



1.

Disposable cups are made from coated paper or poly(styrene).

The table below shows information on the life cycle assessments (LCAs) of

disposable cups.

	<b>Coated paper cups</b>	<b>Poly(styrene) cups</b>
Raw materials	Wood	Crude oil
Mass of 1 cup in g	8.3	1.9
Energy to produce 1 cup in kJ	550	200
Energy released when 1 cup is burned in kJ	166	76
Biodegradable	Yes	No
Recyclable	No	Yes





(b) Calculate the energy needed to produce 1.00 kg of coated paper cups.

Use the table above.

Give your answer in standard form.

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Energy = \_\_\_\_\_ kJ

(2)

(c) Melamine is a polymer used to make non-disposable cups.

Melamine does **not** melt when it is heated.

Explain why.

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(2)

(Total 10 marks)

2.

Metals are extracted from ores in the Earth's crust.

Some ores contain metal carbonates and some ores contain metal oxides.

(a) (i) Name the type of reaction that happens when a metal carbonate is heated.

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(1)



(ii) Which solid product is formed when copper carbonate is heated?

Tick (✓) **one** box.

copper

copper nitrate

copper oxide

copper sulfide

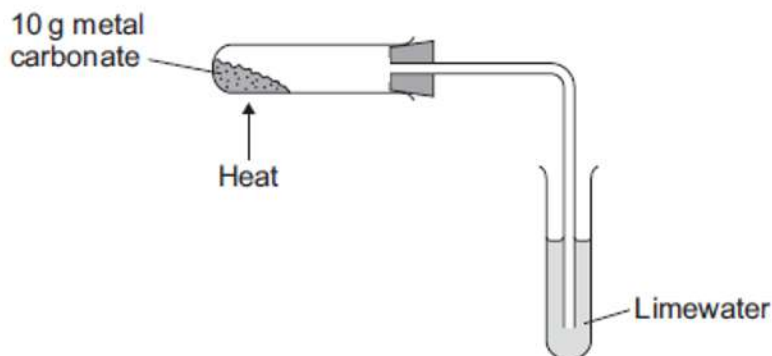
**(1)**



(b) A student investigated heating four metal carbonates.

Figure 1 shows the apparatus used.

Figure 1



The student heated each metal carbonate for five minutes.

The table below shows the results.

Metal carbonate	Mass of metal carbonate at start in g	Mass of solid after heating for 5 minutes in g	Observations
Copper carbonate	10.0	6.9	Limewater turns cloudy
Magnesium carbonate	10.0	9.1	Limewater turns cloudy
Potassium carbonate	10.0	10.0	Limewater does not turn cloudy
Zinc carbonate	10.0	8.3	Limewater turns cloudy

(i) Explain the results for potassium carbonate.

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- (ii) Suggest how the reactivity series can be used to predict which metal carbonate reacts most easily when heated.

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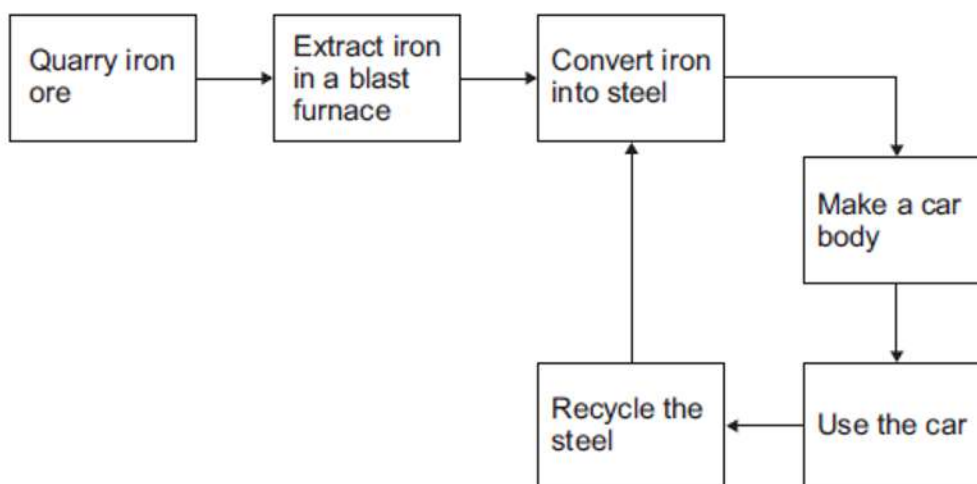
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(2)

- (c) **Figure 2** shows a simple life cycle of a car body.

