

**Q1.** Where copper ore has been mined there are areas of land that contain very low percentages of copper compounds.

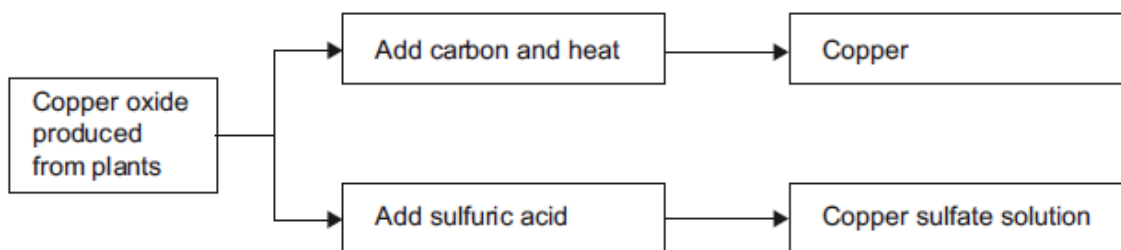
One way to extract the copper is to grow plants on the land.

The plants absorb copper compounds through their roots.

The plants are burned to produce copper oxide.

The copper oxide produced from plants can be reacted to produce copper or copper sulfate solution, as shown in **Figure 1**.

**Figure 1**



(a) Draw a ring around the correct answer to complete each sentence.

(i) Copper ores contain enough copper to make extraction of the metal carbon neutral.  
economical.  
reversible. (1)

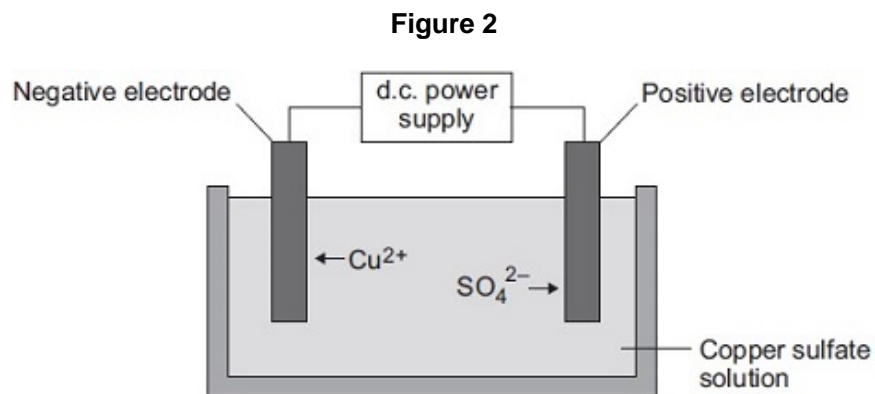
(ii) Using plants to extract metals is called photosynthesis.  
phytomining.  
polymerisation. (1)

(iii) Copper oxide reacts with carbon to produce copper and carbon dioxide.  
oxygen.  
sulfur dioxide. (1)

(b) Copper is produced from copper sulfate solution by displacement using iron or by electrolysis.

(i) Complete the word equation.  
copper sulfate + iron → ..... + ..... (2)

(ii) **Figure 2** shows the electrolysis of copper sulfate solution.



Why do copper ions go to the negative electrode?

.....  
 .....

(1)

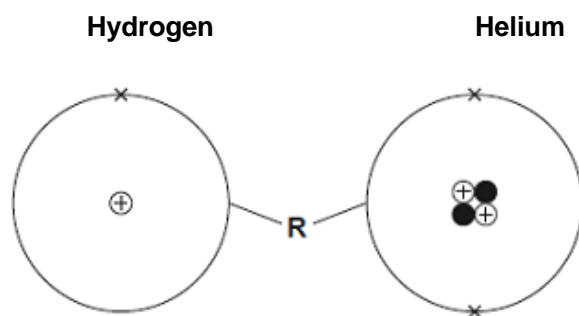
(c) Suggest **two** reasons why copper should **not** be disposed of in landfill sites.

