

Candidate Name	Centre Number	Candidate Number
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**GCSE**

240/01

**ADDITIONAL SCIENCE  
FOUNDATION TIER  
CHEMISTRY 2**

A.M. WEDNESDAY, 26 May 2010

45 minutes

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	6	
2.	7	
3.	7	
4.	8	
5.	3	
6.	4	
7.	4	
8.	6	
9.	5	
<b>Total</b>	<b>50</b>	

**ADDITIONAL MATERIALS**

In addition to this paper you may require a calculator and a ruler.

**INSTRUCTIONS TO CANDIDATES**

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

**INFORMATION FOR CANDIDATES**

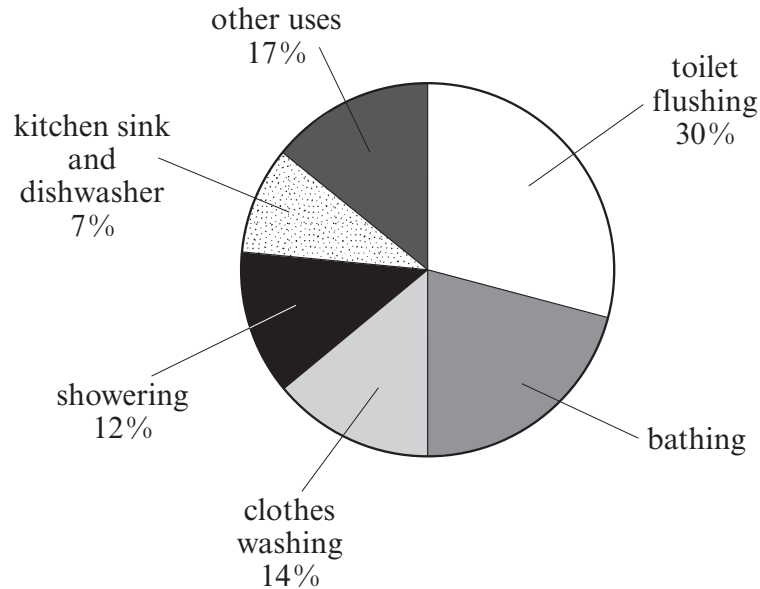
The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

The Periodic Table is printed on the back cover of the examination paper and the formulae for some common ions on the inside of the back cover.

Answer **all** questions.

1. (a) The following pie chart shows some of the main uses of water in the home.



Use the pie chart to answer parts (i) - (iii).

(i) Give the percentage of water used for showering. [1]  
 ..... %

(ii) State the main use of water in the home. [1]  
 .....

(iii) Calculate the percentage of water used for bathing. [2]

Water used for bathing = ..... %

(b) The box below contains some stages in the treatment of water.

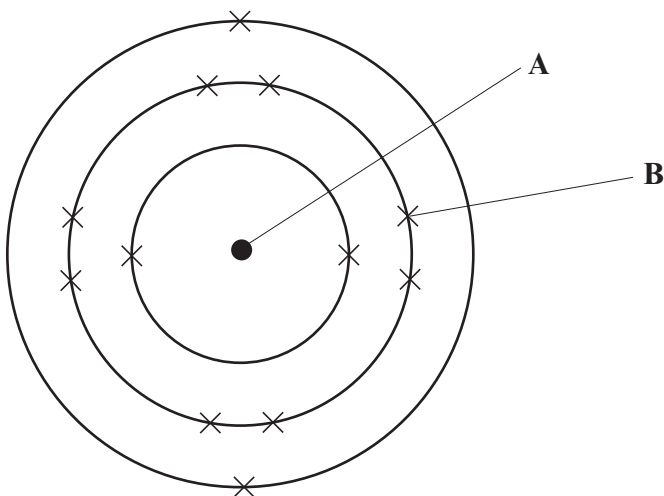
<b>chlorination</b>	<b>filtration</b>	<b>screening</b>	<b>sedimentation</b>
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Choose from the box above, the stage at which

(i) small insoluble particles are removed, ..... [1]

(ii) harmful bacteria are killed. .... [1]

2. The symbol and diagram of an atom of magnesium are shown below.



- (a) Use the information above to give the
- atomic number of magnesium, ..... [1]
  - mass number of magnesium, ..... [1]
  - electronic structure of magnesium. .... [1]
- (b) Use the words in the box below to complete the sentences which follow.

**Each word may be used once, more than once or not at all.**

electrons	nucleus	neutrons	protons	orbits (shells)
-----------	---------	----------	---------	-----------------

- The part of an atom, labelled **A** in the diagram above is known as the ..... [1]
- The negative particles, labelled **B** above are called ..... and are found in ..... [2]
- The atom has no overall charge because the numbers of electrons and ..... are always the same. [1]

3. The properties of substances depend on their structures. Two different types of structure are described below.

#### Giant ionic structures

These are made up of charged ions. These are formed when electrons are transferred from a metal atom to a non-metal atom.

