AQA GCSE CHEMISTRY (HIGHER) · 8462

CHEMISTRY



EXAM QUESTION PACK

4.4.1 REACTIVITY OF METALS (PACK 3)

SCORE	PERCENTAGE
/225	%

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Q1.

This question is about iron.

Iron reacts with dilute hydrochloric acid to produce iron chloride solution and one other product.

(a) Name the other product.

_____

(1)

(b) Suggest how any unreacted iron can be separated from the mixture.

_____

_____

(1)

Magnesium reacts with iron chloride solution.

$$3\ Mg + 2\ FeCl_3 \longrightarrow 2\ Fe + 3\ MgCl_2$$

(c) 0.120 g of magnesium reacts with excess iron chloride solution.

Relative atomic masses (A_r): Mg = 24 Fe = 56

Calculate the mass of iron produced, in mg

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Mass of iron = _____ mg

(5)

(d) Explain which species is reduced in the reaction between magnesium and iron chloride.

$$3\ Mg + 2\ FeCl_3 \longrightarrow 2\ Fe + 3\ MgCl_2$$

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Your answer should include the half equation for the reduction.

(3)
(Total 10 marks)

Q2.

A teacher demonstrated the extraction of copper from copper oxide.

This is the method used.

1. Mix 1.30 g of zinc and 1.59 g of copper oxide.
2. Heat the mixture strongly.
3. When the mixture starts to glow, stop heating.
4. Let the glow spread through the mixture.
5. Leave the mixture to cool.
6. Add hydrochloric acid to the cooled mixture.
7. Filter the mixture obtained in step 6.

(a) A student concluded that an exothermic reaction had taken place.

Explain how an observation made during the demonstration shows this.

(2)

(b) The equation for the reaction between zinc and copper oxide is:

$$Zn + CuO \longrightarrow ZnO + Cu$$

1.59 g of copper oxide reacted.

Calculate the mass of copper produced.

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Relative atomic masses (A_r): Cu = 63.5 O = 16 Zn = 65

Mass of copper produced = _____ g

(3)

(c) Explain why steps 6 and 7 result in only copper being obtained as the residue.

(4)

(d) The ionic equation for the reaction is:

$$Zn + Cu^{2+} \longrightarrow Zn^{2+} + Cu$$

Which statement about the reaction between zinc and copper ions is correct?

Tick **one** box.

- Copper ions have been oxidised because the copper ions have gained electrons. ☐
- Copper ions have been oxidised because the copper ions have lost electrons. ☐
- Zinc has been oxidised because the zinc atoms have gained electrons. ☐
- Zinc has been oxidised because the zinc atoms have lost electrons. ☐

(1)

(Total 10 marks)

Q3.

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This question is about metals and metal compounds.

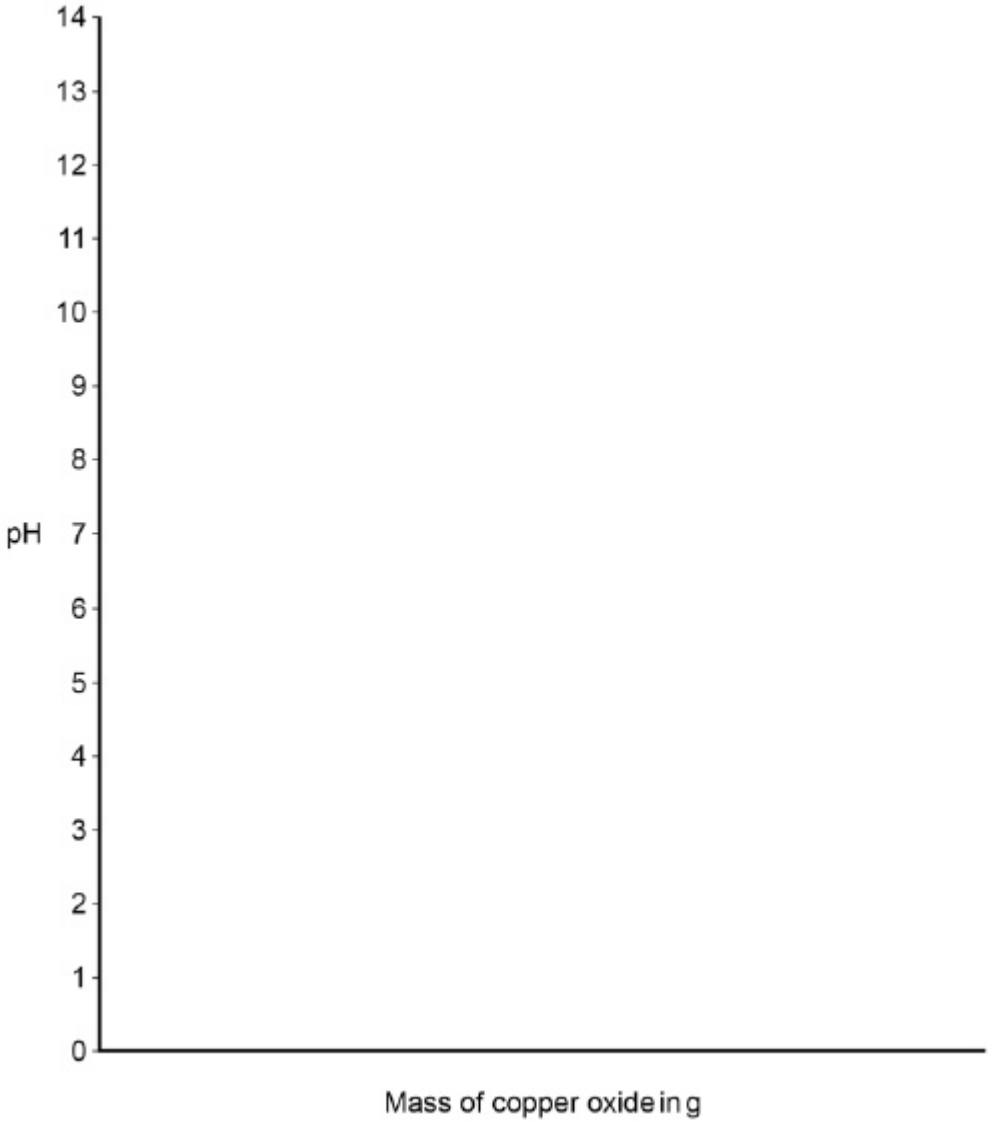
(a) Copper oxide reacts with hydrochloric acid to produce copper chloride and water.

