

# Life Cycle Assessment + Recycling

## Question Paper 1

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Chemistry
Exam Board	AQA
Topic	5.10 Using Resources
Sub-Topic	Life Cycle Assessment + Recycling
Difficulty Level	Gold Level
Booklet	Question Paper 1

**Time Allowed:** 44 minutes

**Score:** /42

**Percentage:** /100

**Grade Boundaries:**

**Q1.** Iron is a metal that has many uses.

- (a) Iron is extracted from iron ore. Part of the process involves reduction of the ore with carbon monoxide.

Iron ore contains iron oxide ( $\text{Fe}_2\text{O}_3$ ).

Write a balanced equation for the reaction of iron oxide with carbon monoxide.

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(3)

- (b) Explain why this reaction is a redox reaction.

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(2)

Steel is an alloy of iron. Steel is used to make cars.

After its useful life a car is taken to a scrapyard for recycling.

- (c) Suggest **four** benefits of recycling a car body.

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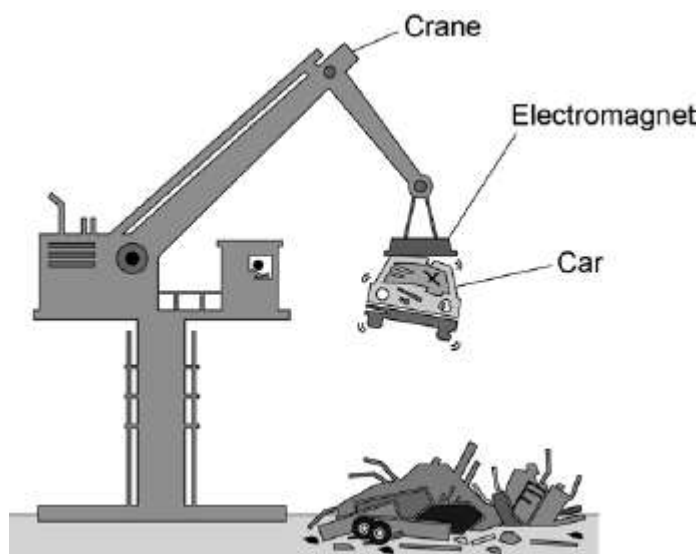
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(4)

- (d) **Figure 1** shows an electromagnet being used to lift a car in a scrapyard.

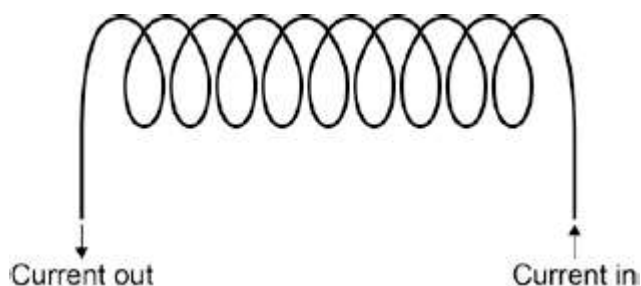
Figure 1



An electromagnet is made up of a solenoid.

Figure 2 shows a solenoid.

Figure 2



Draw the magnetic field of the solenoid on **Figure 2**.

(2)

- (e) In a scrapyard, an electromagnet is used to lift and release cars so they can be moved around.

Suggest **two** ways a solenoid could be made to lift and release cars in a scrapyard.

Explain why each suggestion would be useful in the scrapyard.

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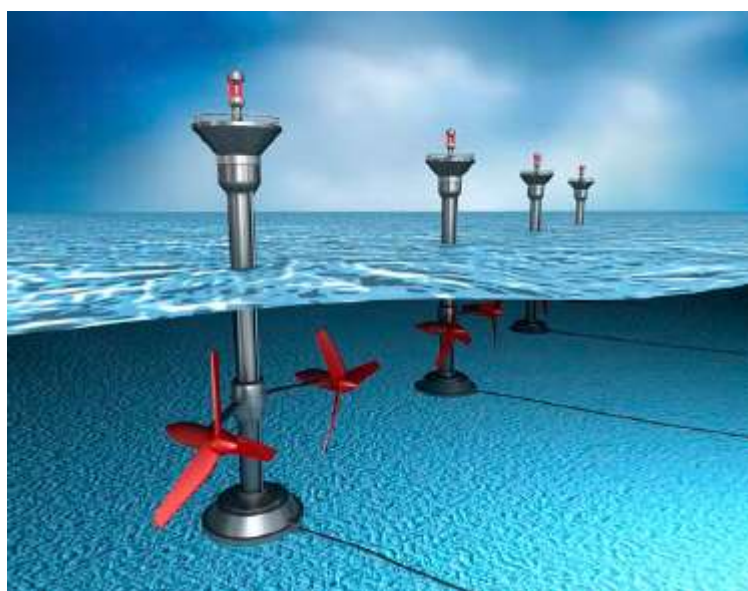
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(4)  
(Total 15 marks)

**Q2.**Electricity in the UK is generated in many ways.

The figure below shows an undersea turbine.