They have very high melting points, are soluble in water and conduct electricity when molten or in solution.

Examples include sodium chloride and copper sulphate.

#### Simple covalent structures

These are made up of small molecules that are formed when pairs of electrons are shared between atoms.

They are generally gases or liquids that have low melting and boiling points. They are poor conductors of electricity.

Examples include carbon dioxide and water.

Use only the information in the boxes above to answer parts (i) - (iv).

- (i) Name

I. an ionic substance, ..... [1]

II. a covalent substance. .... [1]

- (ii) Describe how

I. ions are formed, ..... [1]

II. molecules are formed. .... [1]

- (iii) State why covalent substances are generally liquids or gases. [1]

- (iv) State **two** properties that could be used to tell the difference between giant ionic and simple covalent substances. [2]

*Property 1* .....

*Property 2* .....

4. (a) Ammonia,  $\text{NH}_3$ , is produced by the Haber process. The **symbol** equation for the reaction is shown below.



- (i) Using the equation above give a **word** equation for the reaction. [2]

..... + .....  $\rightleftharpoons$  .....

- (ii) The symbol  $\rightleftharpoons$  shows that the reaction is reversible. Give the meaning of the term **reversible reaction**. [1]

.....

- (b) The main use of ammonia is in the production of fertilisers.

- (i) Name the fertiliser made by reacting ammonia with sulphuric acid. [1]

.....

- (ii) Give the name of the type of reaction taking place between ammonia and sulphuric acid. [1]

.....

- (iii) Ammonium nitrate is another common fertiliser. Name the acid used to produce ammonium nitrate. [1]

.....

- (c) Give **one** advantage and **one** disadvantage of using nitrogenous fertilisers. [2]

*Advantage* .....

.....

*Disadvantage* .....

.....

5. Smart materials are materials whose properties change according to their surroundings.

(i) Shape memory alloys are a type of smart material used to make spectacle frames.



State the property of shape memory alloys that makes them more suitable to make spectacle frames than traditional materials such as steel. [1]

.....

(ii) Another type of smart material can be used to coat the lenses of sunglasses.

<b>photochromic pigment</b>	<b>polymer gel</b>	<b>shape memory polymer</b>
<b>thermochromic pigment</b>		

I. Choose from the box above, the type of smart material used to coat the lenses of sunglasses. [1]

II. State the property of this material that makes it a smart material. [1]

.....

.....

6. The following table shows some examples of different types of steel.

Name	Composition	Properties
Cast iron	iron 2-5% carbon	Hard but brittle. Corrodes.
Mild steel	iron 0.1-0.3% carbon	Tough, ductile and malleable. Good tensile strength. Corrodes.
High carbon steel	iron 0.7-1.5% carbon	Harder than mild steel but more brittle. Corrodes.
Stainless steel	iron and carbon 16-26% chromium	Hard and tough, hardwearing. Doesn't corrode.

Use the information in the table to answer the following questions.

(i) Name the **metallic** element that is added to iron to make stainless steel. [1]

.....

(ii) Suggest a reason why cast iron is **more brittle** than mild steel. [1]

.....