Copper oxide is insoluble in water.

Copper oxide is gradually added to hydrochloric acid until in excess.

Sketch a graph on **Figure 1** to show how the pH of the hydrochloric acid would change.

Figure 1



(3)

(b) Magnesium reacts with hydrochloric acid to produce magnesium chloride and hydrogen.

Plan an investigation to find the accurate volume of hydrogen produced from magnesium.

You do **not** need to write about safety precautions.

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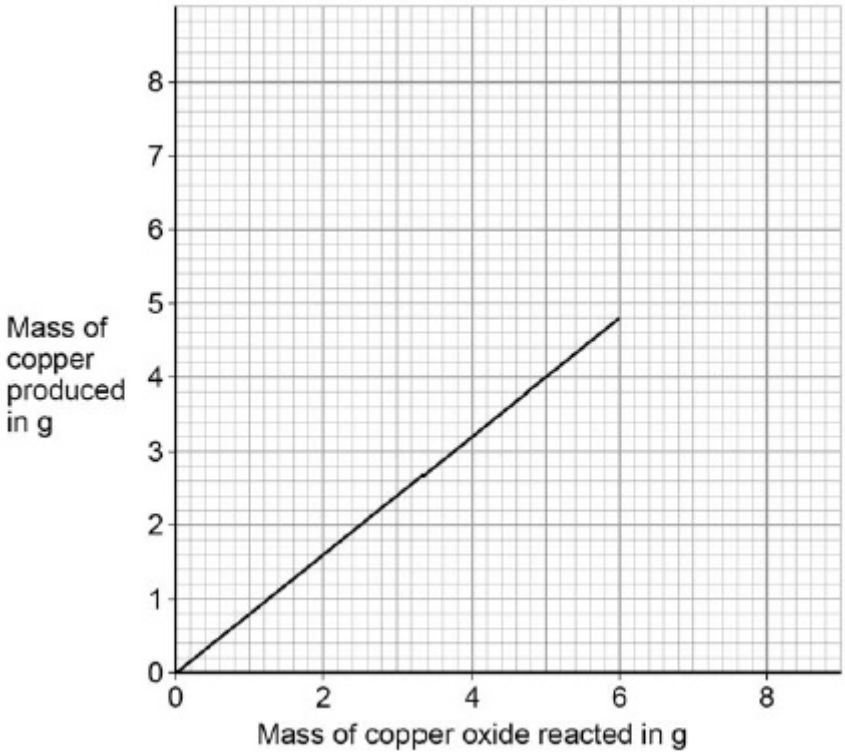
(6)

A student reacts different masses of copper oxide with excess zinc to produce copper.

Figure 2 shows the student's results.

Figure 2

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(c) Calculate the gradient (slope) of the line on **Figure 2**.

_____

_____

_____

_____

Gradient = _____ g of copper per g of copper oxide

(2)

(d) Determine the mass of copper that can be produced from 75 g of copper oxide.

Use **Figure 2**

_____

_____

_____

_____

_____

_____

Mass = _____ g

(3)

(Total 14 marks)

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Q4.

This question is about fluorine.

(a) Calcium reacts with fluorine to produce calcium fluoride (CaF_2).

Explain how oxidation and reduction have taken place in this reaction.

Write about electron transfer in your answer.

(4)

(b) Explain why calcium fluoride has a high melting point.

(4)

(c) Fluorine reacts with sulfur to produce sulfur hexafluoride (SF_6).

$$S + 3F_2 \rightarrow SF_6$$

Relative formula masses, M_r: $F_2 = 38$ $SF_6 = 146$

Calculate the mass of sulfur hexafluoride produced when 0.950 g of fluorine is reacted with an excess of sulfur.

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Give your answer to 3 significant figures.

Mass = _____ g

(5)

(Total 13 marks)

Q5.

This question is about beryllium.

(a) Beryllium is in Group 2.

What does this tell you about the electronic structure of beryllium?

(1)

Beryllium is found in beryllium aluminium silicate.

The formula of beryllium aluminium silicate is $Be_3Al_2(SiO_3)_6$

(b) What is the ratio of atoms of each element in beryllium aluminium silicate?

Ratio of Be : Al : Si : O = ___ : ___ : ___ : ___

(1)

(c) What percentage by mass of beryllium is in beryllium aluminium silicate?

Give your answer to 2 significant figures.

Relative atomic mass (A_r) of Be = 9

Relative formula mass (M_r) of $Be_3Al_2(SiO_3)_6$ = 537

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_____

_____

Percentage of beryllium = _____ %

(2)

Beryllium can be extracted from beryllium chloride.

Beryllium chloride ($BeCl_2$) is heated with potassium to produce beryllium and potassium chloride (KCl).

(d) Complete the equation for the reaction.

Your equation should be balanced.

$BeCl_2$ + _____ → _____ + _____

(2)

(e) Explain why beryllium is produced when potassium is heated with beryllium chloride.

You should refer to reactivity in your answer.

_____

_____

_____

_____

(2)

(f) Describe a test to show that beryllium is a metal.

Give the result of the test.

Test _____

_____

Result _____

_____

(2)

(Total 10 marks)

Q6.

Magnesium is added to dilute hydrochloric acid.

An exothermic reaction takes place.

Magnesium chloride solution and hydrogen gas are produced.

The equation for the reaction is:

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$$Mg\ (s) + 2HCl\ (aq) \longrightarrow MgCl_2\ (aq) + H_2\ (g)$$

(a) Describe the test for hydrogen gas.

Give the result of the test if hydrogen gas is present.

Test _____

_____

Result _____

_____

(2)

(b) A student investigates how the mass of magnesium used affects the temperature change during the reaction.

Plan a method the student could use.

You should include:
- the apparatus needed
- the measurements to be taken.

_____

_____

_____

_____

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_____

_____

_____

_____

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_____

_____

_____

(6)

(Total 8 marks)

Q7.

Some students investigated the reactivity of four unknown metals, **W**, **X**, **Y** and **Z**.

The letters are not the symbols of these elements.

The students used metal salt solutions of copper nitrate, magnesium sulfate and zinc chloride.

