

Candidate Name	Centre Number	Candidate Number
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GCSE

240/01

**ADDITIONAL SCIENCE
FOUNDATION TIER
CHEMISTRY 2**

A.M. THURSDAY, 4 June 2009

45 minutes

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

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

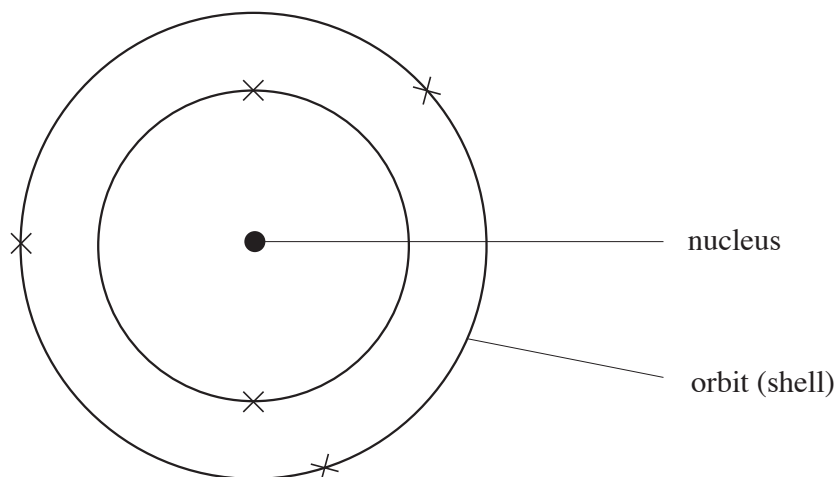
The number of marks is given in brackets at the end of each question or part-question.

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 diagram below shows an atom of boron.
Atoms contain particles called electrons, neutrons and protons.



Use the words in the box below to complete the sentences which follow.
Each word can be used once, more than once or not at all.

electrons

neutrons

protons

- (i) Atoms are neutral because the number of in the nucleus is equal to the number of in the orbits (shells). [2]
- (ii) The negative particles found in the orbits (shells) of an atom are called [1]
- (iii) Protons and have equal masses. [1]
- (b) The calculation below shows how the relative molecular mass (M_r) of water, H_2O , is found.

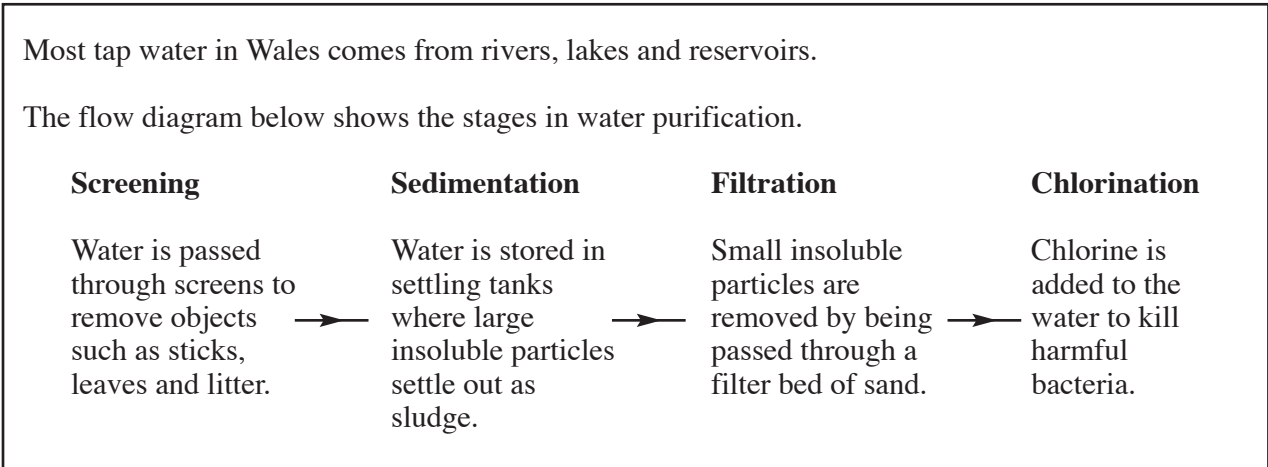
$$A_r(H) = 1; \quad A_r(O) = 16$$

$$M_r(H_2O) = 1 + 1 + 16 = 18$$

Calculate the relative formula mass (M_r) of sodium carbonate, Na_2CO_3 . [2]

