

Surname	Centre Number	Candidate Number
Other Names		0



GCSE

240/01

**ADDITIONAL SCIENCE
FOUNDATION TIER
CHEMISTRY 2**

A.M. WEDNESDAY, 25 May 2011

45 minutes

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

ADDITIONAL MATERIALS

In addition to this paper you may require 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 particles called **electrons, neutrons** and **protons**.

(i) Complete the table below by writing the name of each particle alongside its correct mass and charge. [2]

Particle	Mass	Charge
	1	+1
	1	0
	very small	-1

(ii) Name the particles found in the shells (orbits) of atoms. [1]

.....

(iii) Name **one** particle found in the nucleus of an atom. [1]

.....

(b) Put a tick (✓) in the box next to the calculation used to find the relative molecular mass (M_r) of sulphuric acid, H_2SO_4 . [1]

$$A_r(\text{H}) = 1 \quad A_r(\text{O}) = 16 \quad A_r(\text{S}) = 32$$

$$1 + 32 + 16$$

$$1 + 1 + 32 + 16 + 16 + 16 + 16$$

$$1 + 32 + 32 + 16 + 16 + 16 + 16$$

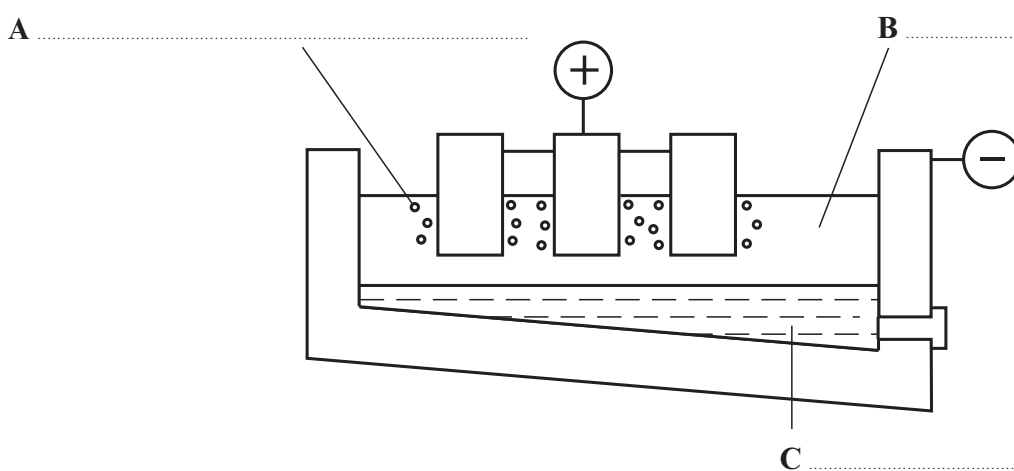
$$1 + 1 + 16 + 16 + 16 + 16$$

2. (a) Read the information about the extraction of aluminium given in the box below.

The main ore of aluminium is bauxite. Bauxite is mainly aluminium oxide and the impurity iron oxide. Aluminium is extracted from molten aluminium oxide by the process of electrolysis. During the process, aluminium oxide is broken down into aluminium and oxygen using an electric current. Aluminium is formed at the negative cathode and oxygen at the positive anode. The process is expensive because a lot of electrical energy is needed.

Use only the information in the box to answer parts (i) and (ii).

- (i) Name the substances labelled **A**, **B** and **C** in the following diagram. [3]



- (ii) State why the process of electrolysis makes aluminium an expensive metal. [1]

- (b) Put a tick (✓) in the box next to **two** factors that affect the siting of an aluminium extraction plant in Britain. [2]

Aluminium extraction plants in Britain need to be close to

a power station

the coast because aluminium ore is imported

limestone quarries

coal mines

bauxite mines

3. (a) The table below shows the ions present in four different bottled mineral waters, A-D.