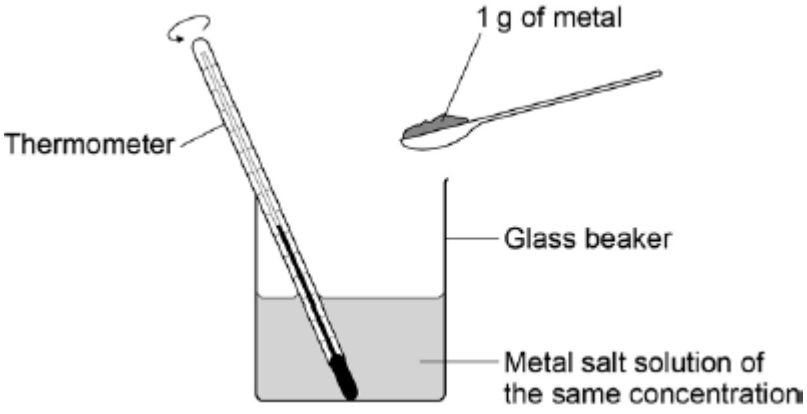
This is the method used.

1. Pour a solution of a metal salt into a glass beaker.
2. Measure the temperature of the solution.
3. Add 1 g of metal to the solution.
4. Measure the temperature of the solution.
5. Calculate the temperature increase.

The students did the experiment using each salt solution with each metal.

Figure 1 shows the apparatus the students used.

Figure 1



The table below shows the students' results.

	Temperature increase in °C			
Solution	**Metal W**	**Metal X**	**Metal Y**	**Metal Z**
Copper nitrate	46	10	29	No change
Magnesium sulfate	No change	No change	No change	No change
Zinc chloride	15	No change	No change	No change

(a) Which metal is **least** reactive?

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Tick **one** box.

Metal W ☐

Metal X ☐

Metal Y ☐

Metal Z ☐

(1)

(b) How do the results show that magnesium is **more** reactive than the metals **W**, **X**, **Y** and **Z**?

_____

_____

(1)

(c) How do the results show that the reaction between metal **Y** and copper nitrate solution is exothermic?

_____

_____

(1)

(d) One student said that the investigation was not valid (a fair test).

Write a plan for the investigation that includes improvements to the method and apparatus.

_____

_____

_____

_____

_____

_____

_____

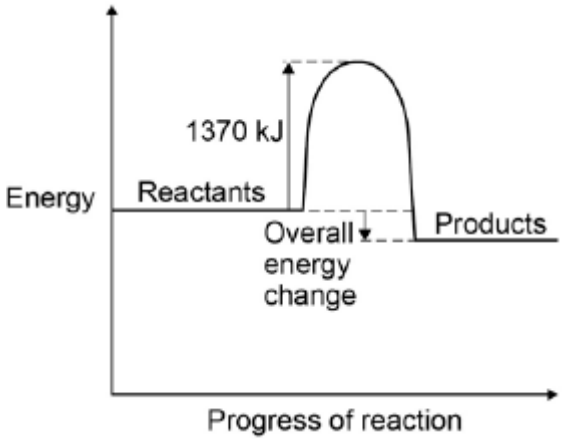
_____

(4)

(e) **Figure 2** shows the reaction profile of an exothermic reaction.

Figure 2

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What does the energy value of 1370 kJ represent?

Tick **one** box.

Activation energy ☐

Products energy ☐

Reactants energy ☐

Released energy ☐

(1)

(f) The overall energy change is 386 kJ.

What percentage of 1370 kJ is this?

Give your answer to two significant figures.

Percentage = _____ %

(2)

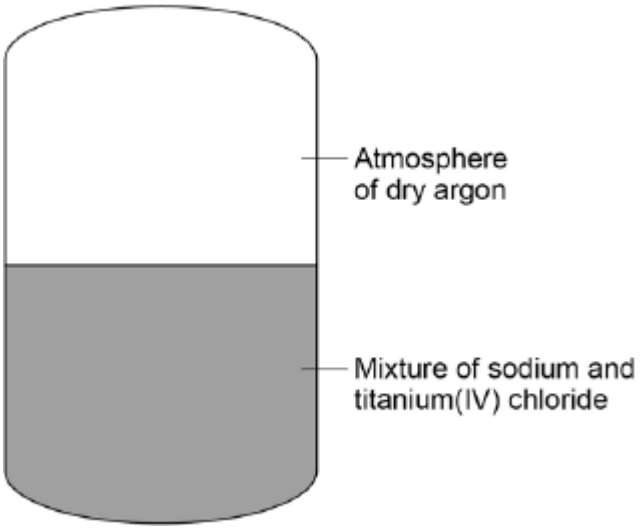
(Total 10 marks)

Q8.

Figure 1 shows a reactor used to produce titanium from titanium(IV) chloride.

Figure 1

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The chemical equation for the reaction of titanium(IV) chloride with sodium is:

$TiCl_4$ + 4Na → Ti + 4 NaCl

titanium(IV) chloride + sodium → titanium + sodium chloride

(a) For one reaction:

- 1615 kg titanium(IV) chloride reacted completely with 782 kg sodium
- 1989 kg sodium chloride was produced.

Calculate the mass of titanium produced from this reaction.

_____

_____

Mass of titanium = _____ kg

(1)

(b) The table below shows the solubility of sodium chloride in 100 cm^3 of aqueous solution at different temperatures.