$$A_r(C) = 12; \quad A_r(O) = 16; \quad A_r(Na) = 23$$

2. (a) Read the information in the box below.



Use only the information in the box above to answer part (a), (i) to (iv).

(i) Name **two** sources of tap water. [1]

..... and

(ii) Give the name of the stage which removes

I. litter,

..... [1]

II. large insoluble particles.

..... [1]

(iii) Name the material used in filter beds.

..... [1]

(iv) Give the reason for adding chlorine to water. [1]

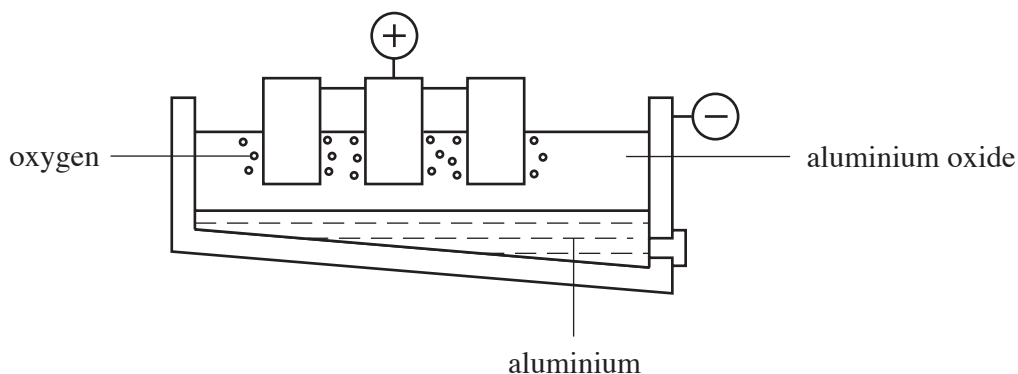
.....

(b) Many people think tap water is pure. Describe a simple experiment you would carry out to show that tap water contains dissolved solids. [2]

Include in your answer the observation you expect.

.....
.....
.....

3. (i) The diagram below shows the industrial extraction of aluminium from molten aluminium oxide.



anode	aluminium	aluminium oxide	bauxite	oxygen
	electricity	electrolysis	cathode	reduction

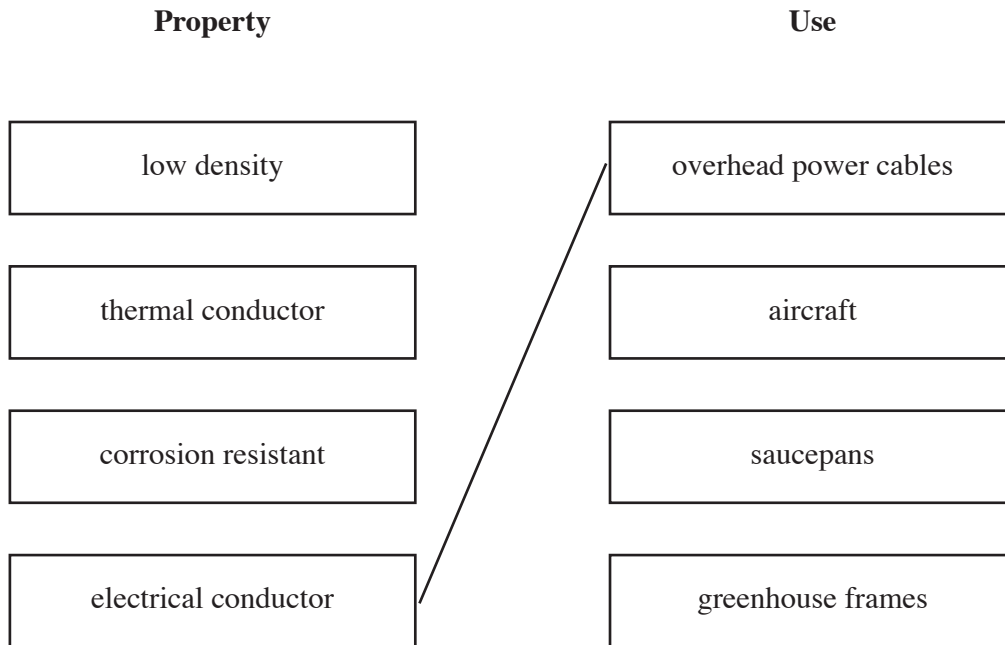
Use the information in the box above to answer the following questions.

