



## New Document 1

Name: \_\_\_\_\_

Class: \_\_\_\_\_

Date: \_\_\_\_\_

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Time: **40 minutes**

Marks: **40 marks**

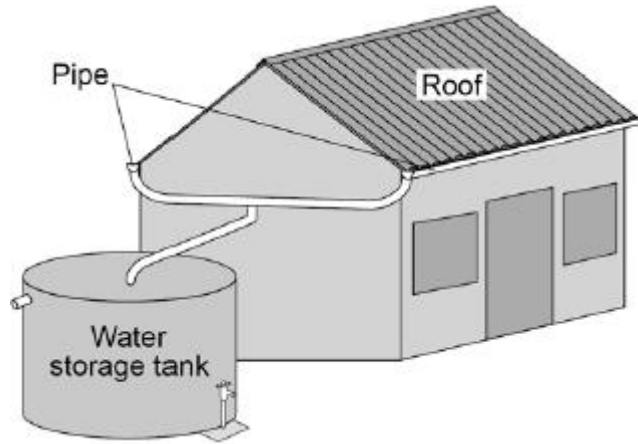
Comments:

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**Q1.**

Rainwater is collected from the roofs of houses as shown in **Figure 1**.

**Figure 1**



- (a) The water in the storage tank is **not** potable.

What does potable mean?

Tick **one** box.

- |                               |                          |
|-------------------------------|--------------------------|
| Contains dissolved substances | <input type="checkbox"/> |
| Pure                          | <input type="checkbox"/> |
| Safe to drink                 | <input type="checkbox"/> |
| Tastes nice                   | <input type="checkbox"/> |

(1)

- (b) Why should the water in the tank be filtered to make it potable?

Tick **one** box.

- |                              |                          |
|------------------------------|--------------------------|
| To kill microbes             | <input type="checkbox"/> |
| To remove dissolved gases    | <input type="checkbox"/> |
| To remove dissolved solids   | <input type="checkbox"/> |
| To remove undissolved solids | <input type="checkbox"/> |

(1)

(c) A gas which bleaches litmus paper can be added to the water to make it potable.

Name this gas and explain why it is added.

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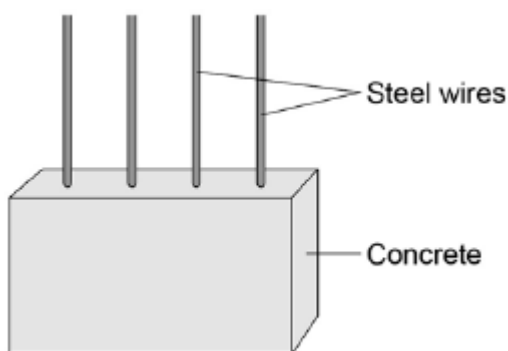
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(2)

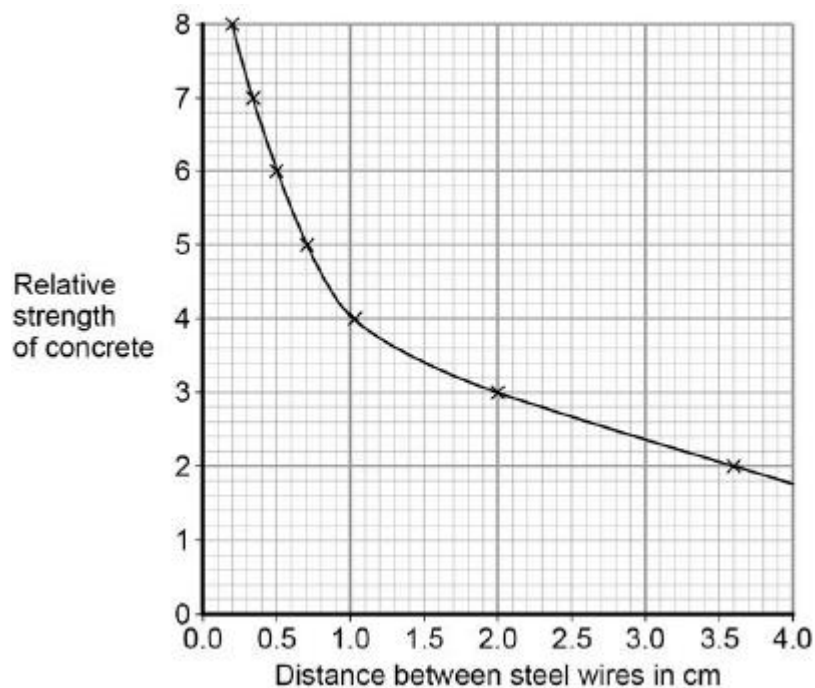
(d) The storage tank is made from concrete reinforced with steel wire, as shown in **Figure 2**.