.....  
 .....

(2)

(Total 8 marks)

**Q2.** The Sun is mainly hydrogen and helium.  
 The diagrams show an atom of hydrogen and an atom of helium.



(a) Draw a ring around the correct answer to complete each sentence.

(i) The centre of each atom is called the

- molecule.
- nucleus.
- shell.

(1)

(ii) The circle (labelled **R**) around the centre of each atom is called

- a bond.
- an electrical charge.
- an energy level (shell).

(1)

(b) Use the diagrams in part (a) to help you to answer these questions.

Draw **one** line from each question to its correct answer.

Question	Answer
How many protons are there in the hydrogen atom?	1
How many electrons are there in the helium atom?	2
What is the mass number of the helium atom?	3
	4

(3)

(c) The Sun is 73% hydrogen and 25% helium. The rest is other elements.

What is the percentage of other elements in the Sun?

..... %

(1)

(d) One of the other elements in the Sun is neon.  
Neon is in the same group of the periodic table as helium.

Use the Chemistry Data Sheet to help you to answer these questions.

(i) How many protons are there in a neon atom?

.....

(1)

(ii) Which group of the periodic table are helium and neon in?

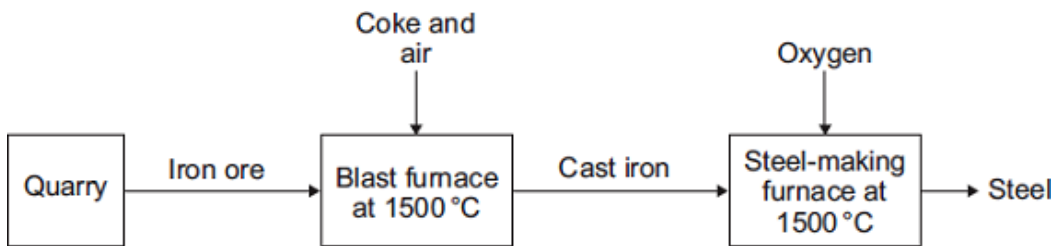
.....

(1)

**(Total 8 marks)**

**Q3.** The iron produced from iron ore in a blast furnace is called cast iron.

Cast iron is converted into steel in a furnace.



Iron ore contains iron oxide.

Coke contains carbon.

(a) Quarrying iron ore will have an impact on everything near to the quarry.

(i) Describe **one** positive impact and **one** negative impact of quarrying iron ore.

positive impact .....

.....

negative impact .....

.....

(2)

(ii) Draw a ring around the correct answer to complete the sentence.

Ores contain enough metal to make extraction of the metal

- |   |
|---|
| carbon neutral.<br>economical.<br>reversible. |
|---|

(1)

(b) Many chemical reactions take place in a blast furnace.  
Use the flow diagram to help you to answer this question.

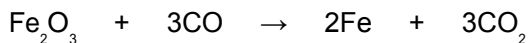
Suggest how the blast furnace is heated.

.....

.....

(1)

(c) A chemical reaction for the extraction of iron is:



(i) Complete the word equation for this chemical reaction.

..... + carbon monoxide → iron + .....

(2)

(ii) Draw a ring around the correct answer to complete the sentence.

Iron is extracted from its ore by

- |                |
|----------------|
| decomposition. |
| oxidation.     |
| reduction.     |

(1)

(d) Cast iron contains about 4% carbon.  
Cast iron is converted into low-carbon steels.

(i) Low-carbon steel is produced by blowing oxygen into molten cast iron.

Suggest how oxygen removes most of the carbon.

.....

.....

.....

.....

(2)

(ii) Draw a ring around the correct answer to complete the sentence.

Metals, such as nickel, are added to low-carbon steels to make the steel

- |                 |
|-----------------|
| corrode easily. |
| easy to shape.  |
| much harder.    |

(1)

(e) Recycling steel uses less energy than producing steel from iron ore.

