

Surname	Centre Number	Candidate Number
Other Names		0



GCSE

0240/01

**ADDITIONAL SCIENCE
FOUNDATION TIER
CHEMISTRY 2**

A.M. MONDAY, 21 May 2012

45 minutes

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

0240
010001

ADDITIONAL MATERIALS

In addition to this paper you will need a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

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.

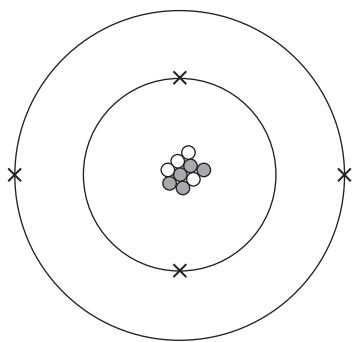
You are reminded of the necessity for good English and orderly presentation in your answers.

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.

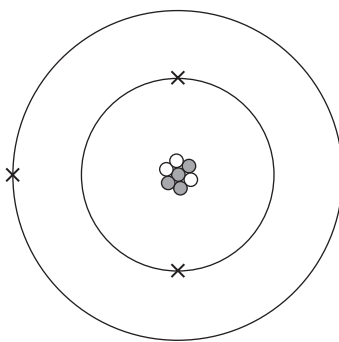
Answer all questions.

1. (a) Atoms are made up of protons, neutrons and electrons.

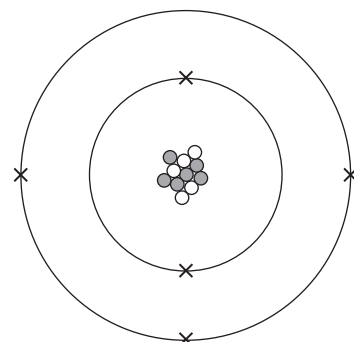
A, B and C represent atoms of three different elements.



A



B



C

Give the **letter** of the atom which contains

(i) four protons,

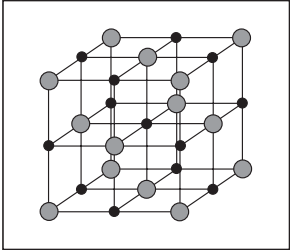
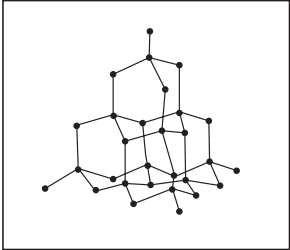
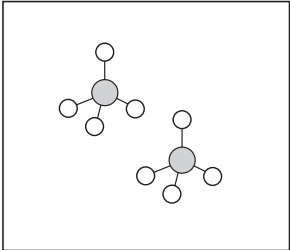
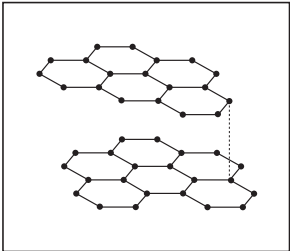
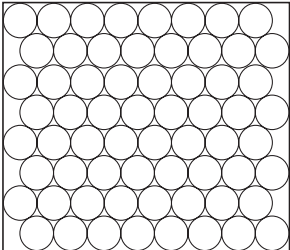
[1]

(ii) five electrons.

[1]

(b) The following diagrams show the structures of some substances.

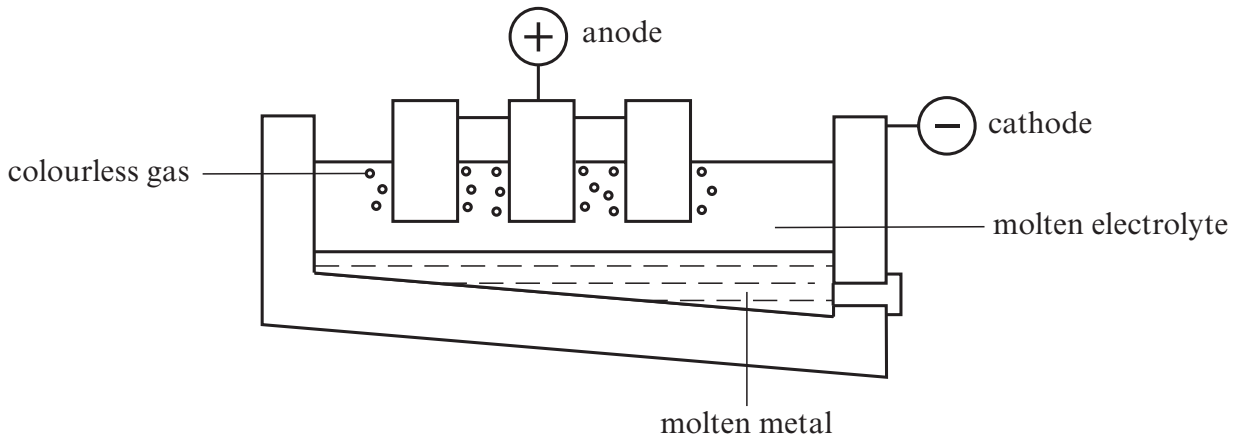
(i) Draw a line to connect **each** substance to its correct structure. [4]

