WJEC 2014 Online Exam Review

GCSE Additional Science Chemistry 2 Higher 4472-02

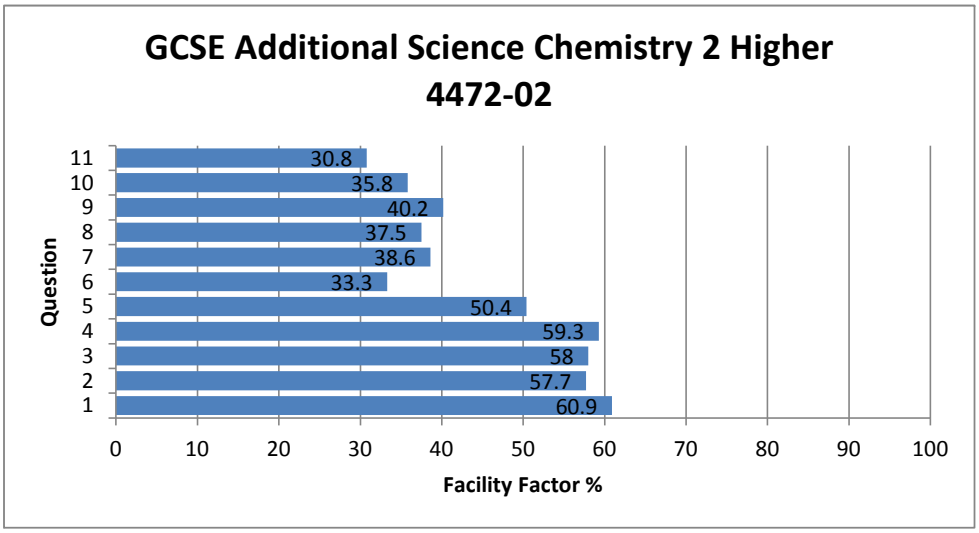
All Candidates' performance across questions

Question Title	N	Mean	S D	Max Mark	F F	Attempt %
1	5209	3	1.4	5	60.9	99.9
2	5212	3.5	1.4	6	57.7	100
3	5214	4.1	1.7	7	58	100
4	5209	3.6	1.4	6	59.3	99.9
5	5210	2	1.3	4	50.4	99.9
6	5194	1.3	1.2	4	33.3	99.6
7	5208	2.7	1.9	7	38.6	99.9
8	5189	1.9	1.6	5	37.5	99.5
9	5209	2	1.3	5	40.2	99.9
10	5109	1.8	1.7	5	35.8	98
11	5090	1.8	1.6	6	30.8	97.6

7

10

11



Examiner only

7. *(a)* Sodium reacts with oxygen to give sodium oxide.

(i) Using the electronic structures below, draw dot and cross diagrams to show the transfer of electrons and the formation of ions that occur as sodium oxide is formed. [3]

sodium 2,8,1 oxygen 2,6

(ii) Give the **electronic structure** of the sodium and oxide **ions**. [1]

	Electronic structure
sodium ion	
oxide ion	

(b) Name the **type of structure** present in ammonia, NH_3, and explain why ammonia has a low melting point. [3]

.....

.....

.....

.....

