

# MARK SCHEME

# GCSE

## CHEMISTRY

## AQA - TRIPLE SCIENCE

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C10 - TEST 3  
USING RESOURCES  
Intermediate

## Mark schemes

- 1.** (a) (Chromium =) 20  
*in correct order* 1
- (Nickel =) 8  
*accept Chromium = 8 **and** Nickel = 20 for 1 mark* 1
- (b) (i) (because iron is made up of only) one type of atom 1
- (ii) not strong  
*allow too soft **or** too flexible*  
*accept it rusts / corrodes **or** that it could wear away*  
*accept could change shape / bend*  
*accept layers / atoms could slide (over each other)* 1
- (iii) structure is different / distorted / disrupted  
*accept not in layers **or** not regular* 1
- so it is difficult for layers / atoms / particles to slip / slide (over each other)  
*accept layers cannot slip / slide* 1
- [6]**
- 2.** (a) (i) phytomining 1
- (ii) (*the land contains*) very little copper  
*allow low grade ore **or** large amounts of waste*  
*ignore quarrying / benefits of using plants* 1
- uneconomical  
*accept (smelting) uses a lot of energy / fossil fuels*  
*allow expensive* 1
- (iii) Cu 1
- $2 \text{CuO} + \text{C} \rightarrow 2 \text{Cu} + \text{CO}_2$   
*allow  $2 \text{CuO} + \text{C} \rightarrow \text{Cu}_2 + \text{CO}_2$  for 1 mark* 1
- (b) (i) iron is more reactive (than copper) 1

iron is cheap(er than copper)

*allow cheaper **or** uses less energy than electrolysis*

1

(ii) any **two** from:

- copper / ions move **or** are attracted to the negative electrode / *cathode*
- where they are reduced **or** gain (two) electrons
- *where they form copper (metal / atoms)*

2

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3.

(a) (i) distillation

1

(ii) 100 / one hundred

1

(b) (i) measuring cylinder **or** pipette **or** burette

*allow phonetic spelling*

*do **not** accept teat pipette*

*ignore any additional words or volumes*

1

(ii) (re)heat the evaporating basin

*accept heat to constant mass for **2** marks*

1

weigh (again) **or** mass will not change

*if no other mark awarded allow **1** mark for a chemical test for water*

1

(iii) 33.2 (g)

*correct answer with or without working scores **2** marks*

*allow mass of residue = (24.04 g – 23.21 g) = 0.83 for **1** mark*

*allow ecf (mass of residue x 40) for **1** mark*

2

(c) to kill microbes / bacteria **or** to sterilise / disinfect water

*allow to prevent disease*

*ignore 'to make it safe to drink'*

1

- (d) Marks awarded for this answer will be determined by the Quality of Communication (QoC) as well as the standard of the scientific response. Examiners should also refer to the information on page 4, and apply a 'best-fit' approach to the marking.

**0 marks**

No relevant content

**Level 1 (1 – 2 marks)**

A simple relevant comment has been made on the data from at least one of the graphs.

**Level 2 (3 – 4 marks)**

At least two of the graphs have been considered with a relevant comment made.

**Level 3 (5 – 6 marks)**

All the graphs have been considered and relevant comments made about each. A justified conclusion may be given.

**examples of chemistry points made in the response:**

***extra information***

- (graph 1 shows) fluoride ions reduce the amount of tooth decay
- (graph 1 shows) the effect in reducing tooth decay is greatest for 55–64 year olds  
*accept any in range 55 – 64*
- (graph 2 shows) the fluoride ions reduce percentage with decayed teeth
- (graph 2 shows) effect is greatest at 2.5 to 3 mg per 1000 g of water then decay increases if more than 2.5 to 3 mg of fluoride ions per 1000 g water  
*accept any in range 2.5 – 3*
- (graph 2 shows percentage) decay decreases from 0 to 2.5 / 3 mg per 1000 g
- (graph 3 shows) more marked / brittle teeth as fluoride level increases
- above points linked together to draw a justified conclusion

6

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4.

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

- copper / ores are running out / harder to find
- there are no / very small amounts of high-grade copper ores left
- copper metal is in demand
- copper is expensive
- now economical to extract copper from low-grade ores  
*it = copper*  
*allow new methods of extraction e.g. bioleaching and phytomining*  
*allow high-grade ores are running out for 2 marks*