**Figure 2.**



**Figure 3** shows how the distance between the steel wires affects the relative strength of the concrete.

**Figure 3**



Use values from **Figure 3** to describe the relationship shown by the graph.

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(2)  
(Total 6 marks)

**Q2.**

Cans for food and drinks are made from steel or aluminium.  
The main metal in steel is iron.



By Sun Ladder (Own work) [CC-BY-SA-3.0 or GFDL],  
via Wikimedia Commons

(a) Iron is extracted by heating a mixture of iron oxide and carbon in a blast furnace.

(i) Name this type of reaction.

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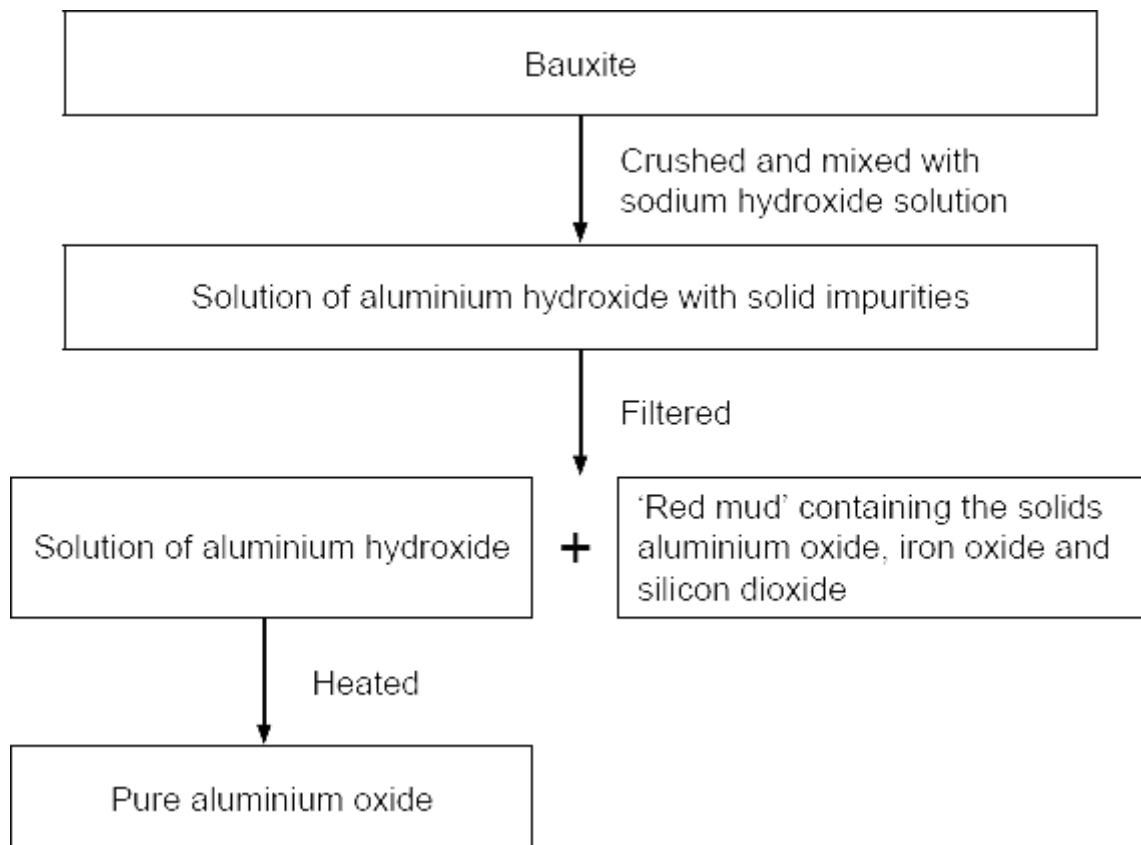
(1)

(ii) Balance the symbol equation for this reaction.