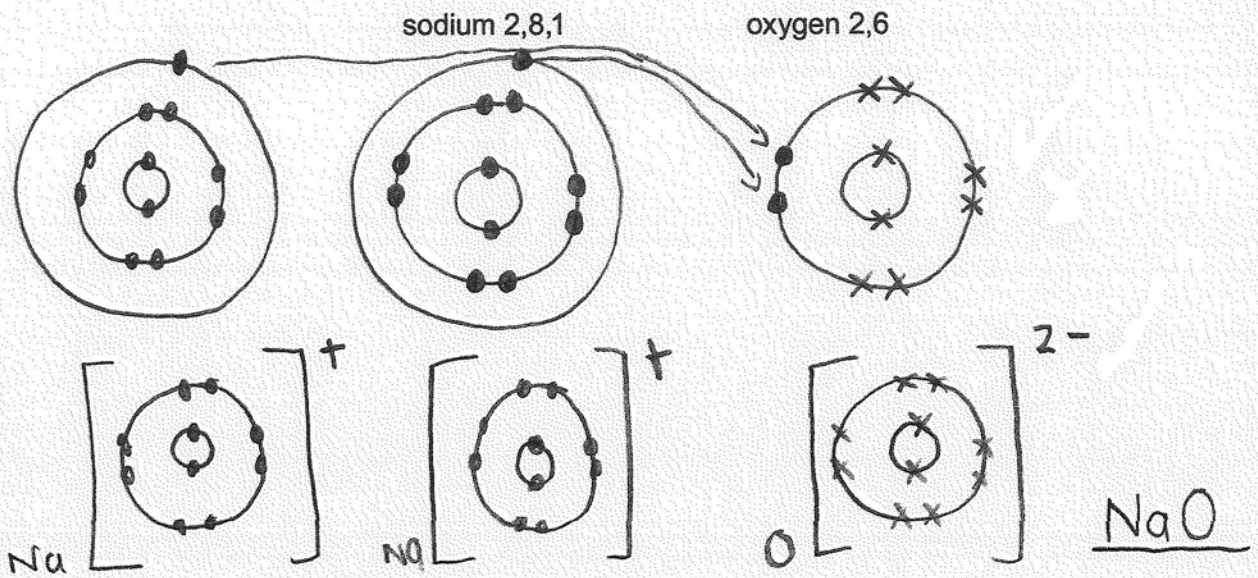
.....

7

Examiner only

7. *(a)* Sodium reacts with oxygen to give sodium oxide.

(i) Using the electronic structures below, draw dot and cross diagrams to show the transfer of electrons and the formation of ions that occur as sodium oxide is formed. [3]



(ii) Give the **electronic structure** of the sodium and oxide **ions**. [1]

	Electronic structure
sodium ion	2,8
oxide ion	2,8

(b) Name the **type of structure** present in ammonia, NH_3, and explain why ammonia has a low melting point. [3]

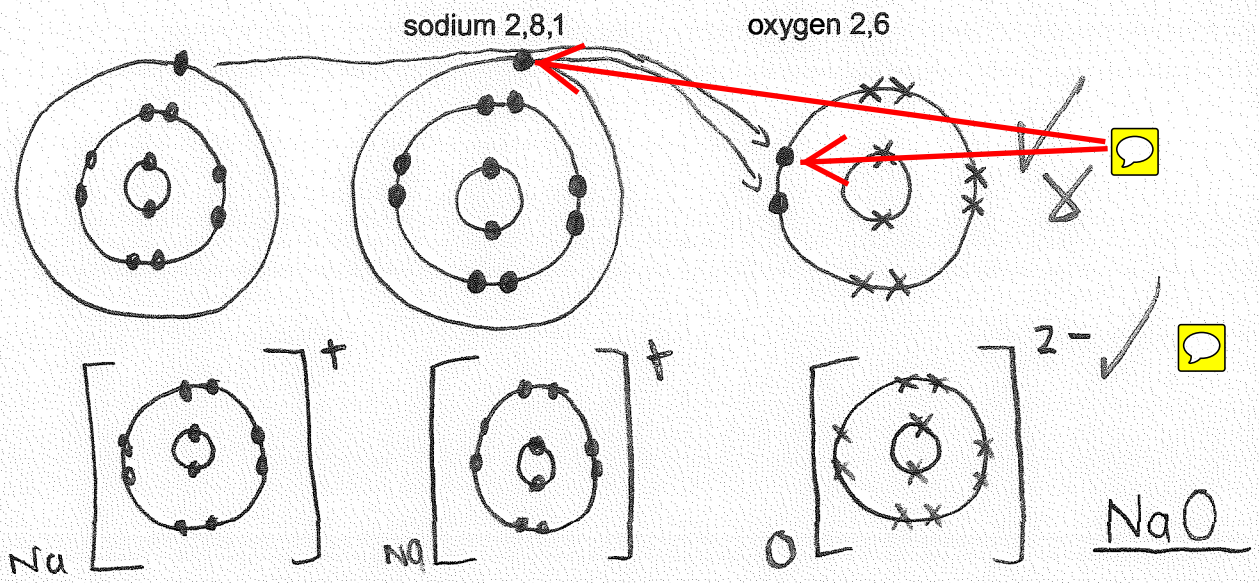
Ammonia is formed by covalent bonding - the molecules are difficult to break apart however there are only very weak forces between the molecules ~~together~~, which means that only a small amount of energy (from heating) is required to break the bonds.