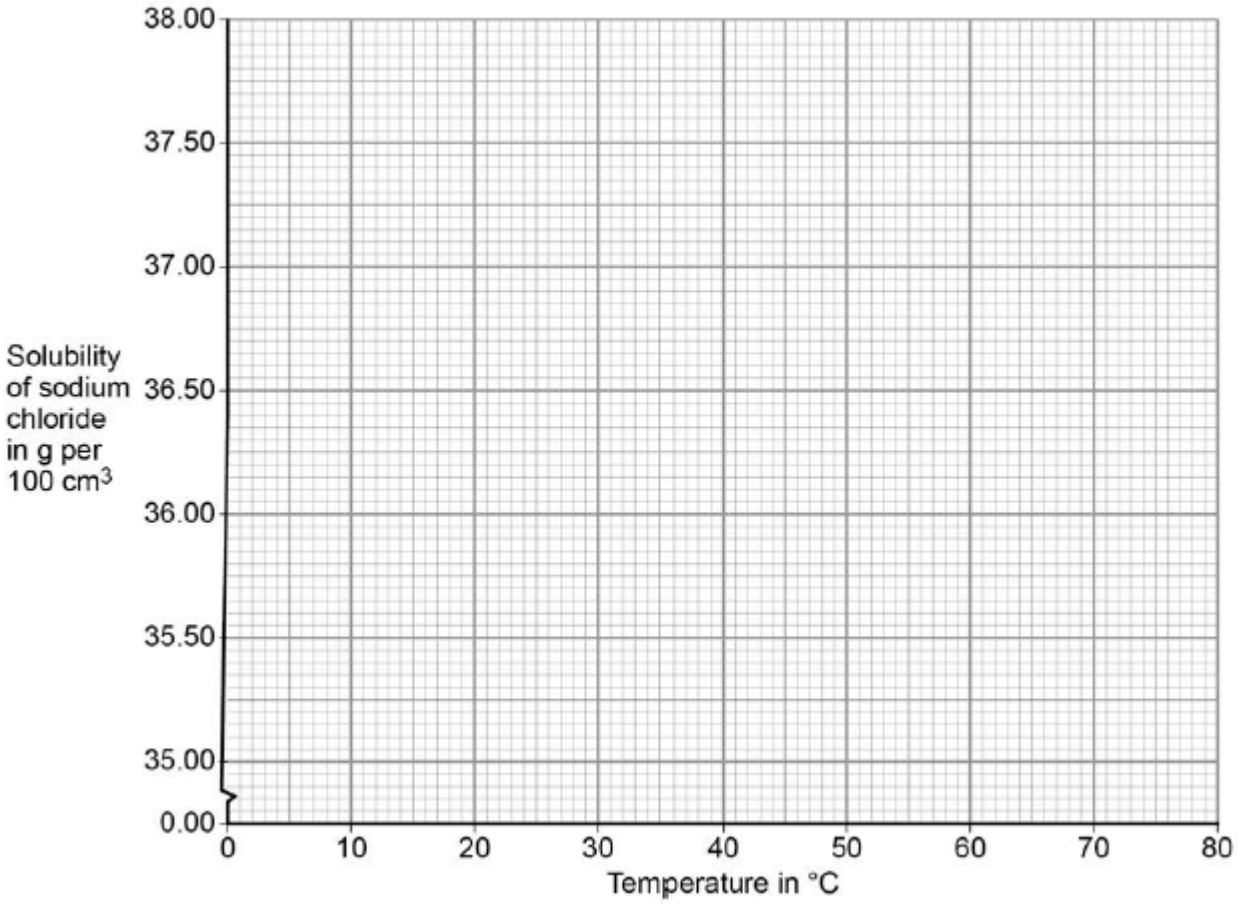
Solubility of sodium chloride in g per 100cm^3	**Temperature in °C**
35.72	10
35.89	20
36.09	30
37.37	40
36.69	50
37.04	60

On **Figure 2**:

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- plot this data on the grid
- draw a line of best fit.

Figure 2



(3)

(c) The product sodium chloride is dissolved in water to separate it from titanium.

At 30 °C the solubility of sodium chloride is 36 kg per 100 dm^3.

Calculate the minimum volume of water in dm^3, at 30 °C, needed to dissolve 1989 kg sodium chloride.

Volume of water = _____ dm^3

(2)

(d) Calculate the percentage by mass of titanium in titanium(IV) chloride ($TiCl_4$).

Give your answer to 3 significant figures.

Relative atomic masses (A_r): Cl = 35.5; Ti = 48

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Percentage of titanium by mass = _____ %

(3)

(e) Suggest why the reaction is done in an atmosphere of dry argon instead of air containing water vapour.

(3)

(f) Explain why titanium conducts electricity.

(3)

(Total 15 marks)

Q9.

Exothermic reactions transfer energy to the surroundings.

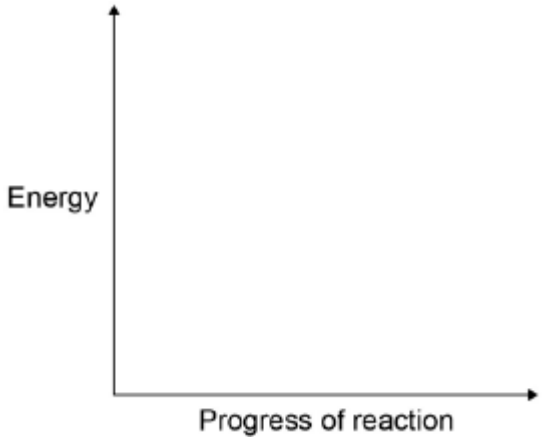
(a) Draw a reaction profile for an exothermic reaction using the axes in **Figure 1**.

Show the:

- relative energies of the reactants and products
- activation energy and overall energy change.

Figure 1

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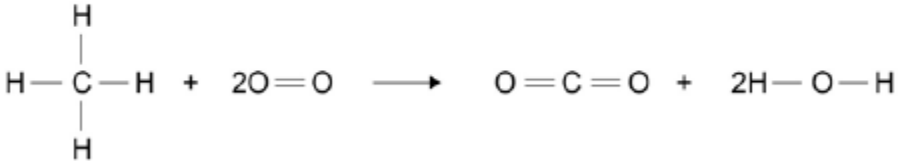


(2)

(b) Combustion is an exothermic reaction.

Calculate the overall energy change for the complete combustion of one mole of methane in oxygen.

$$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$$



Bond	Bond energy in kJ / mol
C — H	413
O = O	498
C = O	805
O — H	464

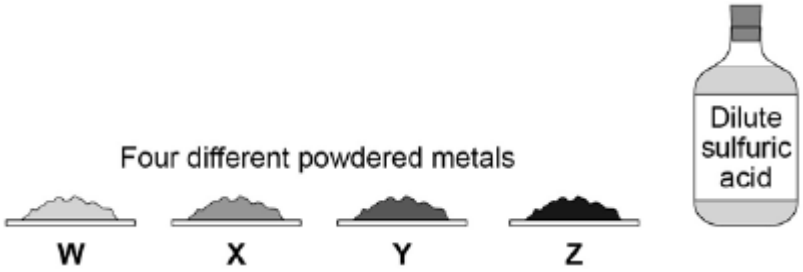
Overall energy change = _____ kJ / mol

(3)

(c) **Figure 2** shows the chemicals given to a student.

Figure 2

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The student wants to investigate the reactivity of the four metals.

Outline a plan the student could use to investigate the relative reactivity of the four metals, **W**, **X**, **Y** and **Z**.

The plan should use the fact that all four metals react exothermically with dilute sulfuric acid.

You should name the apparatus used and comment on the safe use of the chemicals.