Substance	Structure
aluminium	
methane	
diamond	
sodium chloride	
	

(ii) Give the name of the substance which contains positive and negative ions. [1]

.....

2. (a) The diagram below shows the cell used in the industrial extraction of aluminium.



The molten electrolyte used in the process contains the ions Al^{3+} and O^{2-} .

- (i) Give the chemical name for the molten electrolyte. [1]
 - (ii) Name the electrode at which aluminium is formed. [1]
 - (iii) Name the colourless gas formed during the process. [1]
- (b) The electrolyte is obtained from an ore called bauxite. Bauxite needs to be imported into the UK. The industrial extraction also needs a lot of electricity.

Choose from the box below the **two** factors that are **most** important when locating a new aluminium extraction plant in the UK. [2]

coastal position	good transport system	nearby housing
nearby limestone quarries	nearby power station	nearby river for water

Factor 1

Factor 2

- (c) Some properties and uses of aluminium are given below.
Draw a line from each pair of properties to the use which relies on **both** of these properties. [2]

Pair of properties**Use**

heat conductor and malleable

drinks cans

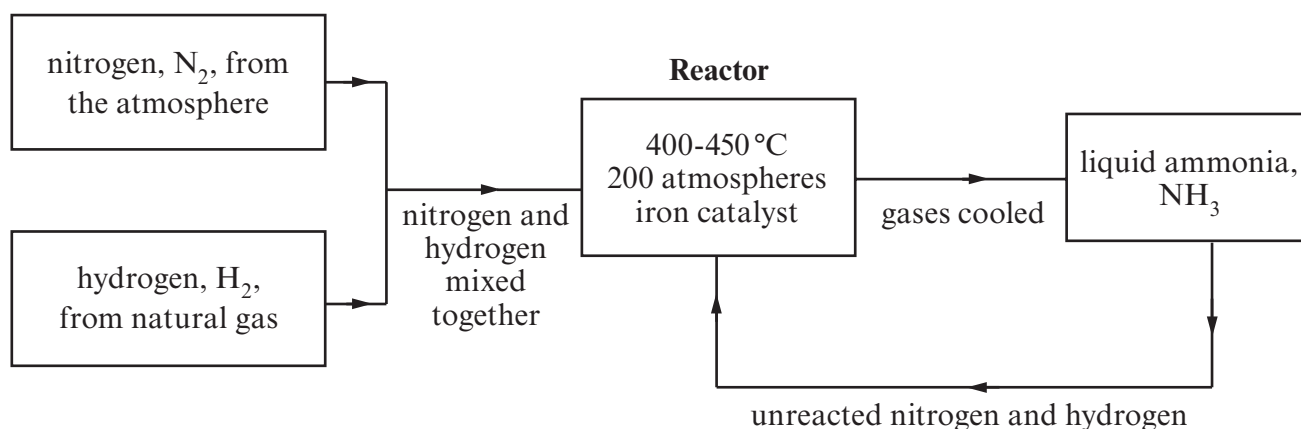
electrical conductor and ductile

overhead power cables

malleable and non-toxic

cooking foil

3. The flow chart below shows the stages in the manufacture of ammonia.



Use only the information in the flow chart to answer parts (a)-(c).

(a) Name the raw materials from which nitrogen and hydrogen are obtained. [1]

Nitrogen

Hydrogen

(b) The manufacture of ammonia is a reversible reaction.

Write a **word** equation for this reaction. [2]

..... + \rightleftharpoons

(c) The reaction mixture contains ammonia and unreacted nitrogen and hydrogen.

(i) Describe what happens to ammonia gas on cooling. [1]

.....

(ii) Only about 20% of the nitrogen and hydrogen react to form ammonia. State what happens to the unreacted gases. [1]

.....

4. The box below shows some smart materials.

thermochromic pigment	photochromic pigment	shape memory alloy
hydrogel	shape memory polymer	

Choose from the box the type of smart material used in each of the following items.

- (a) Battery test strips [1]

Pressing both ends of the battery completes a circuit, causing the strip to heat up and change colour, showing whether the battery is in good condition.