Ions present	Typical analysis / mg dm ⁻³			
	A	B	C	D
calcium	12	40.5	22.0	181
magnesium	1.6	11.6	11.5	53.5
potassium	0.7	0.9	1.0	2.5
sodium	3.9	9.4	22.0	36.1
hydrogencarbonate	45.0	190.0	116.0	239.0
chloride	5.0	8.1	14.0	57.5
sulphate	4.0	6.4	4.0	459.0
nitrate	1.0	2.4	0.1	2.2

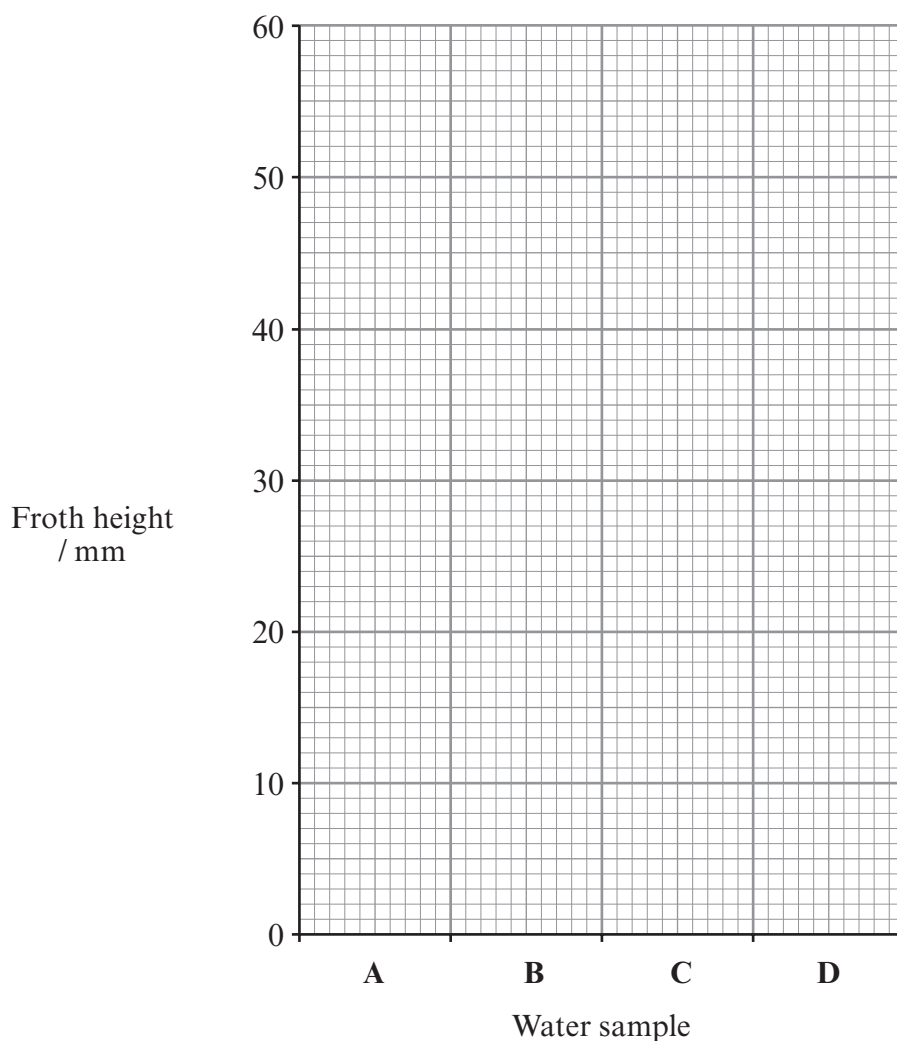
Use the data in the table to answer parts (i) and (ii).

- (i) State which water is the **hardest**. [1]
- (ii) Give **two** reasons for your choice in (i). [2]
1.
2.

- (b) 1 cm³ of soap solution was shaken the same number of times, with equal volumes of each of the waters. The froth height was measured in each experiment. Results are shown in the table below.

Mineral water	Froth height / mm
A	59
B	35
C	38
D	2

(i) Complete the bar chart of the results on the grid below. [2]



(ii) Use the bar chart to place the mineral waters, **A-D**, in order of hardness. [1]

hardest

.....