(6)

(d) Another student used displacement reactions to investigate the relative reactivity of the four metals, **W**, **X**, **Y** and **Z**.

The table below shows the student's results.

	Observations			
Solution	**Metal W**	**Metal X**	**Metal Y**	**Metal Z**
Copper nitrate	Brown layer formed on metal	Brown layer formed on metal	Brown layer formed on metal	No change
Magnesium sulfate	No change	No change	No change	No change
Sulfuric acid	Gas	Few gas	Gas	No change

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	bubbles produced	bubbles produced	bubbles produced	
Zinc chloride	Grey layer formed on metal	No change	No change	No change

Give the order of reactivity of metals, **W**, **X**, **Y** and **Z**.

Use the results in the table above to justify your answer.

_____ > _____ > _____ > _____

(3)

(e) The student concluded that these results could also be used to justify the order of reactivity of copper, magnesium, hydrogen and zinc.

The student is **not completely** correct. Use the results in the table above to explain why.

Suggest one further experiment that would provide evidence for the student's conclusion.

(4)

(Total 18 marks)

Q10.

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This question is about the reactions of acids.

(a) When dilute hydrochloric acid is reacted with sodium hydroxide solution there is a temperature change.

Explain how the temperature changes.

_____

_____

_____

_____

(2)

(b) Acids produce hydrogen ions in aqueous solutions.

What is the ionic equation for neutralisation reactions?

Tick **one** box.

$H^+(aq) + H_2O(l) \rightarrow H_3O^+(aq)$ ☐

$H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$ ☐

$2\ H_2O(l) \rightarrow H_3O^+(aq) + OH^-(aq)$ ☐

$H_2O(l) \rightarrow 2\ H^+(aq) + O^{2-}(aq)$ ☐

(1)

(c) Sulfuric acid reacts with copper carbonate to produce a salt, water and carbon dioxide.

$$H_2SO_4 + CuCO_3 \longrightarrow CuSO_4 + H_2O + CO_2$$

What is the name of the salt produced?

_____

(1)

(d) A student reacted four metals with water and with a dilute acid to work out the order of reactivity of the metals.

The table below shows some of the observations.

Metal	Reaction with water	Reaction with dilute acid
Calcium	Bubbles of gas	**X**

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Copper	**Y**	No bubbles of gas
Magnesium	Few bubbles of gas	Bubbles of gas
Zinc	No bubbles of gas	Bubbles of gas

Write the observations for **X** and **Y**.

Observation at **X** _____

Observation at **Y** _____

(2)

(e) Write the four metals, calcium, copper, magnesium and zinc, in order of reactivity.

Start with the **most** reactive metal.

_____ _____ _____ _____

(2)

(f) Some gases given off in reactions can be identified by chemical tests.

Draw **one** line from each chemical test to the name of the gas.

Chemical test	**Gas**
Put in a lighted splint. The gas burns with a pop sound.	Carbon dioxide
	Chlorine
Put in a glowing splint. The gas relights the splint.	Hydrogen
	Nitrogen
Put into limewater. The gas turns limewater cloudy.	Oxygen

(3)

(g) Acids react with bases to produce salts and water (H_2O).

The electronic structure of a hydrogen atom is 2,1

The electronic structure of an oxygen atom is 2,6

Draw a diagram to show the arrangement of the outer shell electrons in a molecule of water.

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(2)
(Total 13 marks)

Q11.

Iron is a metal that has many uses.

(a) Iron is extracted from iron ore. Part of the process involves reduction of the ore with carbon monoxide.

Iron ore contains iron oxide (Fe_2O_3).

Write a balanced equation for the reaction of iron oxide with carbon monoxide.

_____

(3)

(b) Explain why this reaction is a redox reaction.

_____

_____

_____

(2)

Steel is an alloy of iron. Steel is used to make cars.

After its useful life a car is taken to a scrapyard for recycling.

(c) Suggest **four** benefits of recycling a car body.

_____

_____

_____

_____

_____

_____

_____

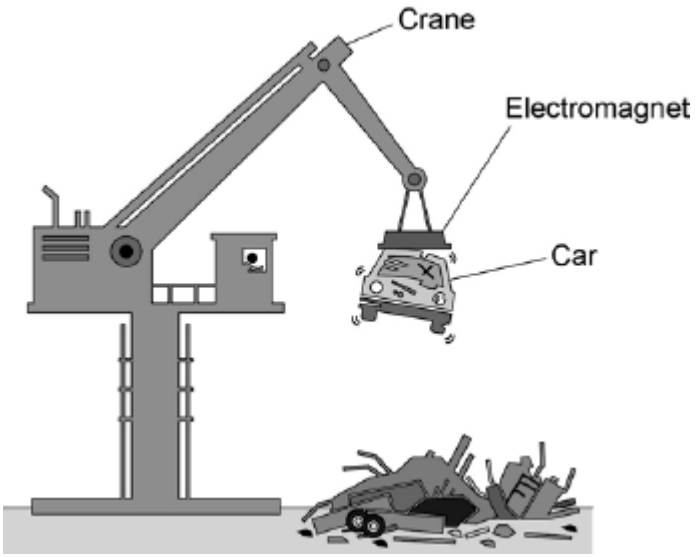
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(4)

(d) **Figure 1** shows an electromagnet being used to lift a car in a scrapyard.

Figure 1

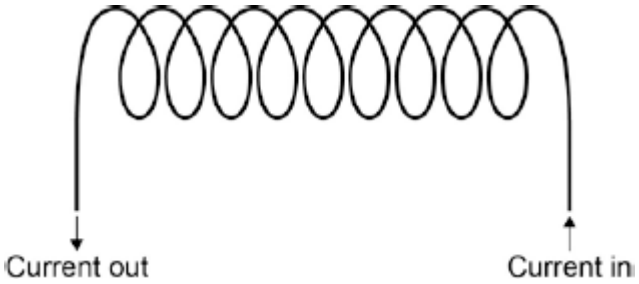
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An electromagnet is made up of a solenoid.

Figure 2 shows a solenoid.

Figure 2



Draw the magnetic field of the solenoid on **Figure 2**.

(2)

(e) In a scrapyard, an electromagnet is used to lift and release cars so they can be moved around.

Suggest **two** ways a solenoid could be made to lift and release cars in a scrapyard.

Explain why each suggestion would be useful in the scrapyard.

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(4)
(Total 15 marks)

Q12.

In 1869 there were 60 known elements.

Mendeleev arranged the elements in order of their atomic mass (atomic weight).