Smart material

- (b) Water-absorbing granules [1]

Some garden centres sell water-absorbing granules which can be mixed with soil in plant pots. The granules absorb up to 100 times their weight in water and then release it slowly back to the soil.

Smart material

- (c) Nitinol stents for veins [1]

A collapsed nitinol stent can be inserted into a vein. On warming the stent returns to its original expanded shape helping to improve blood flow.

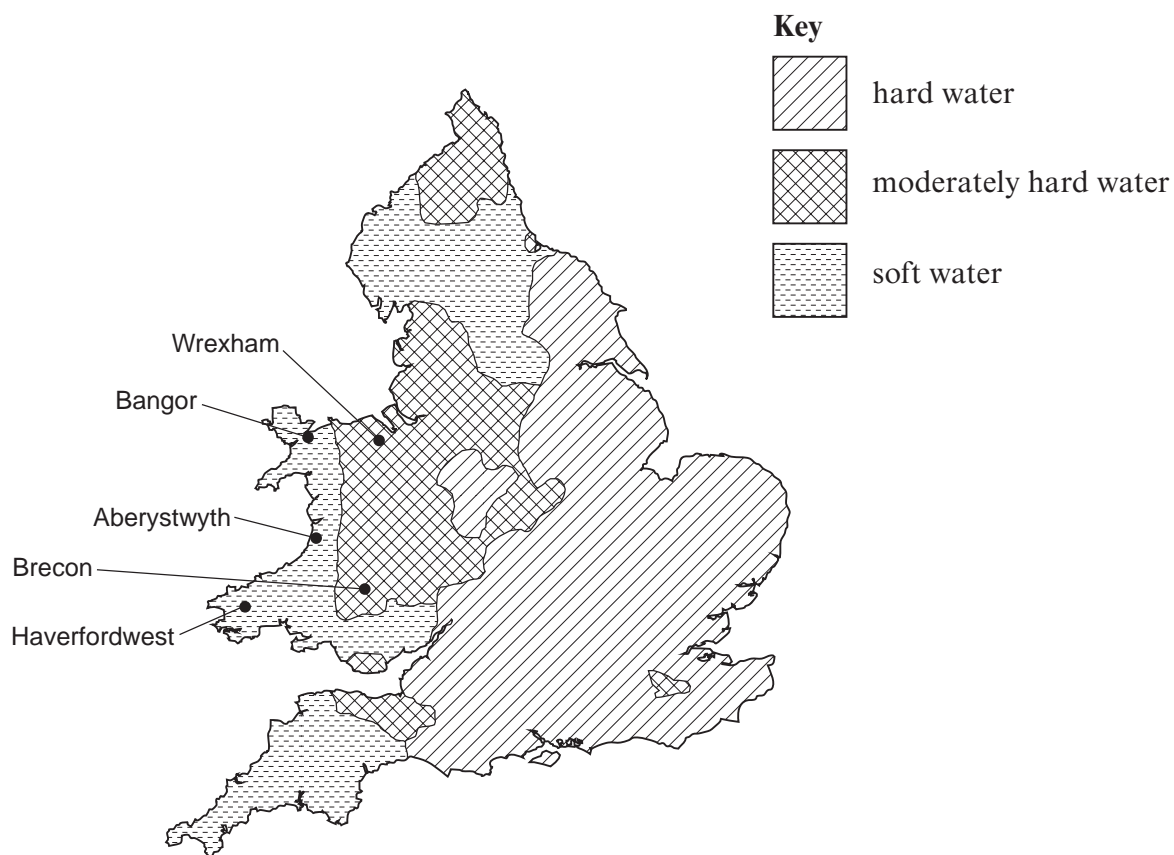
Smart material

- (d) Lenses for sunglasses [1]

Some lenses automatically darken when exposed to sunlight and return to a lighter shade when the light intensity decreases.

Smart material

5. The map below shows the hardness of water across the different regions of Wales and England.



- (a) Water samples were collected at Bangor, Brecon and Wrexham.
 1 cm^3 of soap solution was added to 10 cm^3 of each sample in separate test tubes.
 Each tube was shaken for 10 seconds.

State, and explain, the difference you would expect in the appearance of the shaken solutions in each tube. [3]

.....

.....

.....

.....

- (b) Give **one** way the procedure was made a fair test. [1]

.....

6. (a) (i) Complete the following table to show the **structural** formula for propane. [1]

Structural formula	$\begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{H} \\ \\ \text{H} \end{array}$	$\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array}$		$\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array}$
Molecular formula	CH_4	C_2H_6	C_3H_8	C_4H_{10}
Name	methane	ethane	propane	butane

- (ii) A molecule of pentane contains 5 carbon atoms. Give the number of hydrogen atoms found in a molecule of pentane. [1]

.....