2

- (b) (i) large amounts / 98% of rock to dispose of as waste  
*accept contains toxic (metal) compounds / bioleacher*
- or**  
waste rock takes up a lot of space 1
- (ii) (copper sulfide reacts with oxygen to) produce sulfur dioxide / SO<sub>2</sub>  
*allow (sulfur reacts with oxygen to) produce sulfur dioxide / SO<sub>2</sub>* 1
- that causes acid rain  
*allow description of effects of acid rain or sulfur dioxide*  
*if no other mark awarded allow CO<sub>2</sub> produced which causes global warming or CO<sub>2</sub> produced by burning fuel or heating the furnace for 1 mark* 1
- (iii) any **one** from:
- large amounts of fuels / energy used (for the furnace and electrolysis)  
*allow large amounts of electricity needed*  
*ignore high temperature / electrolysis unqualified*
  - (the extraction has) many steps / stages / processes  
*allow (extraction) is a long process / takes a lot of time*
  - large amounts of ore / material have to be mined  
*allow ores contain a low percentage of copper* 1
- (iv) (copper ions move towards) the negative electrode / *cathode* 1
- because copper ions / Cu<sup>2+</sup> are positively charged **or** are oppositely charged **or** copper ions need to gain electrons  
*allow because metal ions are positive or opposites attract* 1
- (v) (growing) plants 1
- 5.** (a) (i) brown 1
- (ii) oxygen + iron + water  $\longrightarrow$  hydrated iron oxide / rust  
*allow correct symbol equation*  
*ignore oxidation numbers for product* 1
- (b) (i) 32.3 1

[9]

- (ii) 7.6  
*ecf from (b)(i)* 1
- (iii) do not know start volume of air 1
- because the burette not graduated to the end  
*allow iron wool takes up some of the space*  
*if no other marks awarded accept all iron may have rusted (1) or*  
*still some oxygen left / not all used up (1)* 1
- (c) (i) gains oxygen and water **or** oxygen and water are added  
*allow reacts with or gains oxygen*  
*allow reacts with or gains water*  
*allow reacts with or gains elements which add to mass*  
*ignore iron oxide forms* 1
- (ii) as temperature increases (from 10 °C to 42 °C or to 50 °C) the increase in mass of nail increases  
*accept positive correlation*  
*accept mass increases* 1
- rate of increase gets faster as temperature goes up  
*accept exponential*  
*ignore non linear* 1
- no further increase at temperatures over 42 °C  
*accept no further increase at high temperatures*  
*exponential increase scores 2 marks* 1
- (iii) use a (bigger) flask **or** let air into the tube **or** leave for less time **or**  
*ignore more water* 1
- to make sure sufficient oxygen / air **or** not all oxygen used up  
*accept converse*  
*if no other marks awarded allow change in surface area for rusting*  
***or** change in number of nails for 1 mark* 1

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6. (a) filter 1
- to remove solids **or** *insoluble particles*
- OR**
- add coagulant (1)*
- flocculation / settling / remove solids (1) 1
- (add) chlorine
- accept ozone / UV* 1
- to reduce the number of microbes
- accept to kill microbes / bacteria / germs*
- accept sterilise*
- allow disinfect*
- ignore remove microbes* 1
- (b) (i) ion exchange resin
- allow ion exchange column*
- allow sodium ions / Na<sup>+</sup>*
- allow hydrogen ions / H<sup>+</sup>* 1
- (ii) prevent growth of microbes
- accept sterilise*
- accept to kill microbes / bacteria / germs*
- accept to reduce the number of microbes*
- ignore remove microbes* 1
- (c) high cost of energy / *heating*
- allow uses a lot of energy* 1
- (d) any **one** from:
- helps to develop / maintain bones  
*allow any suitable positive effect on bones*
  - helps to develop / maintain teeth  
*allow any suitable positive effect on teeth*
  - reduces heart disease
- 1

**[8]**

<b>7.</b>	<p>(a) (alloy) atoms / ions / particles not in layers  <i>accept layers are distorted</i>  <i>accept different (size) particles / atoms</i></p>	1
	<p>so, (alloy) layers / atoms / ions / particles can't slide  <i>if no other mark awarded allow (an alloy) is a mixture of metals for 1 mark</i></p>	1
	<p>(b) diamonds have a giant covalent structure</p> <p>diamonds have strong bonds between carbon atoms</p>	1
	<p>(c) (i) a compound</p>	1
	<p>(ii) CH<sub>4</sub></p>	1
	<p>(iii) covalent</p>	1
	<p>(d) methane has a low boiling point  or boiling point less than 20°C molecules</p> <p>because it has small molecules  <i>accept it has forces between molecules</i>  <i>accept weak forces between molecules for 2 marks</i></p>	1
		<b>[9]</b>
<b>8.</b>	<p>(a) (i) contains enough metal to <u>make it economical</u> to extract</p>	1
	<p>(ii) Fe (+) CO<sub>2</sub>  <i>formula of both products must be correct</i></p>	1
	<p>(Fe<sub>2</sub>O<sub>3</sub>) (+) ....3....(CO)</p> <p>→</p> <p>.....2.....(Fe) (+) .....3...(CO<sub>2</sub>)  <i>balancing correct</i>  <i>allow correct balancing using Fe<sub>2</sub></i></p>	1
	<p>(iii) reduction  <i>accept redox</i></p>	1

- (b) (i) oxygen reacts with the carbon to produce carbon dioxide  
*allow carbon monoxide for carbon dioxide*

1

**OR**

carbon dioxide is produced (1)

which escapes as a gas (1)

1

- (ii) to give steels with different / particular properties or for  
different / particular uses

*ignore to make different alloys*

1

- (c) copper is very expensive

*accept the metal (iron / steel) costs less than copper*

*ignore energy*

1

because copper ores are 'low grade' / running out

*allow copper is rare*

*ignore nickel*

1

**[9]**