Tick (✓) **one** advantage and Tick (✓) **one** disadvantage of recycling steel.

Statement	Advantage Tick (✓)	Disadvantage Tick (✓)
Iron is the second most common metal in the Earth's crust.		
Less carbon dioxide is produced.		
More iron ore needs to be mined.		
There are different types of steel which must be sorted.		

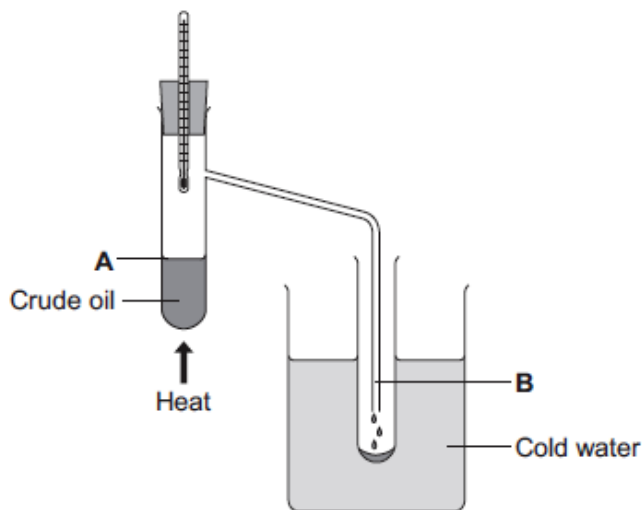
(2)

(Total 12 marks)

**Q4.** Crude oil is a mixture of a very large number of compounds.

**Figure 1** shows a laboratory experiment to separate crude oil.

**Figure 1**



(a) Complete the sentence.

The name for compounds that contain only hydrogen and carbon is .....

(1)

(b) Use the correct word from the box to complete each sentence.

<b>condensation</b>	<b>decomposition</b>	<b>distillation</b>
<b>evaporation</b>	<b>reduction</b>	

(i) The process of separating crude oil is fractional .....

(1)

(ii) The process taking place at **A** is .....

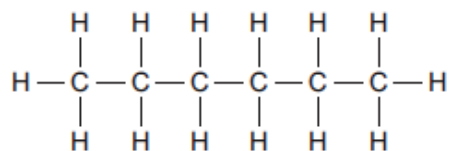
(1)

(iii) The process taking place at **B** is .....

(1)

(c) One of the compounds in crude oil is hexane. The displayed structure of hexane is shown in **Figure 2**.

**Figure 2**

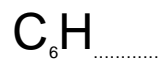


Complete the sentences.

(i) Each line between the atoms in hexane represents a covalent .....

(1)

(ii) Complete the chemical formula for hexane.



(1)

(iii) Hexane can be broken down into smaller molecules by a process called

.....

(1)

(d) Small molecules, called alkenes, are used to make polymers.

(i) Name the polymer made from butene.

.....

(1)

(ii) Incinerators are used to burn waste polymers, such as plastic bags.

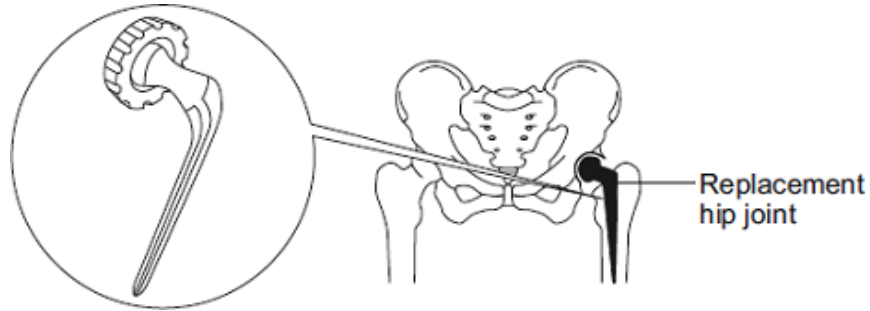
Tick (✓) **one** advantage and tick (✓) **one** disadvantage of burning plastic bags.