7

Examiner only

7. *(a)* Sodium reacts with oxygen to give sodium oxide.

(i) Using the electronic structures below, draw dot and cross diagrams to show the transfer of electrons and the formation of ions that occur as sodium oxide is formed. [3]



(ii) Give the **electronic structure** of the sodium and oxide **ions**. [1]

	Electronic structure
sodium ion	2,8
oxide ion	2,8

(b) Name the **type of structure** present in ammonia, NH_3, and explain why ammonia has a low melting point. [3]

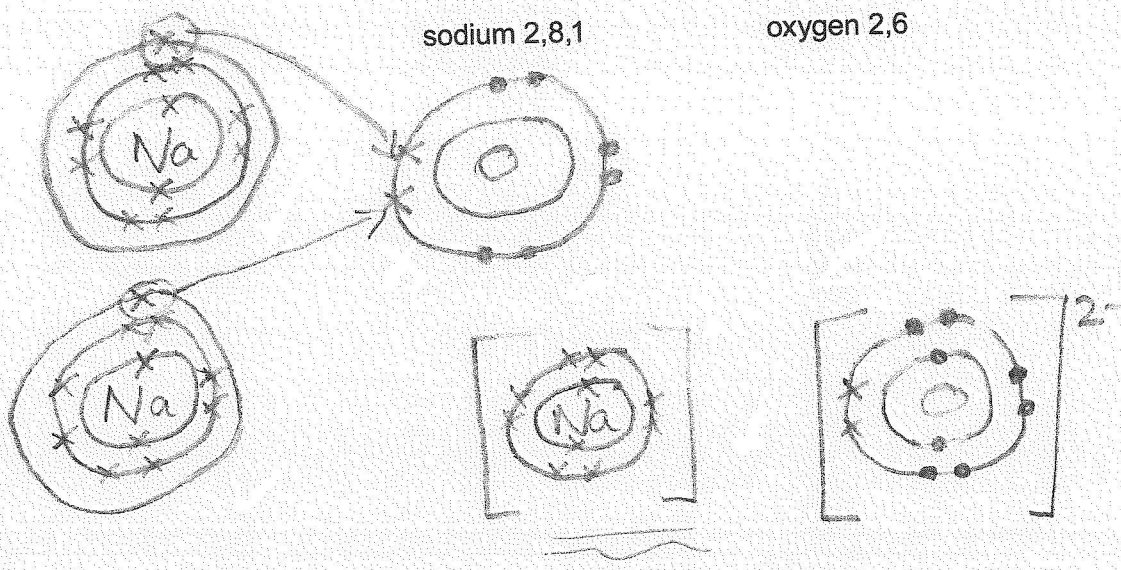
Ammonia is formed by covalent bonding ^ the molecules are difficult to break apart however there are only very weak forces ~~joining~~ between the molecules ~~together~~, which means that only a small amount of energy (from heating) is required to break the bonds.

Examiner only

7. *(a)* Sodium reacts with oxygen to give sodium oxide.