He realised that elements with similar properties occurred at regular intervals.

(a) Suggest why one of the groups that is on today's periodic table was not in Mendeleev's periodic system.

_____

_____

_____

(1)

(b) Explain the arrangement of the first 20 elements in today's periodic table.

You should answer in terms of atomic structure.

_____

_____

_____

_____

(2)

(c) A student put some potassium bromide solution in a test tube.

She added a few drops of chlorine solution and observed the result.

She repeated the process using different potassium halide salts and different halogens.

The table below shows the student's results.

Solution of halogen	Potassium chloride solution	Potassium bromide solution	Potassium iodide solution
Chlorine		Orange colour forms	Brown colour forms
Bromine	No reaction		Brown colour forms
Iodine	No reaction	No reaction	

Give the order of reactivity of the halogens from the results in the table above.

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Explain how you used the results to show this order of reactivity.

Order _____

Explanation _____

_____

_____

_____

(2)

(d) Write a balanced ionic equation for the reaction of chlorine with bromide ions in solution.

_____

(3)

(e) Explain the order of reactivity of Group 7 elements.

Include information about atomic structure.

_____

_____

_____

_____

_____

(2)

(Total 10 marks)

Q13.

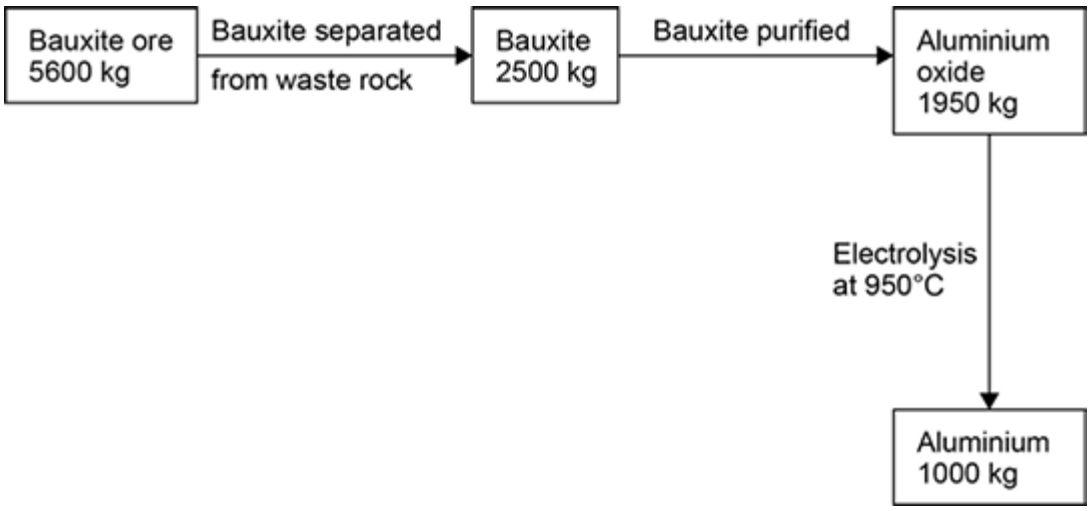
Aluminium is produced from an ore called bauxite.

Bauxite contains aluminium oxide.

Look at **Figure 1**.

Figure 1

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(a) Calculate the percentage of bauxite that is converted into aluminium oxide.

Percentage = _____

(2)

(b) Show by calculation that the mass of aluminium produced is less than that expected from 1 950 kg aluminium oxide (Al_2O_3).

You should state the difference in the mass of aluminium expected and the mass of aluminium produced to three significant figures.

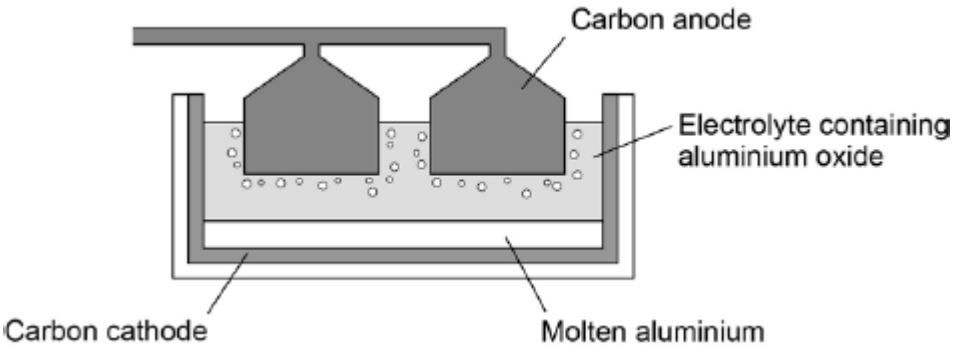
Relative atomic masses (A_r): O = 16; Al = 27

(3)

(c) **Figure 2** shows an electrolysis cell used to extract aluminium.

Figure 2

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Why does the carbon anode used in the electrolysis cell need to be continually replaced?

(3)

(d) In an electrolysis cell the current is 1.5×10^5 A, at a potential difference of 4V.

Calculate the energy transferred by the electrolysis cell in 24 hours.

Energy transferred = _____ J

(5)

(e) The half equation at the cathode is:

$Al^{3+} + 3\,e^- \longrightarrow Al$

Calculate the number of moles of electrons needed to produce 1 000 kg of aluminium.

Give your answer to three significant figures.

Relative atomic mass (A_r): Al = 27

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_____

_____

Answer = _____ moles

(3)

(Total 16 marks)

Q14.

A student investigates a potassium salt, **X**.

She finds that salt **X**:

- has a high melting point
- does not conduct electricity when it is solid
- dissolves in water and the solution does conduct electricity.

(a) What is the type of bonding in salt **X**?

Tick **one** box.

Covalent	☐
Giant molecular	☐
Ionic	☐
Metallic	☐

(1)

(b) What is the name given to solutions that conduct electricity?

_____

(1)

(c) Why does a solution of salt **X** in water conduct electricity?

_____

_____

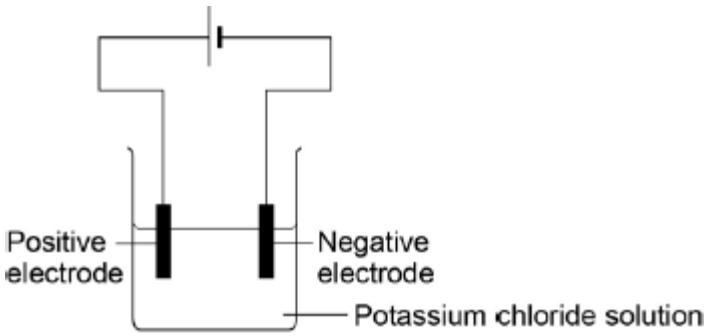
(1)

(d) The student electrolyses a solution of potassium chloride.