**Figure 2**



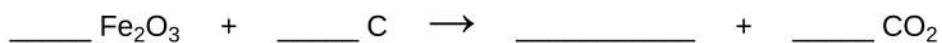
- (i) Complete the sentence.

Iron ores must contain enough iron to \_\_\_\_\_  
\_\_\_\_\_

(1)

- (ii) Some iron ores contain iron oxide ( $\text{Fe}_2\text{O}_3$ ).

Complete and balance the equation for a reaction to produce iron from iron oxide.



(2)



(iii) Give **two** reasons why iron produced in a blast furnace is converted into steel.

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(2)

(iv) When a car reaches the end of its useful life, the car body can be:

- recycled
- reused
- sent to landfill.

Give **three** reasons why a steel car body should be recycled and **not** reused or sent to landfill.

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(3)

(Total 15 marks)

3.

Metals are extracted from ores in the Earth's crust.

(a) Why is copper used in the manufacture of computers?

Tick (✓) **one** box.

Because it has a high density.

Because it does not react with water.

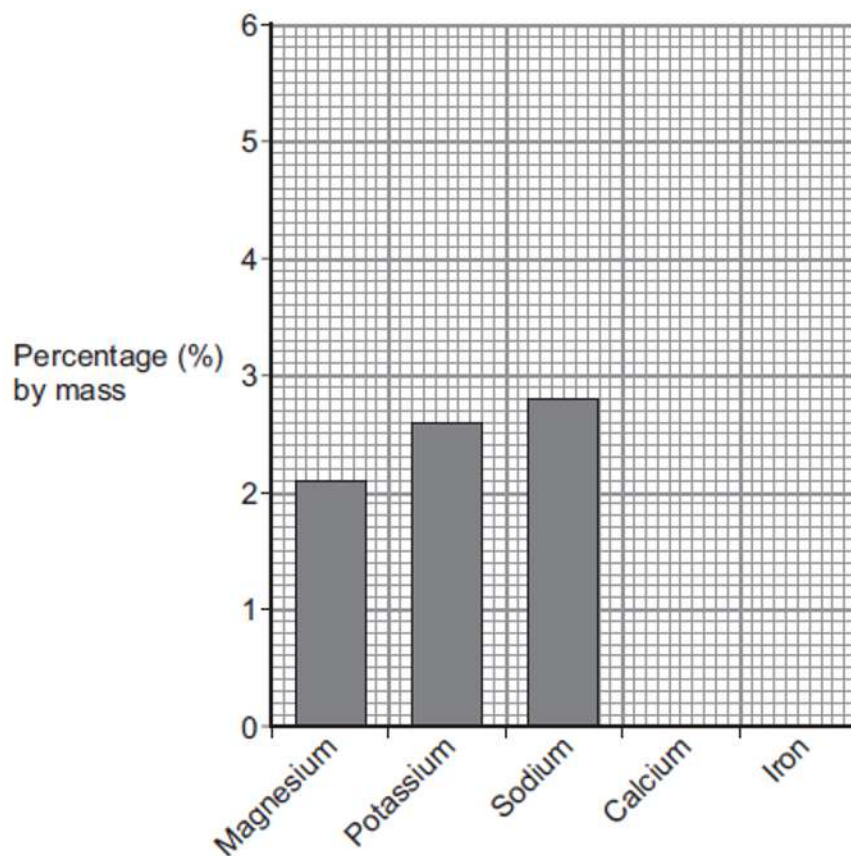
Because it is a good conductor of electricity.

(1)

(b) **Figure 1** shows the percentage (%) by mass of some metals in the Earth's crust.



**Figure 1**



(i) What is the percentage by mass of magnesium in the Earth's crust?

\_\_\_\_\_ %

**(1)**

(ii) On **Figure 1** draw the bars for:

- calcium at 3.6% by mass
- iron at 5.0% by mass.

**(2)**



(c) An ore of zinc contains zinc carbonate.

The equation for the reaction when zinc carbonate is heated is:



(i) What is the name of this type of reaction?

Tick (✓) **one** box.

corrosion

decomposition

electrolysis

(1)

(ii) Which substance in the equation is a gas at room temperature (20 °C)?

Tick (✓) **one** box.

zinc carbonate

zinc oxide

carbon dioxide

(1)

(iii) Complete the table below to show the number of atoms of carbon and oxygen in the formula of zinc carbonate.

Element	Number of atoms in the formula ZnCO <sub>3</sub>
zinc, Zn	1
carbon, C	
oxygen, O	

(2)



(iv) When 125 g zinc carbonate is heated, 81 g zinc oxide is produced.