(i) Using the electronic structures below, draw dot and cross diagrams to show the transfer of electrons and the formation of ions that occur as sodium oxide is formed. [3]

sodium 2,8,1 oxygen 2,6



(ii) Give the **electronic structure** of the sodium and oxide **ions**. [1]

	Electronic structure
sodium ion	2, 8
oxide ion	2, 8

(b) Name the **type of structure** present in ammonia, NH_3, and explain why ammonia has a low melting point. [3]

A Simple covalent structure. Ammonia has a low melting point because the bonds between the elements are not very strong so the heat can easily break them apart at a low temperature so it has a low boiling point.

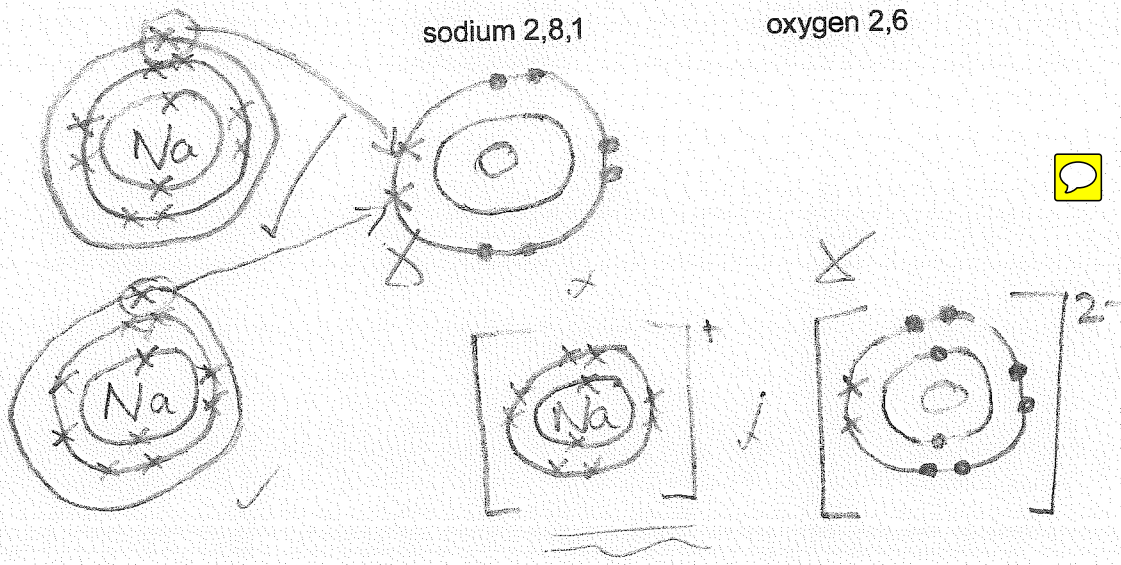
7

Examiner only

7. *(a)* Sodium reacts with oxygen to give sodium oxide.

(i) Using the electronic structures below, draw dot and cross diagrams to show the transfer of electrons and the formation of ions that occur as sodium oxide is formed. [3]

sodium 2,8,1 oxygen 2,6



(ii) Give the **electronic structure** of the sodium and oxide **ions**. [1]

	Electronic structure
sodium ion	2, 8
oxide ion	2, 8

(b) Name the **type of structure** present in ammonia, NH_3, and explain why ammonia has a low melting point. [3]

A Simple covalent structure. Ammonia has a low melting point because the bonds between the elements are not very strong so the heat can easily break them apart at a low temperature so it has a low boiling point.

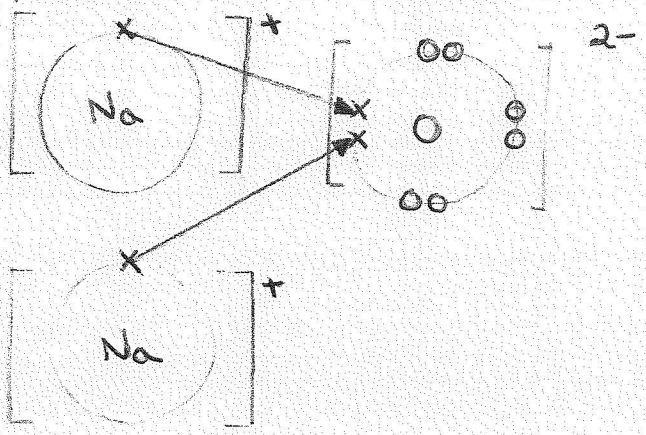
3

Examiner only

7. *(a)* Sodium reacts with oxygen to give sodium oxide.