.....

softest

(iii) Give **two** ways in which this experiment was made a fair test. [2]

1.

2.

(iv) State which part of the procedure could make the results unreliable. [1]

.....

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4. (a) Polythene is made from ethene and is an example of a polymer.

alkanes	alkenes	cracking	monomers	polymerisation	polymers
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Choose words from the above box to complete the following sentences.

- (i) Small molecules, like ethene, which can join together are called

.....

[1]

- (ii) Ethene belongs to the family of hydrocarbons called

.....

[1]

- (iii) The process of making polythene from ethene is called

.....

[1]

- (b) The table below shows some properties of four plastics, **A**, **B**, **C** and **D**.

Plastic	Effect of heat	Flexibility	Hardness	Lets light through?
A	melts	brittle	soft	no
B	melts	flexible	soft	no
C	melts	brittle	hard	yes
D	stable to heat	brittle	hard	no

Use only the information in the table to answer parts (i)-(iii) opposite.

State which plastic, **A**, **B**, **C** or **D**, you would choose to make the following items, and give the **main** reason for your choice.

(i) Crash helmet *visor*



Plastic

Main reason [1]

(ii) Electric kettle



Plastic

Main reason [1]

(iii) Carrier bag



Plastic

Main reason [1]

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5. (a) Use the word equation for the formation of ammonia to answer parts (i) and (ii).



- (i) Name the **reactant** which is found in the atmosphere. [1]

.....

- (ii) Name the **product** of the reaction. [1]

.....

- (iii) The above reaction can go in both directions. Give the chemical term used to describe this type of reaction. [1]

.....

- (b) Ammonium sulphate, $(\text{NH}_4)_2\text{SO}_4$, and ammonium nitrate, NH_4NO_3 , are examples of nitrogenous fertilisers made from ammonia.

- (i) Name the **element** present in both fertilisers which is used by plants to help them grow. [1]

.....

- (ii) Name the **acid** used to make ammonium sulphate, $(\text{NH}_4)_2\text{SO}_4$. [1]

.....

- (c) State how nitrogenous fertilisers might get into our public water supplies. [1]

.....

6. Smart materials are modern materials whose properties change with a change in their surroundings.

(a) Shape memory polymers are being developed to manufacture self-repairing car bodies. The diagram below shows a piece of twisted shape memory polymer.

State how the polymer can be made to regain its original shape. [1]



twisted shape memory polymer

original shape

.....

(b) Thermochromic and photochromic pigments are examples of smart materials that have different colours under different conditions.

State the **type** of smart material used to make the following products, and the change in surroundings which causes the colour change in each case.

(i) Self-darkening sun glasses



Type of smart material

Change in surroundings which causes the colour change [1]

.....