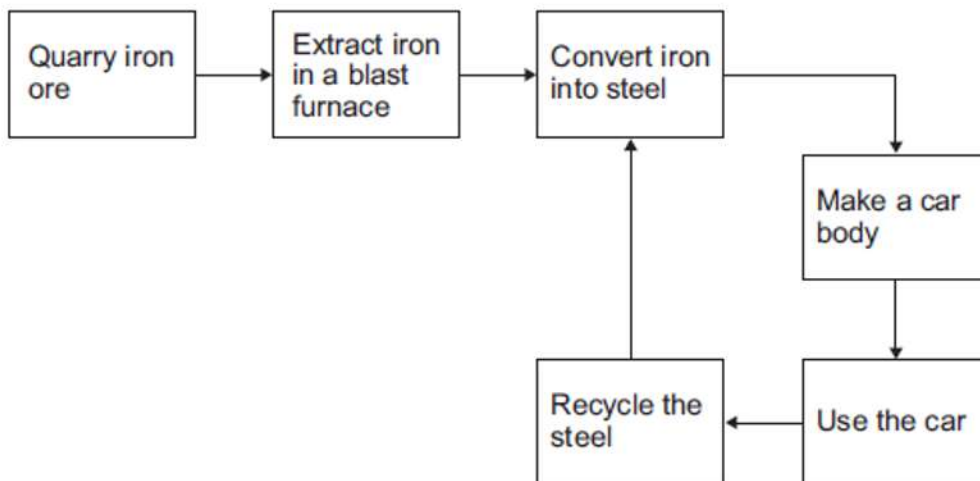
Calculate the mass of carbon dioxide produced.

Mass of carbon dioxide = \_\_\_\_\_ g

(1)

(d) **Figure 2** shows a simple life cycle of a car body.

**Figure 2**



(i) What is **one** reason why iron from the blast furnace is converted into steel?

Tick (✓) **one** box.

To make the iron pure.

To make the iron more brittle.

To make alloys for specific uses.

(1)



(ii) Apart from cost, give **three different** reasons why steel should be recycled.

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

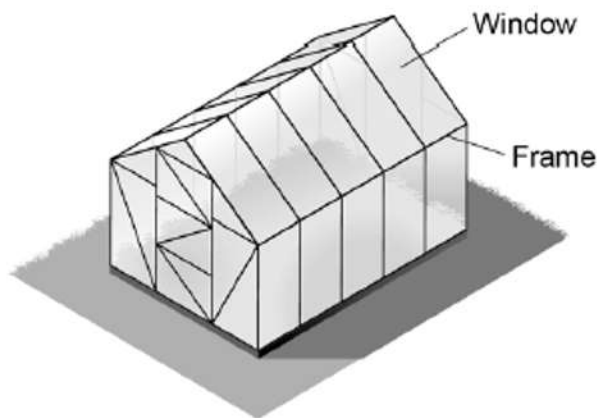
3. \_\_\_\_\_

\_\_\_\_\_

(3)  
(Total 13 marks)



4. The diagram shows a greenhouse.



A greenhouse frame can be made from wood or aluminium.

**Table 1** gives some information about wood and aluminium.

**Table 1**

	<b>Wood</b>	<b>Aluminium</b>
<b>Raw material</b>	Renewable	Non-renewable
<b>Mass of greenhouse frame in kg</b>	80	20
<b>Useful lifetime in years</b>	20	50
<b>End of useful life</b>	Can be chopped up and used as fuel	Can be recycled into new aluminium products

(a) Evaluate the use of each material for making greenhouse frames.

Use **Table 1**.

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(b) Greenhouse frames are transported by lorry.

The lorry used can carry a maximum load of 12 tonnes.

Calculate the largest number of wooden greenhouse frames which could be transported by the lorry.

Use **Table 1**.

100 kg = 1 tonne

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Number of wooden greenhouse frames = \_\_\_\_\_

(2)

(c) It is more sustainable to make greenhouse frames from recycled aluminium than from aluminium from aluminium ore.

Give **two** reasons why.

1. \_\_\_\_\_

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2. \_\_\_\_\_

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(2)



(d) Greenhouse windows can be made from glass or from polymers.

**Table 2** gives information about glass and a polymer.

	<b>Glass</b>	<b>Polymer</b>
<b>Density in g / cm<sup>3</sup></b>	2.8	1.2
<b>Cost in £ per m<sup>2</sup></b>	20	28
<b>Effect of sunlight</b>	No effect	Discolours over time

Suggest **one** advantage of making greenhouse windows from the polymer rather than from glass.

Use **Table 2**.

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(1)  
(Total 9 marks)