(i) Using the electronic structures below, draw dot and cross diagrams to show the transfer of electrons and the formation of ions that occur as sodium oxide is formed. [3]

sodium 2,8,1 oxygen 2,6



(ii) Give the **electronic structure** of the sodium and oxide **ions**. [1]

	Electronic structure
sodium ion	
oxide ion	

(b) Name the **type of structure** present in ammonia, NH_3, and explain why ammonia has a low melting point. [3]

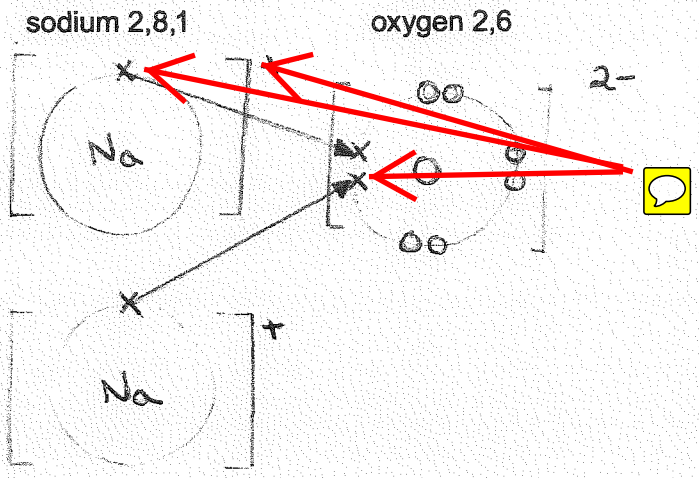
It has a simple covalent structure and it has a low melting point because the bonds between the molecules, the inter-molecular force, isn't very strong, so when heat is applied, the bonds break and the substance melts and becomes liquid.

7

Examiner only

7. *(a)* Sodium reacts with oxygen to give sodium oxide.

(i) Using the electronic structures below, draw dot and cross diagrams to show the transfer of electrons and the formation of ions that occur as sodium oxide is formed. [3]



(ii) Give the **electronic structure** of the sodium and oxide **ions**. [1]

	Electronic structure
sodium ion	
oxide ion	

(b) Name the **type of structure** present in ammonia, NH_3, and explain why ammonia has a low melting point. [3]

It has a simple covalent structure and it has a low melting point because the bonds between the molecules, the inter-molecular force, isn't very strong, so when heat is applied, the bonds break and the substance melts and becomes liquid.

2

Examiner only

10. Many metal ores contain sulfides. Chalcocite is an important copper ore which contains copper(I) sulfide, Cu_2S.

Copper can be obtained from the ore by heating in air.

The equation for the reaction that takes place is as follows.

$$Cu_2S + O_2 \longrightarrow 2Cu + SO_2$$

(a) Use the above equation to calculate the mass of copper produced on reacting 20.5 tonnes of copper(I) sulfide with an excess of oxygen. [3]

A_r(Cu) = 64 A_r(S) = 32

Mass of copper = ... tonnes

(b) When the extraction was carried out with 20.5 tonnes of chalcocite only 12.3 tonnes of copper was formed.

Calculate the percentage of **impurity** present in the ore. [2]

Percentage of impurity = ... %

5

Turn over.

Examiner only

10. Many metal ores contain sulfides. Chalcocite is an important copper ore which contains copper(I) sulfide, Cu_2S.

Copper can be obtained from the ore by heating in air.