(ii) Electric kettles

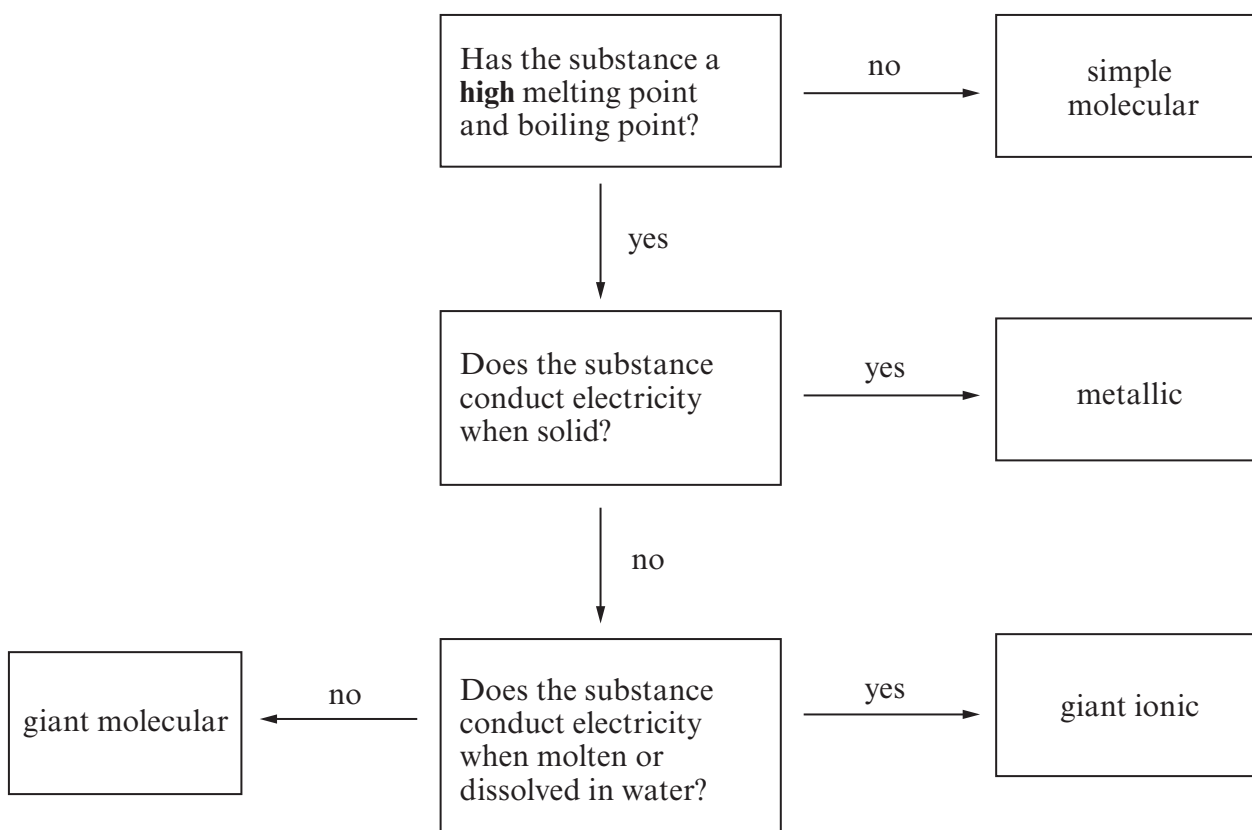


Type of smart material

Change in surroundings which causes the colour change [1]

.....

7. (a) The flow chart below can be used to identify the type of structure found in different substances.

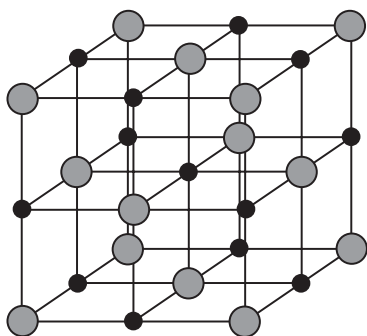


Complete the table below using the flow chart.

[4]

Substance	Melting point / °C	Boiling point / °C	Electrical conductivity	Structure
aluminium oxide	2072	2980	conducts electricity only when molten	
ammonia	-77	-34	does not conduct electricity	
silicon dioxide	1610	2230	does not conduct electricity	
titanium	1667	3277	conducts electricity when solid	

(b) The diagram below shows the structure of sodium chloride.