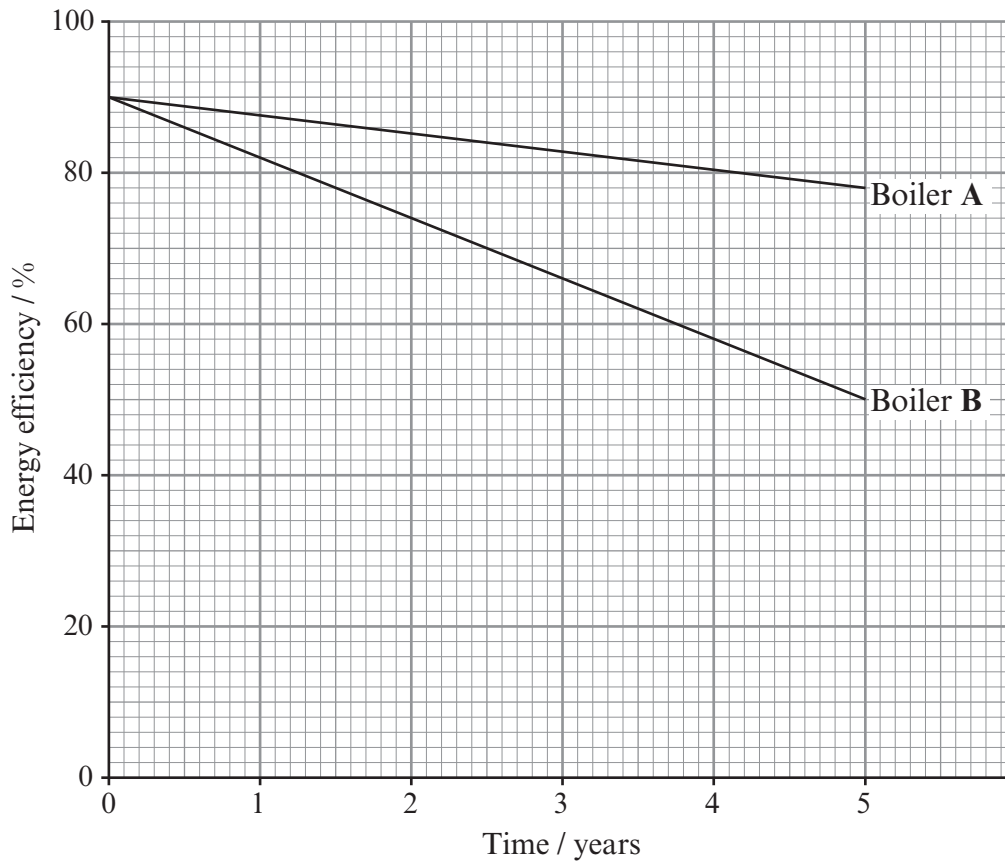
(iii) Name the type of steel most suitable for making car bodies. [1]

.....

(iv) Give the main reason why stainless steel is used to make cutlery. [1]

.....

7. The following graph shows how the energy efficiency of two identical water boilers changes during the first 5 years of use.



Use the graph to answer part (a).

(a) Calculate the

- I. **difference** in efficiency between boilers **A** and **B** after 1 year, [1]

..... %

- II. **decrease** in efficiency of boiler **B** over 5 years. [1]

..... %

(b) Both boilers have been used for the same amount of time in different hard water areas.

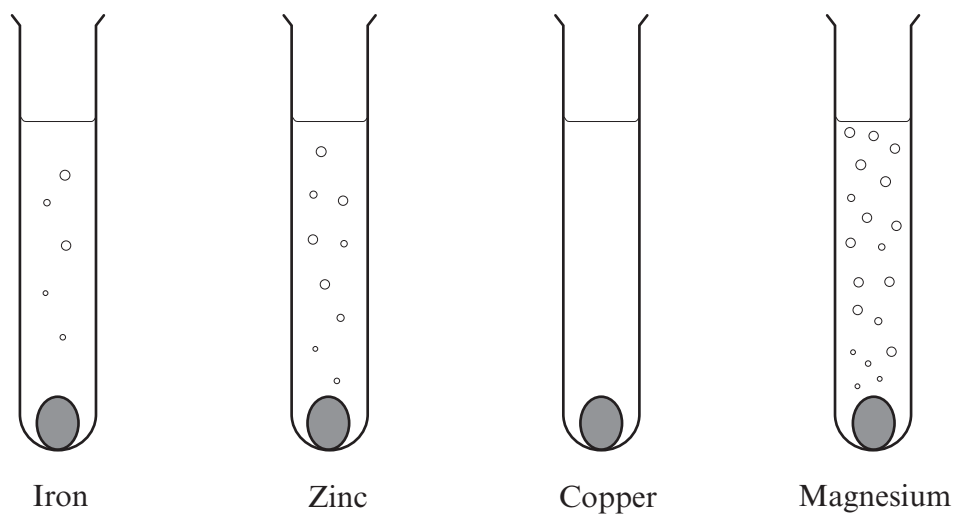
(i) Give a reason why the efficiency of both boilers is decreasing. [1]

.....  
.....

(ii) State why the efficiency of boiler **A** decreases less than that of boiler **B**. [1]

.....  
.....

8. Four metals, iron, zinc, copper and magnesium, were placed in hydrochloric acid of equal concentration at room temperature. The diagrams below show what happened.



- (i) Place the metals in order of reactivity, with the **most reactive** first.