The equation for the reaction that takes place is as follows.

$$Cu_2S + O_2 \longrightarrow 2Cu + SO_2$$

(a) Use the above equation to calculate the mass of copper produced on reacting 20.5 tonnes of copper(I) sulfide with an excess of oxygen. [3]

$A_r(Cu) = 64$ $A_r(S) = 32$

(64x2) + 32 = 160

2Cu = 2x64 = 128

20.5 ÷ 160 = 0.128125

0.128125 x 128 = 16.4

Mass of copper = 16.4 tonnes

(b) When the extraction was carried out with 20.5 tonnes of chalcocite only 12.3 tonnes of copper was formed.

Calculate the percentage of **impurity** present in the ore. [2]

$$\frac{12.3}{16.4} \times 100 = 75$$

100 - 75 = 25

Percentage of impurity = 25 %

Examiner only

10. Many metal ores contain sulfides. Chalcocite is an important copper ore which contains copper(I) sulfide, Cu_2S.

Copper can be obtained from the ore by heating in air.

The equation for the reaction that takes place is as follows.

$$Cu_2S + O_2 \longrightarrow 2Cu + SO_2$$

(a) Use the above equation to calculate the mass of copper produced on reacting 20.5 tonnes of copper(I) sulfide with an excess of oxygen. [3]

$A_r(Cu) = 64$ $A_r(S) = 32$

(64x2) + 32 = 160

2Cu = 2x64 = 128

20.5 ÷ 160 = 0.128125

0.128125 x 128 = 16.4

3

Mass of copper = 16.4 tonnes

(b) When the extraction was carried out with 20.5 tonnes of chalcocite only 12.3 tonnes of copper was formed.

Calculate the percentage of **impurity** present in the ore. [2]

$$\frac{12.3}{16.4} \times 100 = 75$$

100 - 75 = 25

Percentage of impurity = 25 %

Examiner only

10. Many metal ores contain sulfides. Chalcocite is an important copper ore which contains copper(I) sulfide, Cu_2S.

Copper can be obtained from the ore by heating in air.

The equation for the reaction that takes place is as follows.

$$Cu_2S + O_2 \longrightarrow 2Cu + SO_2$$

(a) Use the above equation to calculate the mass of copper produced on reacting 20.5 tonnes of copper(I) sulfide with an excess of oxygen. [3]

$A_r(Cu) = 64$ $A_r(S) = 32$

	Cu_2S	O_2	$2Cu$	SO_2
Mass	20.5	3.2	12.8	6.4
A_r M_r	160	32	64	64
Moles	0.1	0.1	0.2	0.1

Mass of copper = ..12.8.. tonnes

(b) When the extraction was carried out with 20.5 tonnes of chalcocite only 12.3 tonnes of copper was formed.

Calculate the percentage of **impurity** present in the ore. [2]

$$\frac{12.3}{12.8} \times 100 = 96$$

Percentage of impurity = ..4.. %

Examiner only

10. Many metal ores contain sulfides. Chalcocite is an important copper ore which contains copper(I) sulfide, Cu_2S.

Copper can be obtained from the ore by heating in air.

The equation for the reaction that takes place is as follows.

$$Cu_2S + O_2 \longrightarrow 2Cu + SO_2$$

(a) Use the above equation to calculate the mass of copper produced on reacting 20.5 tonnes of copper(I) sulfide with an excess of oxygen. [3]

A_r(Cu) = 64 A_r(S) = 32

	Cu_2S	O_2	$2Cu$	SO_2
Mass	20.5	3.2	12.8	6.4
Ar Mr	160	32	64	64
Moles	0.1	0.1	0.2	0.1

Mass of copper = ... 12.8 ..... tonnes

2

(b) When the extraction was carried out with 20.5 tonnes of chalcocite only 12.3 tonnes of copper was formed.

Calculate the percentage of **impurity** present in the ore. [2]

$\frac{12.3}{12.8} \times 100 = 96$

Correct

Percentage of impurity = ... 4 ..... %

2

Examiner only

10. Many metal ores contain sulfides. Chalcocite is an important copper ore which contains copper(I) sulfide, Cu_2S.

Copper can be obtained from the ore by heating in air.