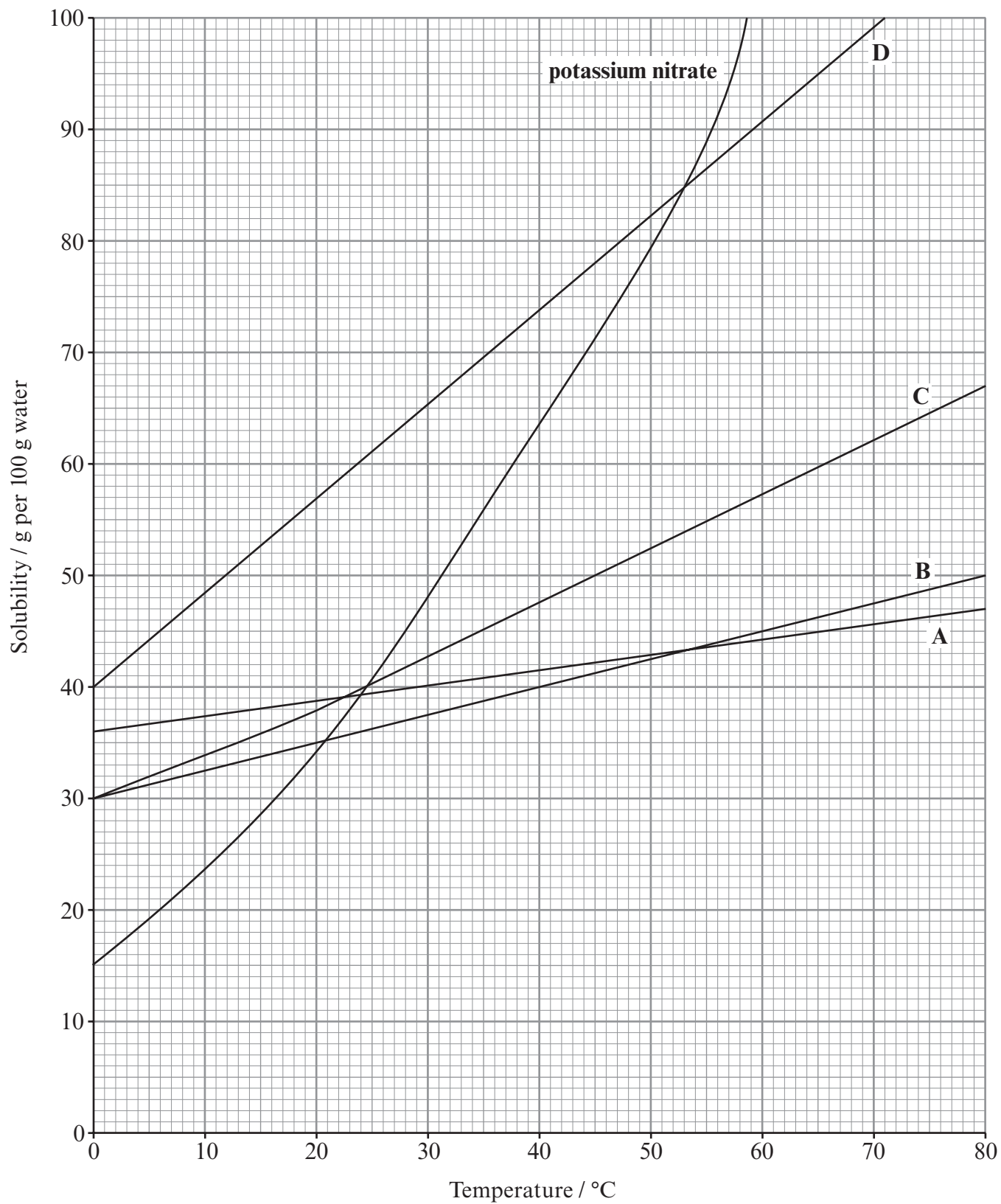
Describe the electrical conductivity of sodium chloride.

[1]

.....

.....

8. The graph below shows the solubility of potassium nitrate and four substances, **A**, **B**, **C** and **D**, in water at various temperatures.



Use the graph to answer parts (a)-(e).

Give the letter of the substance which

(a) has the **lowest** solubility at 70 °C,

[1]

.....

(b) has the **same** solubility as potassium nitrate at 53 °C,

[1]

.....

(c) has the solubility that **changes the least** with temperature,

[1]

.....

(d) forms 21 g of solid when a saturated solution in 100 g of water at 65 °C is cooled to 40 °C,

[1]

.....

(e) forms the **smallest** mass of solid when a saturated solution in 100 g of water at 20 °C is cooled to 0 °C.

[1]

.....

9. The table below shows information about the atoms of four 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. [5]

Element	Symbol and data	Number of protons	Number of neutrons	Number of electrons
lithium	${}^7_3\text{Li}$	3	4	3
beryllium	${}^9_4\text{Be}$			4
aluminium		13	14	
	${}^{31}_{15}\text{P}$	15	16	15

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⁺		