[1]

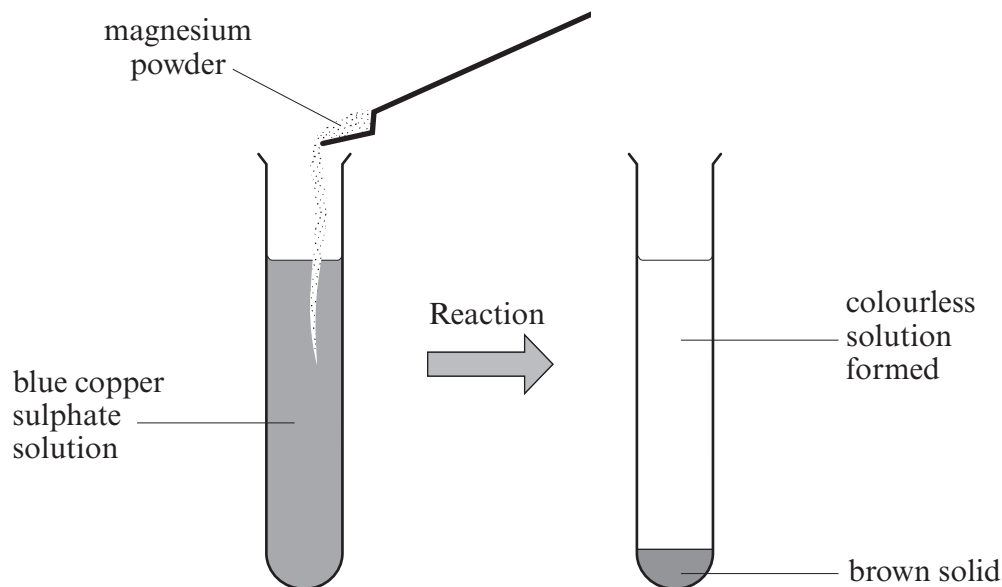
**Most reactive** .....

.....

.....

**Least reactive** .....

- (ii) The following diagram shows what happens when magnesium powder is added to copper sulphate solution.



- I. Give a **word** equation for the reaction. [2]

..... + ..... → ..... + .....

- II. Explain, in terms of the reactivity series, why this reaction takes place. [1]

.....

- (iii) When iron oxide is heated with carbon, iron is produced. The iron oxide is *reduced*. Aluminium oxide cannot be reduced by carbon.

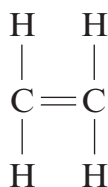
- I. State what this tells you about the position of carbon in the reactivity series, relative to that of iron and aluminium. [1]

.....

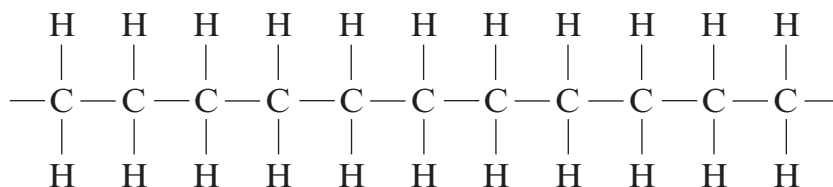
- II. Suggest a method by which aluminium oxide can be reduced. [1]

.....

9. The following diagram shows the structure of an ethene molecule and part of a polyethene molecule.



ethene



part of a polyethene molecule

- (i) Name the process taking place when polyethene is made from ethene. [1]

.....

- (ii) Using the structures above, give **two** differences between a molecule of ethene and a molecule of polyethene. [2]

*Difference 1* .....

.....

*Difference 2* .....

.....

- (iii) Calculate the relative molecular mass,  $M_r$ , of ethene,  $\text{C}_2\text{H}_4$ . [2]

$$A_r(\text{H}) = 1 \quad A_r(\text{C}) = 12$$

$$M_r(\text{C}_2\text{H}_4) = \dots\dots\dots$$

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**FORMULAE FOR SOME COMMON IONS**

POSITIVE IONS		NEGATIVE IONS	
Name	Formula	Name	Formula
Aluminium	$\text{Al}^{3+}$	Bromide	$\text{Br}^-$
Ammonium	$\text{NH}_4^+$	Carbonate	$\text{CO}_3^{2-}$
Barium	$\text{Ba}^{2+}$	Chloride	$\text{Cl}^-$
Calcium	$\text{Ca}^{2+}$	Fluoride	$\text{F}^-$
Copper(II)	$\text{Cu}^{2+}$	Hydroxide	$\text{OH}^-$
Hydrogen	$\text{H}^+$	Iodide	$\text{I}^-$
Iron(II)	$\text{Fe}^{2+}$	Nitrate	$\text{NO}_3^-$
Iron(III)	$\text{Fe}^{3+}$	Oxide	$\text{O}^{2-}$
Lithium	$\text{Li}^+$	Sulphate	$\text{SO}_4^{2-}$
Magnesium	$\text{Mg}^{2+}$		
Nickel	$\text{Ni}^{2+}$		
Potassium	$\text{K}^+$		
Silver	$\text{Ag}^+$		
Sodium	$\text{Na}^+$		