(1)

(b) Aluminium ore, bauxite, contains aluminium oxide, iron oxide and silicon dioxide.  
Aluminium is extracted by electrolysis of aluminium oxide.



The 'red mud' which is dumped in very large ponds contains:

Name of solid	Percentage (%)
Aluminium oxide	10
Iron oxide	65
Silicon dioxide	25

- (i) 100 tonnes of bauxite produced 50 tonnes of pure aluminium oxide and 50 tonnes of 'red mud'.

What percentage of aluminium oxide did the bauxite contain?

Answer = \_\_\_\_\_ %

(1)

- (ii) Apart from the solids shown in the table, name **one** other substance that would be in the 'red mud'.

(1)

- (iii) The purification of the aluminium oxide is usually done near to the bauxite quarries.

Suggest **one** reason why.

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(1)

(c) Aluminium is used to make many things including cans.

During one year in the USA:

- 100 billion aluminium cans were sold
- 55 billion aluminium cans were recycled.

Give **one** environmental impact of recycling aluminium cans and **one** ethical or social impact of recycling aluminium cans.

Environmental \_\_\_\_\_

\_\_\_\_\_

Ethical or social \_\_\_\_\_

\_\_\_\_\_

(2)

(Total 7 marks)

**Q3.**

Good quality water is essential for life.

(a) In the United Kingdom, water is filtered and treated with chlorine to make it safe to drink.



Explain why the water is:

filtered \_\_\_\_\_

\_\_\_\_\_

treated with chlorine. \_\_\_\_\_

\_\_\_\_\_

(2)

(b) Millions of people in Bangladesh drink water from wells that contain high levels of arsenic. Arsenic is poisonous.

The World Health Organisation recommends that there should be no more than 0.01 mg of arsenic per litre in drinking water.

The table gives some information about two instrumental methods of testing for arsenic.

Factor to consider	Laboratory Instrumental Method	Portable Instrumental Method
Cost of equipment	£10 000	£50
Skill level of technician	Highly skilled	where test is done
Little training needed	Laboratory only	Anywhere
Time to prepare the instrument for the test	5 minutes	10 seconds
Sensitivity of the instrument	0.000001 mg of arsenic per litre of water	0.1 mg of arsenic per litre of water

(i) Use the information in the table to give **two** advantages and **one** disadvantage of using the Portable Instrumental Method compared with the Laboratory Instrumental Method.

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(3)

(ii) The information about these two instrumental methods was provided by the Professional Institute of Water Engineers (PIWE). The Institute has no connection with the companies that make these instruments.

Suggest why many people would accept the views of PIWE rather than the views of the companies that make the instruments.

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(1)

(Total 6 marks)

**Q4.**

Read the following information and then answer the questions.

## Chlorine – for better, for worse?



Chlorine is used to make bleaches, plastics and medicines. Swimming pool water is often treated with chlorine.

Chlorine is used to make water safe to drink. It is relatively cheap and easy to use. People who drink untreated water risk dying from typhoid and cholera.

However, chlorine is a poisonous chemical. It causes breathing difficulties and can kill people. Some people are also allergic to chlorine.

- (a) How does chlorine make water safe to drink?

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(1)

- (b) The amount of chlorine in swimming pool water should be carefully monitored and controlled.

Explain why.

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(2)

- (c) Developing countries are likely to choose chlorination as their method of making water safe to drink.

Suggest why.

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(1)

(d) A government is setting up an enquiry into the safety of using chlorine.

(i) Suggest why people from all political parties should be represented.

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(1)

(ii) Suggest why the opinion of a well-respected scientist might change the outcome of any discussion.

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(1)

(iii) The decision taken about the safety of using chlorine should be based on evidence and data rather than on hearsay and opinion.

Suggest why.

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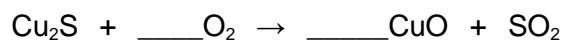
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(1)

(Total 7 marks)

### Q5.

Copper is a widely used metal. The main ore of copper contains copper sulfide. Copper can be extracted from copper sulfide in a three stage process.



(1)

(ii) Explain why there would be an environmental problem if the gas from this reaction were allowed to escape into the atmosphere.

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(2)

(b) In the second stage copper oxide, CuO, is reduced using carbon.

Describe and explain what happens during this reaction.