- (b) Use the relative atomic masses given below to calculate the relative molecular mass (M_r) of butane, C_4H_{10} . [2]

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

$$M_r(\text{C}_4\text{H}_{10}) = \dots\dots\dots$$

- (c) Plastics have replaced many traditional materials.

Apart from cost, give **two** general properties of a plastic which makes it a better material than

- (i) paper for making carrier bags, [2]

Property 1

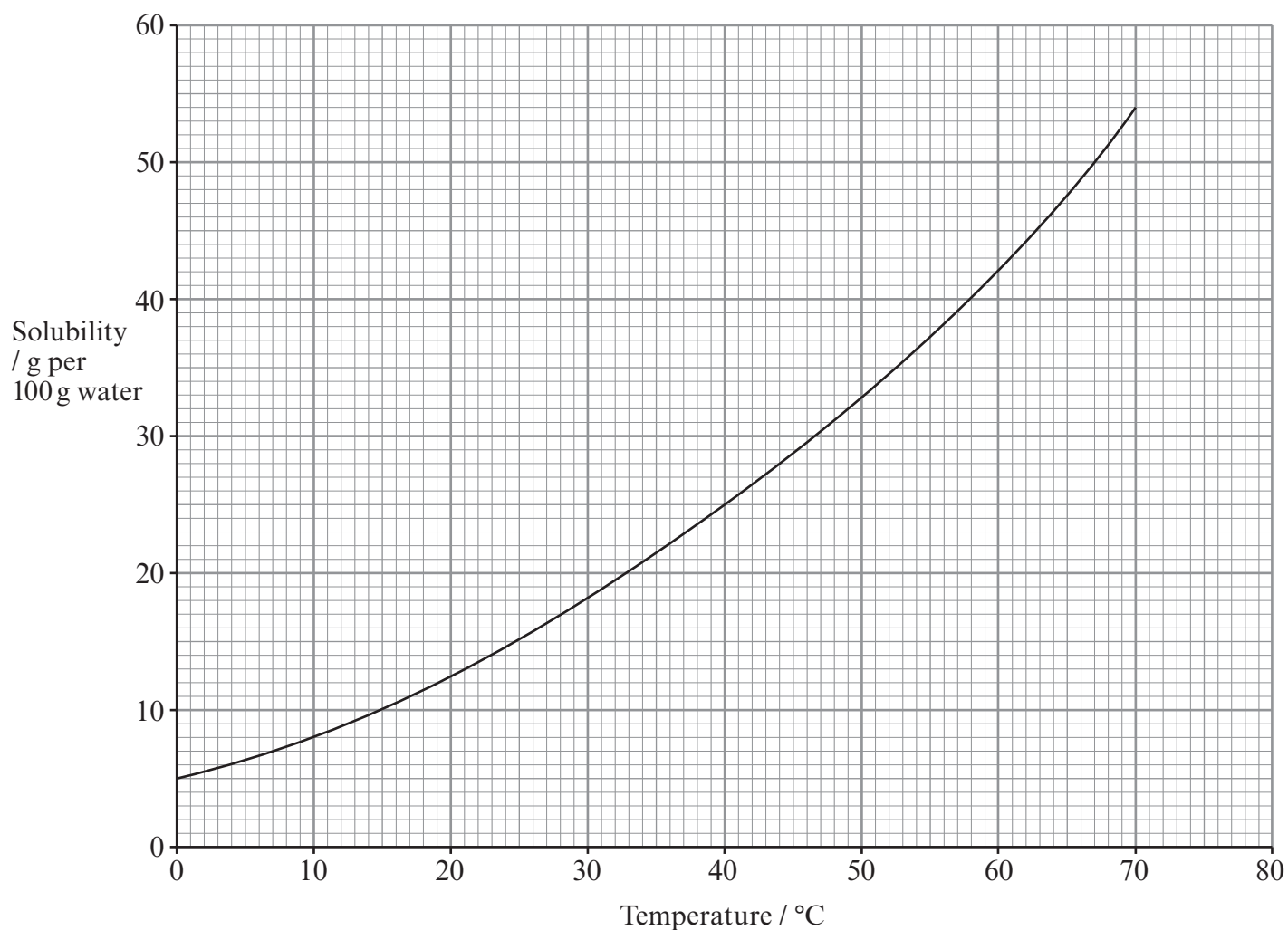
Property 2

- (ii) iron for making guttering. [2]

Property 1

Property 2

7. The graph below shows the solubility of potassium dichromate in water at different temperatures.



The table below shows the solubility of potassium chloride in water at different temperatures.