	Advantage Tick (✓)	Disadvantage Tick (✓)
Energy is released.		
More recycling is needed.		
Carbon dioxide is produced.		

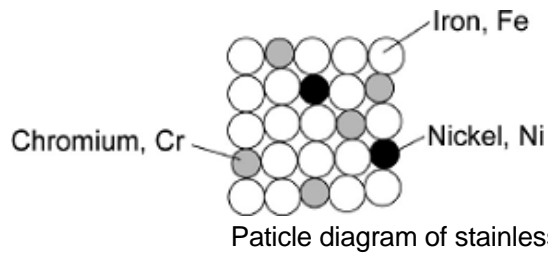
(2)

(Total 10 marks)

- Q5.** The hip joint sometimes has to be replaced.  
Early replacement hip joints were made from stainless steel.



Stainless steel is an alloy of iron, chromium and nickel.  
The diagram below represents the particles in stainless steel.



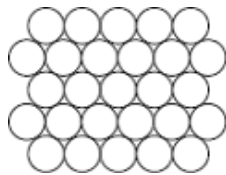
- (a) Use the diagram to complete the percentages of metals in this stainless steel.

The first one has been done for you.

Element	Percentage (%)
Iron, Fe	72
Chromium, Cr	
Nickel, Ni	

(2)

- (b) Pure iron is a soft, metallic *element*.



- (i) Why is iron described as an *element*?

.....  
.....

(1)

(ii) Pure iron would **not** be suitable for a replacement hip joint.

Suggest why.

.....  
.....

(1)

(iii) The three metals in stainless steel have different sized atoms.  
Stainless steel is harder than pure iron.

Explain why.

.....  
.....  
.....  
.....

(2)

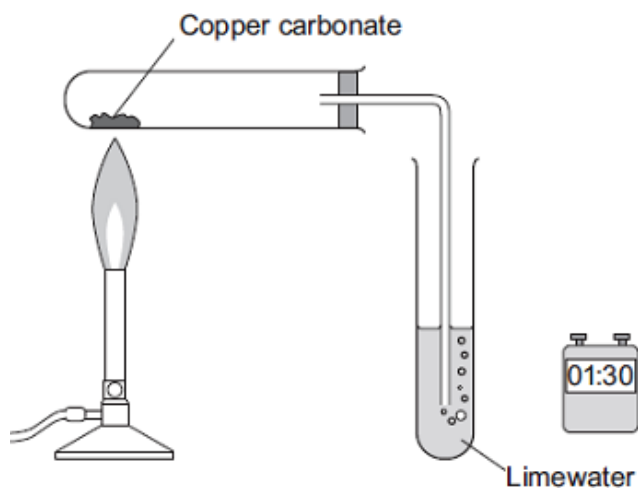
(Total 6 marks)

**Q6.** Carbon dioxide is produced when copper carbonate is heated.

A student investigated heating copper carbonate.

The student used the apparatus to measure how long it took for carbon dioxide to be produced.

The student also noted what happened during each minute for three minutes.



(a) The student used changes to the limewater to measure how long it took for carbon dioxide to be produced.

Describe how.

.....  
.....  
.....  
.....

(2)

(b) The student wrote down her observations.

Time interval in minutes	Observations
Between 0 and 1	A slow release of gas bubbles. The limewater did not change. The solid in the test tube was green.
Between 1 and 2	A fast release of gas bubbles. The limewater changed at 1 minute 10 seconds.
Between 2 and 3	No release of gas bubbles. The solid in the test tube was black.

(i) Suggest the reason for the student's observations between 0 and 1 minute.

.....  
.....  
.....  
.....  
.....

(2)

(ii) Explain the student's observations between 1 and 2 minutes.

.....  
.....  
.....  
.....