Figure 1 shows the apparatus she uses.

Figure 1

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When the current is switched on, bubbles of hydrogen gas are given off at the negative electrode.

Explain why hydrogen is produced and **not** potassium.

_____

_____

_____

_____

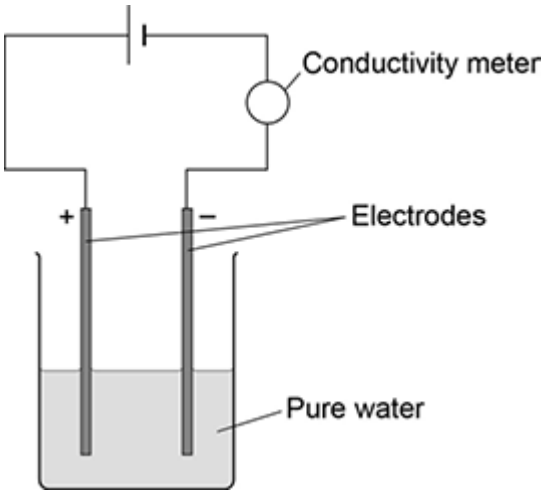
_____

(2)

(e) The student then compares the relative conductivity of different concentrations of potassium chloride.

Figure 2 shows the apparatus she uses.

Figure 2



This is the method used.

1. Add potassium chloride solution to the water one drop at a time.

2. Stir the mixture.

3. Record the reading on the conductivity meter.

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The table below shows the student's results.

Number of drops of potassium chloride solution	Relative conductivity of solution
0	0
1	90
2	180
3	270
4	360
5	450
6	540

When there is no potassium chloride in the beaker no electrical charge flows.

Suggest why pure water does **not** conduct electricity.

_____

_____

_____

_____

(2)

(f) Describe the relationship shown in the table above.

_____

_____

_____

_____

(2)

(Total 9 marks)

Q15.

The elements in Group 1 of the periodic table are metals.

(a) The elements in Group 1 are called the alkali metals.

Why are they called the alkali metals?

_____

_____

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_____

_____

(2)

(b) Explain the increase in reactivity of elements further down the group.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(c) Lithium oxide is an ionic compound.

Draw a dot and cross diagram to show how lithium and oxygen combine to form lithium oxide.

Only show the electrons in the outer shell of each atom.

Give the charges on the ions formed.

(4)

(Total 10 marks)

Q61.

The Mary Rose was a wooden warship built in 1510. The Mary Rose sank in 1545 but was lifted from the sea bed in 1982. Scientists are now preserving the ship.

Metal objects found on the Mary Rose included some made from gold, some made from iron, but none made from aluminium.

(a) (i) Why is gold found in the Earth's crust as the element?

_____

_____

(1)

(ii) Iron is extracted from iron(III) oxide by reduction with carbon.

Complete and balance the symbol equation for the reaction.

$$___Fe_2O_3 + ___C \longrightarrow _____ + _____$$

(2)

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(iii) Scientists were not able to extract aluminium until the 19th century.

Explain why.

_____

_____

_____

_____

(2)

(b) The image shows the Mary Rose being supported on poles as it is preserved. As part of the preservation process the ship was sprayed with water for 12 years.



By Mary Rose Trust (MR Trust) [CC BY-SA 3.0] via Wikimedia Commons

The table gives information about two materials which could have been used to make the poles to support the Mary Rose.

Material	**Density in g / cm^3**	**Relative strength**	**Cost in £ per kg**
Steel	7.85	1	4
Titanium	4.51	3.9	4000

Compare the physical properties of the materials in the table above to suggest why the poles were made of titanium instead of steel.

_____

_____

(1)

(Total 6 marks)

Q62.

The table below shows information about three metals.

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Metal	Mainly found as	% of metal in Earth's crust	Relative cost of 1 kg
Aluminium	Aluminium oxide, Al_2O_3	8.2	4.2
Gold	Gold	0.0000001	30000
Iron	Iron(III) oxide, Fe_2O_3	4.1	1

(a) Suggest why gold is a very expensive metal.

_____

_____

(1)

(b) Iron is extracted from iron oxide by reduction with carbon.

Aluminium cannot be extracted by reduction with carbon.

(i) What is the name of the process used to extract aluminium from aluminium oxide?

_____

(1)

(ii) Why is it more expensive to extract aluminium than iron?

_____

_____

(1)

(Total 3 marks)

Q63.

The table below shows information about three metals.

Metal	Mainly found as	% of metal in Earth's crust	Relative cost of 1 kg
Aluminium	Aluminium oxide, Al_2O_3	8.2	4.2
Gold	Gold	0.0000001	30000
Iron	Iron(III) oxide, Fe_2O_3	4.1	1

(a) Suggest why gold is a very expensive metal.

_____

_____

(1)

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Iron is extracted from iron oxide by reduction with carbon.

Aluminium cannot be extracted by reduction with carbon.

(b) (i) What is the name of the process used to extract aluminium from aluminium oxide?

_____

(1)

(ii) Why is it more expensive to extract aluminium than iron?

_____

_____

_____

(1)

(c) Complete and balance the symbol equation for the reaction to produce iron from iron(III) oxide.

_____ + _____ → _____ + _____ CO_2

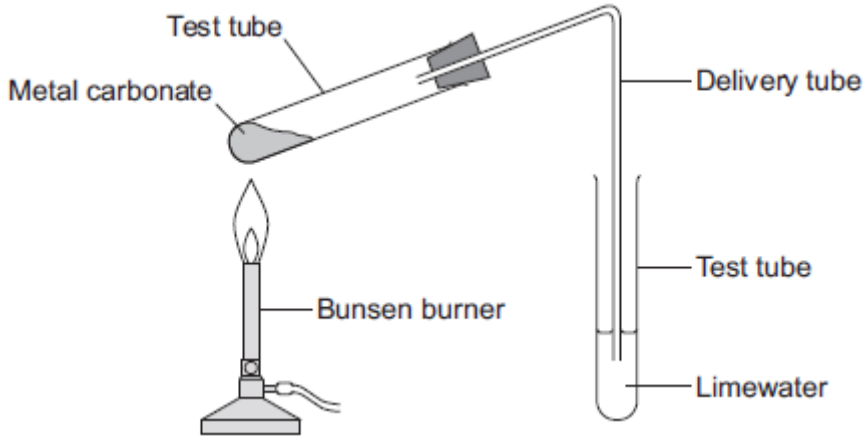
(2)

(Total 5 marks)

Q64.