The equation for the reaction that takes place is as follows.

$$Cu_2S + O_2 \longrightarrow 2Cu + SO_2$$

20.5 — 0.128 moles — 0.128 moles — 0.25625 moles

(a) Use the above equation to calculate the mass of copper produced on reacting 20.5 tonnes of copper(I) sulfide with an excess of oxygen. [3]

$A_r(Cu) = 64$ $A_r(S) = 32$

Cu_2S moles $= \frac{\text{mass}}{\text{RMM}}$

$= \frac{20.5}{160}$

$= 0.128125$ moles of copper sulphide

$2Cu$ moles $= \frac{\text{mass}}{\text{RAM}}$

mass = moles × RAM

$= 0.256\,25 \times 64$

$= 16.4$

Mass of copper = 16.4 tonnes

(b) When the extraction was carried out with 20.5 tonnes of chalcocite only 12.3 tonnes of copper was formed.

Calculate the percentage of **impurity** present in the ore. [2]

percentage yield $= \frac{\text{successful}}{\text{possible}} \times 100$

$= \frac{12.3}{20.5} \times 100 = 60\%$

$100\% - 60\% = 40\%$

Percentage of impurity = 40 %

Examiner only

10. Many metal ores contain sulfides. Chalcocite is an important copper ore which contains copper(I) sulfide, Cu_2S.

Copper can be obtained from the ore by heating in air.

The equation for the reaction that takes place is as follows.

$$Cu_2S + O_2 \longrightarrow 2Cu + SO_2$$

20.5 0.128 moles 0.128 moles 0.25625 moles

(a) Use the above equation to calculate the mass of copper produced on reacting 20.5 tonnes of copper(I) sulfide with an excess of oxygen. [3]

$A_r(Cu) = 64$ $A_r(S) = 32$

Cu_2S moles $= \frac{\text{mass}}{\text{RMM}}$

$= \frac{20.5}{160}$

$= 0.128125$ moles of copper sulphide

2 Cu moles $= \frac{\text{mass}}{\text{RAM}}$

mass = moles × RAM

$= 0.256125 \times 64$

$= 16.4$

Mass of copper = 16.4 tonnes

3

(b) When the extraction was carried out with 20.5 tonnes of chalcocite only 12.3 tonnes of copper was formed.

Calculate the percentage of **impurity** present in the ore. [2]

percentage yield $= \frac{\text{successful}}{\text{possible}} \times 100$

$= \frac{12.3}{20.5} \times 100 = 60\%$

$100\% - 60\% = 40\%$

Percentage of impurity = 40 %

0

5

Examiner only

11. Describe how reactions involving chlorine, bromine and iodine can be used to show the trend in reactivity in Group 7 elements. [6 *QWC*]

You should include equations in your answer.

END OF PAPER

6

Examiner only

11. Describe how reactions involving chlorine, bromine and iodine can be used to show the trend in reactivity in Group 7 elements. [6 QWC]

You should include equations in your answer.

Reactions involving the halogens can be used to show the trend in reactivity. When passing the 3 elements over iron wool there are 3 different results. When chlorine is passed over the iron wool, the wool will heat into flames, bromine will make it glow brightly and iodine will make it glow dimly. This helps show their reactivity.