Give the name of the

- I. process used to break down a compound using an electric current,
 [1]
- II. electrolyte used in the process,
 [1]
- III. term used for the removal of oxygen from a metal oxide,
 [1]
- IV. product formed at the anode,
 [1]
- V. negative electrode.
 [1]

- (ii) Some properties and uses of aluminium are given below.
Draw a line from each property to the box with a use which relies on this property.
One line has been drawn for you.

[2]



4. (i) Ammonia, NH_3 , is made industrially from two gases.

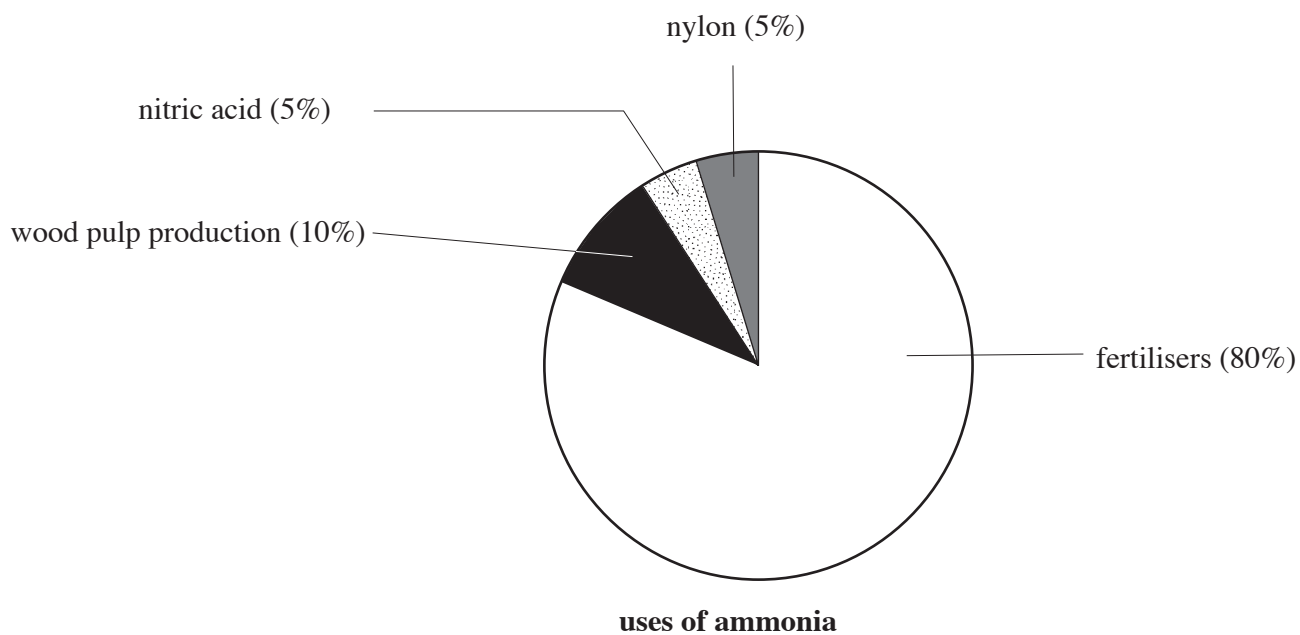
One of the gases is hydrogen and the other is obtained from the atmosphere.