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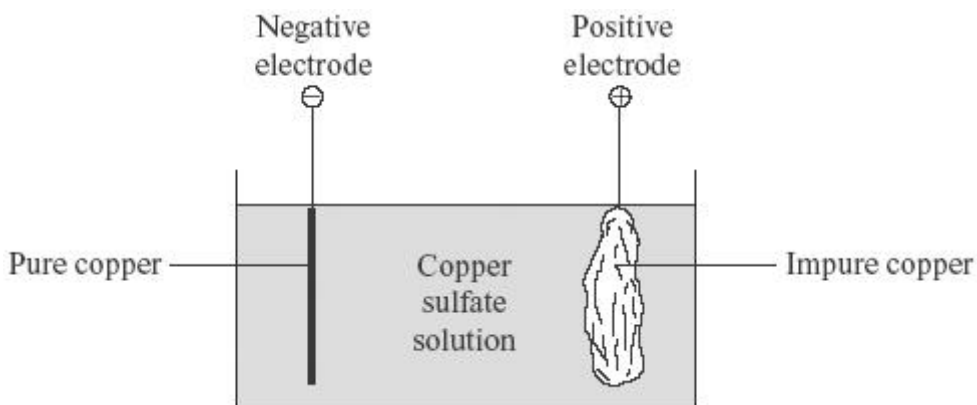
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(2)

(c) During the third stage the copper can be purified as shown in the diagram.



(i) What is the name of the type of process used for this purification?

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(1)

(ii) Give **one** use of purified copper.

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(1)

(d) Copper-rich ores are running out.

New ways of extracting copper from low grade ores are being researched.

Recycling of copper may be better than extracting copper from its ores.

Explain why.

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(3)

(Total 10 marks)

**Q6.**

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 \_\_\_\_\_

\_\_\_\_\_

Recycled \_\_\_\_\_

\_\_\_\_\_

Burned \_\_\_\_\_

\_\_\_\_\_

Dumped \_\_\_\_\_

\_\_\_\_\_

(4)  
(Total 4 marks)

## Mark schemes

### Q1.

- (a) Safe to drink 1
- (b) To remove undissolved solids 1
- (c) the gas is chlorine / Cl<sub>2</sub> 1
- which sterilises water 1
- (d) as distance between steel increases strength of concrete decreases 1
- change above and change below 1.0 cm separation is compared and described  
*must refer to graph values for this mark* 1

[6]

### Q2.

- (a) (i) reduction 1  
*accept redox / smelting*
- (ii) 3 4 3 1
- (b) (i) 55 1  
*ignore other units*
- (ii) Water 1  
*accept sodium hydroxide*  
*accept correct formulae H<sub>2</sub>O or NaOH*
- (iii) any **one** from: 1
- save energy / fuel for transporting the ore  
*accept less (cost of) transport allow transported quickly*
  - (old) quarries nearby for waste/red mud
- (c) **Environmental**
- any **one** from:
- less mining / quarrying (of bauxite)  
*allow loss of habitat / less qualified noise pollution*
  - less landfill space needed / used  
*allow less red mud / waste*

- less use of fossil fuels / energy
- less carbon dioxide produced

1

### Ethical or social

any **one** from:

- saves resources  
*allow using resources more than once*
- creates (local) employment  
*if answers reversed and both correct award 1 mark*
- more people aware of the need for recycling  
*allow less qualified noise pollution if not given in environmental*

1

[7]

### Q3.

- (a) filtered: removes insoluble / solid  
*Ignore named substances / minerals*  
*do **not** accept ions*

1

chlorine: kills microorganisms / microbes / bacteria / disinfects (water)  
*allow kills germs / pathogens **or** sterilises*  
*allow chlorine is a disinfectant*  
*ignore cleans water or removes impurities / bacteria*

1

- (b) (i) advantages of portable:  
*accept converse throughout*

any **two** from :

- costs less
- little training needed
- water can be tested within 10 seconds / immediately / quicker
- can be used anywhere

2

disadvantage of portable

less precise / sensitive  
*allow only detect down to 0.1 mg*  
*ignore less accurate*

1

- (ii) (PIWE) is unbiased  
*it / they = PIWE*

*allow honest / trusted / respected / reliable*  
*ignore professional / scientific / skilled*

**or**

company may be biased  
*allow company trying to sell products*

1

[6]

**Q4.**

- (a) sterilise / disinfect (water)  
*ignore removes bacteria / impurities / disease*

