New Document 1

Name: __________________________

Class: __________________________

Date: __________________________

Time: 40 minutes

Marks: 40 marks

Comments:
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
- Pure
- Safe to drink
- Tastes nice

(1)

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

Tick one box.

- To kill microbes
- To remove dissolved gases
- To remove dissolved solids
- To remove undissolved solids

(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.
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

(2)

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

![Figure 2](image.png)

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

![Figure 3](image.png)

Use values from Figure 3 to describe the relationship shown by the graph.
___________________________________________________________________
Q2.

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

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

(i) Name this type of reaction.

(ii) Balance the symbol equation for this reaction.

\[ 2\text{Fe}_2\text{O}_3 + \underline{\text{C}} \rightarrow \underline{\text{Fe}} + \underline{\text{CO}_2} \]

(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:

<table>
<thead>
<tr>
<th>Name of solid</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminium oxide</td>
<td>10</td>
</tr>
<tr>
<td>Iron oxide</td>
<td>65</td>
</tr>
<tr>
<td>Silicon dioxide</td>
<td>25</td>
</tr>
</tbody>
</table>

(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 = _____________________ %

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

______________________________________________________________

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

Suggest one reason why.
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

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.

________________________________________________________________________

________________________________________________________________________

(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.
(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.

[Blank lines for answer]

(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.

[Blank lines for answer]

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?

_____________________________________________________________________

_____________________________________________________________________

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

Explain why.

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

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

Suggest why.

_____________________________________________________________________

_____________________________________________________________________

(1)

(2)
(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.

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

(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.

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.

\[ \text{Cu}_2\text{S} + \text{nO}_2 \rightarrow \text{mCuO} + \text{SO}_2 \]  

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

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

(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?
___________________________________________________________________

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

(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.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

(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.

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

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)
Q1.
(a) Safe to drink
1
(b) To remove undissolved solids
1
(c) the gas is chlorine / Cl\(_2\)
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

Q2.
(a) (i) reduction
accept redox / smelting
1
(ii) 3 4 3
1
(b) (i) 55
ignore other units
1
(ii) Water
accept sodium hydroxide
accept correct formulae H\(_2\)O or NaOH
1
(iii) any one from:
• save energy / fuel for transporting the ore
  accept less (cost of) transport allow transported quickly
• (old) quarries nearby for waste/red mud
1

(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

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

Q3.
(a) filtered: removes insoluble / solid
  Ignore named substances / minerals
  do not accept ions

  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

(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

  disadvantage of portable

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

(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

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

(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

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

(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 or twice

(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
(iii) (more likely) to be correct / less likely to be incorrect

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

Q5.

(a) (i) \[ \text{Cu}_2\text{S} + 2\text{O}_2 \rightarrow 2\text{CuO} + \text{SO}_2 \]

accept fractions and multiple

(ii) any two from:

• sulfur dioxide
  accept sulphur dioxide / sulphur oxide / SO\(_2\)

• causes acid rain
  ignore other comments eg global warming / ozone /
  global dimming / greenhouse effect

• consequence of acid rain eg kills fish / plants

(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

(c) (i) electrolysis

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

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

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 / CO₂ emissions
• reduces use of landfill
• saves cost of a new bag
• no waste

Recycled
• saves raw materials / crude oil
  • has to be collected / transported / washed / separated / melted
• saves energy / use of fuel
• reduces carbon / CO₂ emissions
• reduces use of landfill
• can be used for new products
  ignore uses energy

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 / CO₂

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 CO₂ / greenhouse gas into the air
  • not biodegradable / take years to decompose

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