(2)

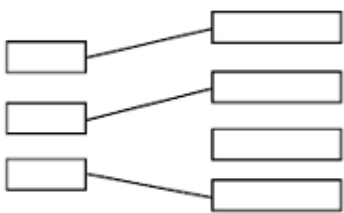
(iii) Explain the student's observations between 2 and 3 minutes.

.....  
.....  
.....  
.....

(2)

- M1.** (a) (i) economical 1
- (ii) phytomining 1
- (iii) carbon dioxide 1
- (b) (i) copper / Cu 1
- iron sulfate /  $\text{FeSO}_4$  1
- (ii) copper / ions have a positive charge  
*it = copper ions*  
*allow copper ions have a different charge*  
*accept copper / ions are free to move*  
*accept to gain electrons*  
*accept copper / ions are attracted to the negative electrode or*  
*opposite charges attract* 1
- (c) any **two** from:  
*ignore not biodegradable or does not decay*
- copper ores are limited / running out  
*allow copper is running out*
  - copper can be recycled
  - copper can be reused
  - copper is expensive
  - landfill sites are filling up
  - copper compounds are toxic  
*allow copper is toxic*

[8]

- M2.** (a) (i) nucleus 1
- (ii) an energy level (shell) 1
- (b)
- 
- 3

- (c) 2 / two(%) 1
- (d) (i) 10 / ten 1
- (ii) (group) 0  
*accept noble gases*  
*ignore (group) 8* 1 [8]

**M3.** (a) (i) Positive impact

any **one** from:

- provides employment **or**
- improves local economy
- improved transport - new roads are built, new rail links
- after use the quarry could provide recreation facilities

1

Negative impact

any **one** from:

- destruction of animal habitats
- fewer plants and trees to absorb carbon dioxide
- visual pollution **or** noise pollution **or** atmospheric / air pollution  
*allow dust pollution*
- more traffic
- uses non-renewable resources  
*allow pollutants from burning diesel*

1

- (ii) economical 1

- (b) carbon / coke burns (in oxygen / air)  
*accept carbon / coke reacts with oxygen / air* 1

- (c) (i) iron oxide (reactant)  
*must be words* 1

- carbon dioxide (product) 1

	(ii) reduction	1
(d)	(i) oxygen <u>reacts with</u> carbon	1
	<b>or</b>	
	oxygen and carbon produce carbon dioxide / carbon monoxide	
	carbon dioxide / carbon monoxide is a <u>gas</u>	
	<b>or</b>	
	the carbon is removed as a <u>gas</u>	1
	(ii) much harder	1
(e)	Advantage:	
	less carbon dioxide is produced	1
	Disadvantage:	
	there are different types of steel which must be sorted	1
		<b>[12]</b>
<b>M4.</b>	(a) hydrocarbons <b>or</b> hydrocarbon	1
(b)	(i) distillation	1
	(ii) evaporation	1
	(iii) condensation	1
(c)	(i) bond	1
	(ii) $(C_6H)_{14}$	1
	(iii) cracking	1
(d)	(i) poly(butene)	
	<i>allow with or without brackets</i>	1

- (ii) Advantage = energy is released  
do **not** accept more than one tick in the advantage column 1
- Disadvantage = carbon dioxide is produced  
do **not** accept more than one tick in the disadvantage column 1

[10]

- M5.** (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]

- M6.** (a) time from when the heating is started until 1

the limewater turns cloudy / milky 1

- (b) (i) the temperature was not high enough  
accept the copper carbonate had not started to decompose / react  
accept it takes time to heat up the copper carbonate 1

the bubbles of gas were air  
accept no carbon dioxide produced 1

(ii) the copper carbonate was decomposing / reacting  
*accept the temperature was high enough to cause decomposition /  
a reaction*

1

so carbon dioxide was produced  
*allow correct word / symbol equation*

1

(iii) copper oxide was produced  
*allow correct word / symbol equation*

1

because the copper carbonate had completely decomposed / reacted  
*ignore all of the carbon dioxide had been given off*

1

[8]