Temperature / °C	0	20	40	60	80
Solubility / g per 100 g water	28	34	40	46	52

(a) Plot the graph of the solubility of potassium chloride on the grid on the opposite page. [3]

(b) Using the graphs give

(i) the temperature at which the solubility is the **same** for both potassium chloride and potassium dichromate, [1]

Temperature = °C

(ii) the **difference** between the solubilities of potassium chloride and potassium dichromate at 30°C. [1]

Difference = g per 100 g of water

5

8. The table below shows information about the atoms of three elements.

Use the data and key on the Periodic Table of Elements shown on the **back page of this examination paper** to complete the table. [4]

Element	Symbol	Number of protons	Number of neutrons	Number of electrons
beryllium	${}^9_4\text{Be}$	4		4
phosphorus		15	16	15
argon	${}^{40}_{18}\text{Ar}$		22	

4

9. (a) Copper, magnesium, silver and zinc were added separately to solutions containing copper nitrate, magnesium nitrate, silver nitrate and zinc nitrate.

The table shows the results obtained from the series of experiments.

Metal	Metal nitrate solution			
	copper nitrate	magnesium nitrate	silver nitrate	zinc nitrate
copper	no reaction	no reaction	silvery-grey crystals form on copper foil	no reaction
magnesium	brown solid forms and blue solution turns colourless	no reaction	silvery-grey solid forms	silvery-grey solid forms
silver	no reaction	no reaction	no reaction	no reaction
zinc	brown solid forms and blue solution turns colourless	no reaction	silvery-grey solid forms	no reaction

- (i) Use the information in the table above to place the metals copper, magnesium, silver and zinc in order of reactivity. [2]

Most reactive

.....

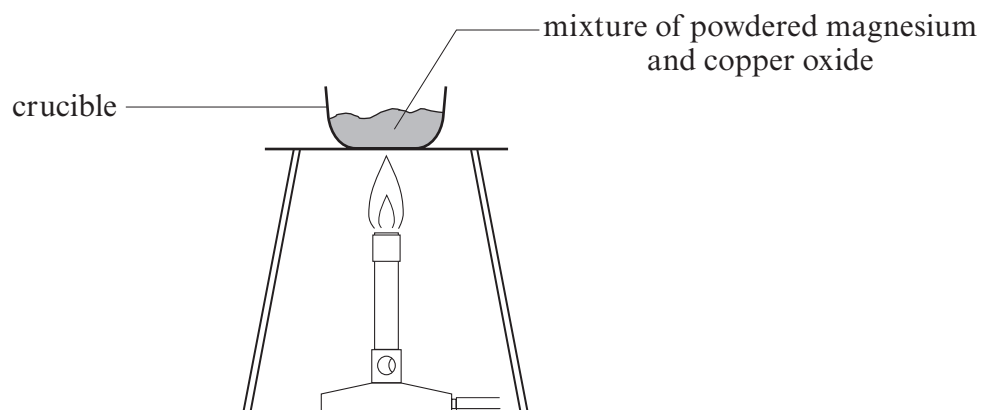
.....

Least reactive

- (ii) Write a **word** equation for the reaction between copper and silver nitrate. [2]

..... + → +

- (b) The apparatus in the diagram below can be used to show the violent reaction between magnesium and copper oxide. Both solids are in **powdered** form and well mixed together.



After a few minutes of heating a violent reaction occurs. Tiny brown specks and a white powdery substance remain.

Explain, **using this reaction**, the terms oxidation and reduction.

[2]

.....

.....

.....

BLANK PAGE

FORMULAE FOR SOME COMMON IONS

POSITIVE IONS		NEGATIVE IONS	
Name	Formula	Name	Formula
Aluminium	Al³⁺	Bromide	Br⁻
Ammonium	NH₄⁺	Carbonate	CO₃²⁻
Barium	Ba²⁺	Chloride	Cl⁻
Calcium	Ca²⁺	Fluoride	F⁻
Copper(II)	Cu²⁺	Hydroxide	OH⁻
Hydrogen	H⁺	Iodide	I⁻
Iron(II)	Fe²⁺	Nitrate	NO₃⁻
Iron(III)	Fe³⁺	Oxide	O²⁻
Lithium	Li⁺	Sulphate	SO₄²⁻
Magnesium	Mg²⁺		
Nickel	Ni²⁺		
Potassium	K⁺		
Silver	Ag⁺		
Sodium	Na⁺		