Another experiment is a displacement reaction. In this reaction, you have 4 compounds of Sodium Fluoride, Sodium Chloride, Sodium Bromide and Sodium Iodide. To show the reactivity one can add fluorine, chlorine, bromine and iodine to the 4 compounds. The fluorine will displace the chloride, bromide and iodide ions in each of the other 3 compounds as it is more reactive. The chlorine will displace the bromide and iodide ions and bromine will displace the iodide ions. This will occur as the reactivity of the halogens decreases as we move down the table, due to weaker electrostatic forces on the electrons of other atoms. The equations we would see from these reactions would be:

END OF PAPER

$2NaCl + F_2 \rightarrow 2NaF + Cl_2$

$2NaBr + F_2 \rightarrow 2NaF + Br_2$

$2NaI + F_2 \rightarrow 2NaF + I_2$

$2NaBr + Cl_2 \rightarrow 2NaCl + Br_2$

$2NaI + Cl_2 \rightarrow 2NaCl + I_2$

$2NaI + Br_2 \rightarrow 2NaBr + I_2$

6

Examiner only

11. Describe how reactions involving chlorine, bromine and iodine can be used to show the trend in reactivity in Group 7 elements. [6 QWC]

You should include equations in your answer.

Reactions involving the halogens can be used to show the trend in reactivity. When passing the 3 elements over iron wool there are 3 different results. When chlorine is passed over the iron wool, the wool will heat into flames, bromine will make it glow brightly and iodine will make it glow dimly. This helps show their reactivity.

Another experiment is a displacement reaction. In this reaction, you have 4 compounds of Sodium Fluoride, Sodium Chloride, Sodium Bromide and Sodium Iodide. To show the reactivity one can add Fluorine, Chlorine, bromine and iodine to the 4 compounds. The Fluorine will displace the Chloride, bromide and iodide ions in each of the other 3 compounds as it is more reactive. The Chlorine will displace the bromide and iodide ions and bromine will displace the iodide ions. This will occur as the reactivity of the halogens decreases as we move down the table, due to weaker electrostatic forces on the electrons of other atoms. The equations we would see from these reactions would be:

END OF PAPER

$2NaCl + F_2 \rightarrow 2NaF + Cl_2$

$2NaBr + F_2 \rightarrow 2NaF + Br_2$

$2NaI + F_2 \rightarrow 2NaF + I_2$

$2NaBr + Cl_2 \rightarrow 2NaCl + Br_2$

$2NaI + Cl_2 \rightarrow 2NaCl + I_2$

$2NaI + Br_2 \rightarrow 2NaBr + I_2$

Examiner only

11. Describe how reactions involving chlorine, bromine and iodine can be used to show the trend in reactivity in Group 7 elements. [6 *QWC*]

You should include equations in your answer.

Displacement reactions can be used to test the trend in reactivity. By ~~Pppp~~ setting up a reaction with Sodium bromide and Chlorine we can see that Chlorine would displace bromine to form Sodium Chloride

Chlorine + Sodium bromide → Sodium chloride + bromine

$ Chlorine displaces bromine as it is ~~more~~ the more reactive element.

~~Again this can be done with Sodium Chloride~~

Again this can be done with Sodium iodide and bromine. Bromine will displace iodine to form Sodium bromide.

bromine + Sodium iodide → Sodium bromide + iodine

With this information we can see that Group 7 decreases in reactivity as you move down the group. Using these experiments we can tell that Chlorine is the most reactive then bromine then iodine.

I displacement reaction would not occur if the element was less reactive.

END OF PAPER

6

Examiner only

11. Describe how reactions involving chlorine, bromine and iodine can be used to show the trend in reactivity in Group 7 elements. [6 QWC]

You should include equations in your answer.

Displacement reactions can be used to test the trend in reactivity. By ~~Bea~~ setting up a reaction with Sodium bromide and Chlorine we can see that Chlorine would displace bromine to form Sodium Chloride

Chlorine + Sodium bromide → Sodium chloride + bromine

$ Chlorine displaces bromine as it is ~~more~~ the more reactive element.

~~Again this can be done with Sodium Chloride~~ Again this can be done with Sodium iodide and bromine. Bromine will displace iodine to form Sodium bromide.

bromine + Sodium iodide → Sodium bromide + iodine

With this information we can see that Group 7 decreases in reactivity as you move down the group. Using these experiments we can tell that Chlorine is the most reactive then bromine then iodine.

I displacement reaction would not occur if the element was less reactive.

4

END OF PAPER