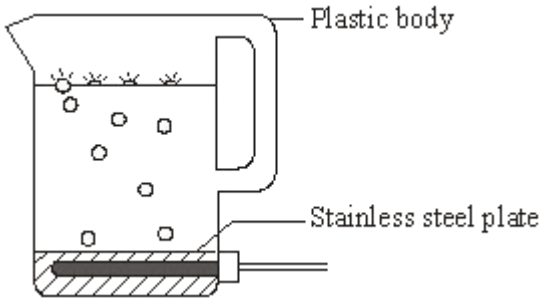
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(1)

(Total 5 marks)

Q4. Plastics are used to make many everyday items, such as the body of the kettle.



(a) Complete the sentences by drawing a ring around the correct words.

(i)	The plastic is made from many small molecules called	catalysts monomers polymers

(1)

(ii) Propene is produced by cracking some of the fractions that are

separated from	crude oil limestone metal ores

(1)

(b) After a few years the kettle no longer worked.

- Some parts of the kettle are made of plastic.

- Some parts of the kettle are made of stainless steel.
- The owner of the kettle disposed of it in a landfill site.

Consider these statements.

Suggest **three** reasons why the kettle should **not** be disposed of in a landfill site.

1 .....

.....

2 .....

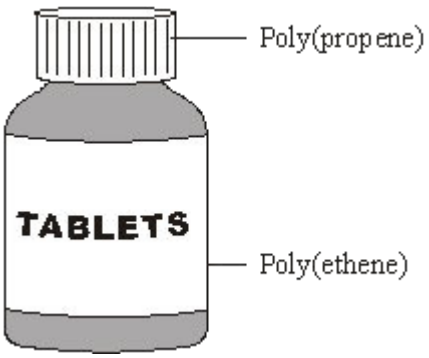
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3 .....

.....

(3)
(Total 5 marks)

Q5. Tablet containers are often made from two different polymers.



(a) Ethene, C_2H_4, and propene, C_3H_6, can be made from crude oil.

(i) Complete the following sentence.

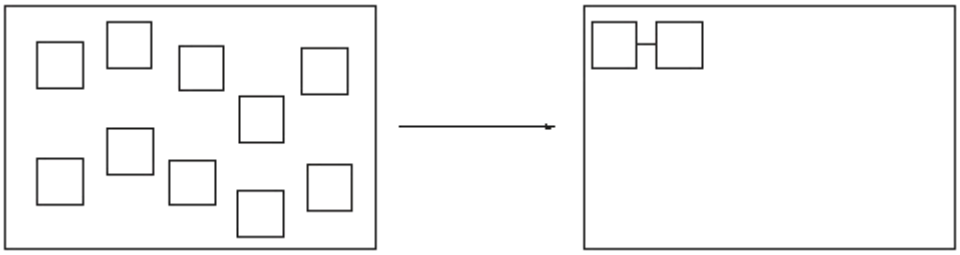
Ethene and propene are called hydrocarbons because they are made up of carbon and ..... atoms only.

(1)

(ii) Ethene molecules are used to form poly(ethene) molecules.

Complete the diagram to show the poly(ethene) molecule.

Ethene molecules **Poly(ethene) molecule**



(2)

(b) The tablet containers could be disposed of in a landfill site or could be recycled.

(i) Suggest **two** reasons why disposing of the tablet containers in a landfill site could cause problems.

1 .....

.....

2 .....

.....

(2)

(ii) Suggest **one** reason why recycling the tablet containers would be difficult.

.....

.....

(1)
(Total 6 marks)

Q6. Polymers are used to make many materials that people need.

(a) Plastic bags are used to carry, protect and store food. Plastic bags are made from polymers.



Plastic bag made from a polymer

(i) Ethene is the small molecule (the monomer) used to make the polymer for this plastic bag.

Name the polymer that is made from ethene.

.....

(1)

(ii) Use the correct word from the box to complete the sentence about ethene.

condensing	**corroding**	**cracking**

Ethene is made by breaking down large hydrocarbon molecules into smaller hydrocarbon molecules by a process called .....

(1)

(iii) The hydrocarbon ethene has the formula C_2H_4

Complete the sentence about ethene.

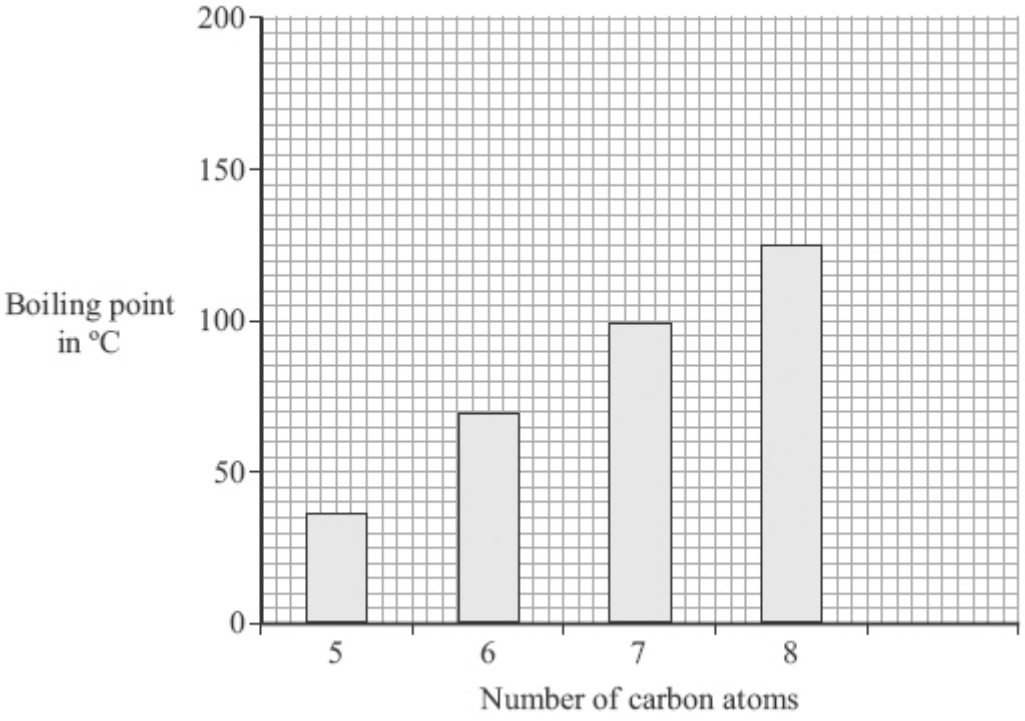
Ethene is a hydrocarbon made up of carbon and ..... atoms.

(1)

(b) The hydrocarbons used to make ethene come from crude oil. The properties of hydrocarbons are linked to the number of carbon atoms in their molecules.

Number of carbon atoms	5	6	7	8	9
Boiling point in °C	36	69	99	125	151

(i) Use the data in the table to complete the bar chart.



(2)

(ii) What happens to the boiling point of a hydrocarbon as the number of carbon atoms increases?

.....

(1)

(iii) All the hydrocarbons in the table are found in petrol. Petrol is one of the fractions separated from crude oil.

Describe how the fractions are separated from crude oil.

.....

.....

.....

.....

.....

(2)

(c) Most plastic bags that are made of hydrocarbons are not biodegradable.

Used plastic bags can be:

- dumped into large holes, which is called landfill
- burned to give out heat energy, which would produce large amounts of gases.

Would burning used plastic bags be better for the environment than dumping them in landfill?

Explain your answer.

.....

.....

.....

.....

(2)
(Total 10 marks)