A student investigated heating metal carbonates.

The student used the apparatus in the figure below.



The student's results are shown in the table below.

Metal carbonate	Colour before heating	Colour after heating	Mass before heating in g	Mass after heating in g	Limewater
Copper carbonate	Green	Black	12.4	8.0	Turns cloudy

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Potassium carbonate	White	White	13.8		
Zinc carbonate	White	White	12.5	8.1	

(a) Explain the observations seen when heating copper carbonate.

Include the names of the substances produced.

_____

_____

_____

_____

_____

_____

(3)

(b) (i) Potassium carbonate did **not** decompose when heated.

State why.

_____

_____

(1)

(ii) Complete the table above to show the results you would expect the student to obtain.

(3)

(Total 7 marks)

Q65.

Iron is extracted from iron ore by heating the ore with coke in a blast furnace.

Iron ore contains iron oxide (Fe_2O_3).
Coke contains carbon (C).

(a) (i) Explain why carbon can be used to produce iron from iron oxide.

_____

_____

_____

_____

(2)

(ii) Balance the equation for the reaction of iron oxide with carbon.

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_____ Fe_2O_3 + _____ C → _____ Fe + _____ CO_2

(2)

(b) Two methods of extracting copper are by smelting ores and by phytomining.

Which of these two methods is likely to be the more environmentally friendly?

Give reasons for your choice.

_____

_____

_____

_____

(2)

(Total 6 marks)

Q66.

Gold, silver and bronze medals were made for a competition.



Photograph supplied by iStockphoto/Thinkstock

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

(i) Gold is found as a pure metal in the Earth because gold is

coloured.
reactive.
unreactive.

(1)

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(ii) Gold is an element because all of its

atoms
molecules
symbols

are the same.

(1)

(b) The atomic number of silver is 47.
The mass number of a silver atom is 108.

Use this information to work out the number of protons and neutrons in a silver atom.

Draw **one** line from each particle in **List A** to the correct number in **List B**.

List A Particle	**List B Number**
	47
Proton	
	61
Neutron	
	108

(2)

(c) Bronze is an alloy of copper and tin.

(i) What is an alloy?

_____

_____

(1)

(ii) Medals made of copper or bronze cost the same.

Bronze is used to make medals instead of pure copper.

Give **one** reason why.

_____

_____

(1)

(Total 6 marks)

Q67.

Copper is found in the Earth's crust as an ore containing copper sulfide. Large areas of land, where this ore was once quarried, are contaminated with low percentages of copper sulfide. Copper would be too expensive to extract from this contaminated land using the

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traditional method of quarrying and then heating in a furnace.

(a) Extracting copper from this land by the traditional method would have a major environmental impact.

Give **two** reasons why.

_____

_____

_____

_____

(2)

(b) One way to extract the copper from land that contains low percentages of copper sulfide is by bioleaching. Bioleaching uses bacteria. The bacteria produce a solution of copper sulfate.

It is possible to get copper from a solution of copper sulfate using scrap iron.

(i) It is economical to use scrap iron to get copper.

Give **one** reason why.

_____

_____

(1)

(ii) Iron can be used to get copper from copper sulfate solution.

Explain why.

_____

_____

_____

_____

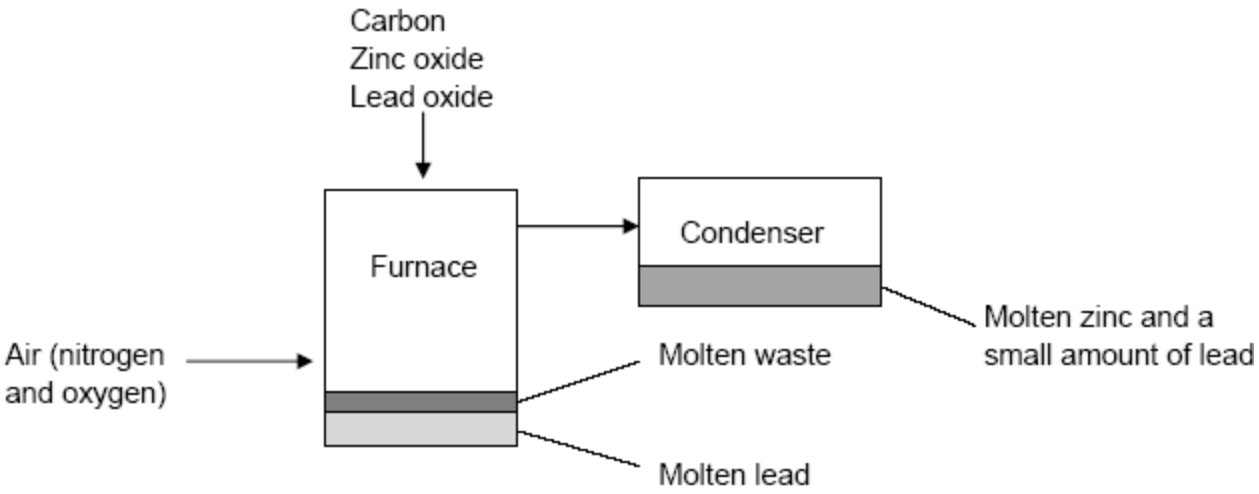
(2)

(Total 5 marks)

Q68.

Nearly all zinc is obtained from ores that also contain lead. The metals zinc and lead can be extracted by reducing their oxides using carbon.

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(a) Complete the following sentence.

Zinc oxide is reduced by carbon, which takes away _____ to leave zinc metal.

(1)

(b) The melting points and boiling points of lead and zinc are given in the table.

Metal	Lead	Zinc
Melting point in °C	328	420
Boiling point in °C	1740	907
Density in g per cm^3	11.34	7.14

The furnace operates at a temperature of 1200 °C.

(i) Explain why only lead metal remains in the furnace.

_____

_____

_____

(2)

(ii) Suggest how zinc can be separated from the lead in the condenser.

_____

_____

_____

(2)

(Total 5 marks)

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