**or**

kill bacteria / micro-organisms / microbes / germs / pathogens  
*ignore cleans the water / makes (water) safe*  
*allow destroy bacteria or gets rid of bacteria*

1

- (b) any **two** from:  
*ignore reference to safe / unsafe*

- chlorine is toxic / poisonous
- so (too much) will be dangerous / harmful / kill people / cause illness / health problems  
*allow causes damage*
- cause breathing difficulties **or** cause (more) allergic reactions / skin **or** eye irritation
- too little will not kill bacteria  
*allow bacteria still there*

2

- (c) cheap / easy / quick to use (process)  
*accept prevents typhoid / cholera*  
*ignore reference to specialists or equipment*

1

- (d) (i) fair / more ideas / views / opinions **or** less chance of bias **or** more democratic  
*allow idea of different points of view / balanced view*  
*allow avoids undue influence owtte*

1

- (ii) (more likely) to have support / influence / convince people  
*ignore well respected*  
*allow ideas about trust eg people will have more confidence in their views / more likely to be believed*  
*allow ideas about expertise eg more likely to know what they are talking about / have done experiments / tests*  
*allow have knowledge / understanding*  
*allow (more) reliable*

1

- (iii) (more likely) to be correct / less likely to be incorrect  
*owtte*

**or**

reliable / factual / accurate / based on proof / based on experiments or tests / based on validation

*ignore based on evidence unqualified*

*allow hearsay / opinion can be biased*

1

[7]

**Q5.**

- (a) (i)  $\text{Cu}_2\text{S} + 2\text{O}_2 \rightarrow 2\text{CuO} + \text{SO}_2$   
*accept fractions and multiple*

1

- (ii) any **two** from:

- sulfur dioxide  
*accept sulphur dioxide / sulphur oxide / SO<sub>2</sub>*
- causes acid rain  
*ignore other comments eg global warming / ozone / global dimming / greenhouse effect*
- consequence of acid rain eg kills fish / plants

2

- (b) any **two** from:

- heat (copper oxide with carbon)
- oxygen is removed by carbon  
*accept copper (oxide) loses oxygen*

**or**

*carbon gains oxygen*

*accept carbon oxide*

**or**

carbon monoxide / carbon dioxide is produced

**or**

carbon displaces copper

*accept a correct word or balanced*

*symbol equation*

- because carbon is more reactive than copper  
*allow a correct comparison of reactivity*

2

- (c) (i) electrolysis  
*accept electroplating*

1

(ii) (electrical) wiring / appliances / coins / pipes / cladding for buildings / jewellery / making alloys

1

**or**

named alloys

(d) any **three** explanations from:

for recycling

- less acid rain (pollution)
- copper reserves last longer / conserved

**or**

do not run out

- energy for extraction (saved)

**or**

less energy required

- less mining / quarrying
- less waste (copper) / electrical appliances dumped

**or**

less landfill

against recycling

- collection problems
- transport problems
- difficult to separate copper from appliances
- energy used to melt the collected copper  
*ignore electrolysis / pollution*  
*ignore ideas about less machinery / plant*  
*ignore idea of cost*

3

[10]

## Q6.

Reused

- saves raw materials / crude oil
  - *unable to reuse many times*
  - *bags easily split*
- saves energy / fuel / transport



- fewer bags needed / made
- reduces carbon / CO<sub>2</sub> emissions
- reduces use of landfill
- saves cost of a new bag
- no waste

1

### Recycled

- saves raw materials / crude oil
  - *has to be collected / transported / washed / separated / melted*
- saves energy / use of fuel
- reduces carbon / CO<sub>2</sub> emissions
- reduces use of landfill
- can be used for new products
  - *ignore uses energy*

1

### Burned

- heat / energy released can be used (for heating / generating electricity)
  - *has to be collected / transported*
- reduces use of landfill
  - *wastes the resource / plastic*
  - *releases harmful gases / toxic gases / CO<sub>2</sub>*

1

### Dumped

- collected / transported with household waste
  - *wastes the resource*
  - *plastic uses landfill*
- (slowly) biodegrades **or** produces methane which can be used as a fuel
  - *produces methane which is a greenhouse gas / could cause explosions*
- (not biodegradable so) does not release CO<sub>2</sub> / green house gas into the air
  - *not biodegradable / take years to decompose*

ignore cost / litter / waste / global warming / habitats unless mentioned above

1