The undersea turbine uses tidal energy to generate electricity.



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(a) What is the original source of energy for tidal power schemes?

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(1)

(b) Explain **two** advantages of using undersea tidal turbines to generate electricity rather than burning fossil fuels.

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(4)

- (3)

Fuel	Direct CO <sub>2</sub> emissions in kg per MWh	Lifecycle CO <sub>2</sub> emissions in kg per MWh
Coal	460	540
Natural gas	185	215
Oil	264	313
Wood	2 100	58

**Direct CO<sub>2</sub> emissions** are the amounts of carbon dioxide released when the fuel is burned.

**Lifecycle CO<sub>2</sub> emissions** is the total amount of carbon dioxide released during all stages from fuel extraction to when the fuel has been used.

Use the data from the table above to explain why wood is considered to be a low carbon dioxide emitting fuel.

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(2)  
(Total 10 marks)

**Q3.**Read the information about production of copper.

- World demand for copper in 2014 was about 22 million tonnes.
- World reserves of copper are about 700 million tonnes.
- Most of the copper today is obtained from copper ores. The ores are mined.
- Copper ore is heated in a furnace to produce copper sulfide. The furnace is heated by burning fossil fuels. Air is blown through the hot copper sulfide to produce copper and sulfur dioxide.
- Some copper is extracted from low-grade ores by phytomining. Phytomining uses plants to absorb copper compounds. The plants are burned and copper is extracted from the ashes.

A scientist stated:

‘more copper should be extracted by phytomining.’

Use the information to justify the scientist’s statement.

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(Total 6 marks)

**Q4.** Read the article and then answer the questions.

### **Supermarkets launch eco-friendly plastic milk bags. Could this be the end of the milk bottle?**



Milk bottles are made from glass or from plastic.

Glass milk bottles contain 0.5 litres of milk. When the milk is used up the empty bottles are returned to be re-used. Glass milk bottles are re-used 24 times on average. The glass to make new milk bottles is produced when a mixture of sand, limestone, soda and recycled glass is heated to about 1600 °C in a furnace. There are almost unlimited amounts of the raw materials needed to produce this glass. About 35% of used glass is recycled.

The most common plastic milk bottles contain 2 litres of milk. When the milk is used up the empty bottles are discarded as waste. The plastic used to make these milk bottles is poly(ethene). Poly(ethene) is produced from crude oil by first using fractional distillation, then cracking the naphtha fraction and finally polymerising the ethene. About 5% of used poly(ethene) is recycled.

The new plastic milk bags contain 2 litres of milk. The milk bags are also made from poly(ethene). A milk bag uses 75% less poly(ethene) than is used to make the poly(ethene) milk bottles. When the milk is used up the empty bags are discarded as waste.

- (a) Describe what happens in fractional distillation so that fractions, such as naphtha, are separated from crude oil.

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- (b) Supermarkets claim that using milk bags instead of milk bottles would have less environmental impact.

Do you agree with this claim?

Use the information in the article and your knowledge and understanding to make appropriate comparisons to justify your answer.

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(Total 7 marks)

- Q5.** Supermarkets in the UK have been advised by the Government to stop giving plastic bags to customers. The Government states that this is because plastic bags use up resources that are not renewable and that the manufacture of plastic bags produces carbon dioxide.  
Most of these plastic bags are made from poly(ethene). The table shows methods to deal with large numbers of used plastic bags.

Method	Description of what happens to the plastic bag
Reused	used again by the customer
Recycled	collected, transported, washed and melted to make new plastic items
Burned	collected, transported and burnt to release heat energy
Dumped	mixed with other household waste, collected, transported and disposed of at a landfill site

Use the information and your knowledge and understanding to briefly give **one advantage and one disadvantage** for each of these methods.

Reused .....

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Recycled .....

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Burned .....

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Dumped .....

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(4)  
(Total 4 marks)