Name the gas obtained from the atmosphere which is used to make ammonia.

.....

[1]

- (ii) The pie chart below shows the main uses of ammonia.



Use the pie chart to answer parts I and II.

- I. Give the percentage of ammonia used to make nylon.

..... %

[1]

- II. State the main use of ammonia.

.....

[1]

(iii) The box below contains some statements about fertilisers.

increase crop yield	increase soil acidity	improve soil quality
pollute water supplies	cause overgrowth of plants in canals	release land for other purposes

Put each statement into the correct column below.

[3]

Advantages	Disadvantages

5. (i) Plastics have replaced glass in making most bottles.
The table below shows some options for disposing of waste plastic bottles.

<i>Option</i>	<i>Method of Disposal</i>
A	Burn them with other household waste
B	Fill in landfill sites along with other household waste
C	Re-use the bottles
D	Recycle into plastic which can be re-moulded

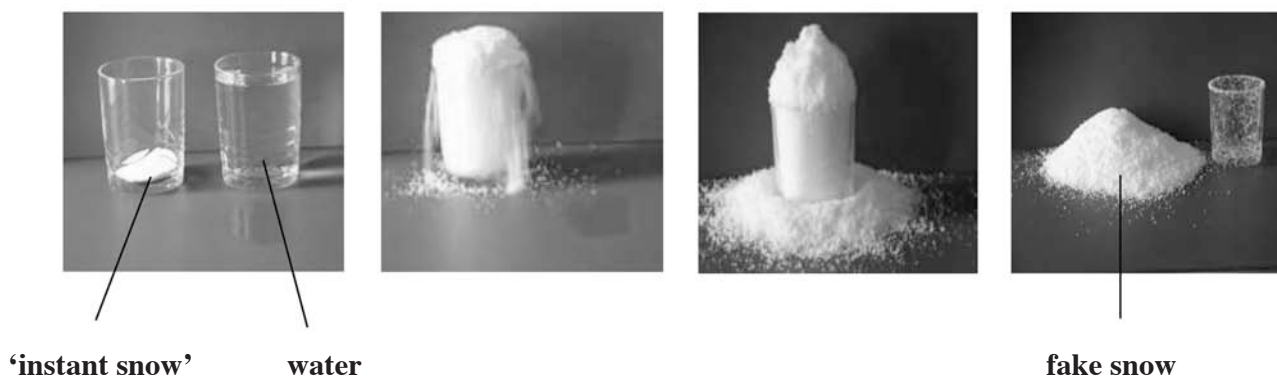
Give the **letter** of the option which would result in

- I. the conservation of oil reserves, [1]
- II. the spoiling of the appearance of the landscape, [1]
- III. an increase in air pollution. [1]
- (ii) Glass bottles are sterilised using super-heated steam before being re-used.
State why this method might be unsuitable for some types of plastic bottles. [1]
-
- (iii) Give **two** reasons, apart from cost, for plastics having replaced glass in making bottles. [2]

1.
2.

6. (a) The film industry often needs fake snow for winter scenes when filming in summer. They use *'instant snow'*, a *'smart'* material which increases in volume when water is added.

The diagram below shows what happens when water is added to a small amount of *'instant snow'*.



(i)

thermochromic paint shape memory polymer hydrogel shape memory alloy

Choose, from the box **above**, the type of smart material used to make *'instant snow'*.

.....

[1]

(ii)

kitchen towel paper tissues toilet paper nappies

Choose, from the box above, **one** everyday use of the material chosen in part (i).

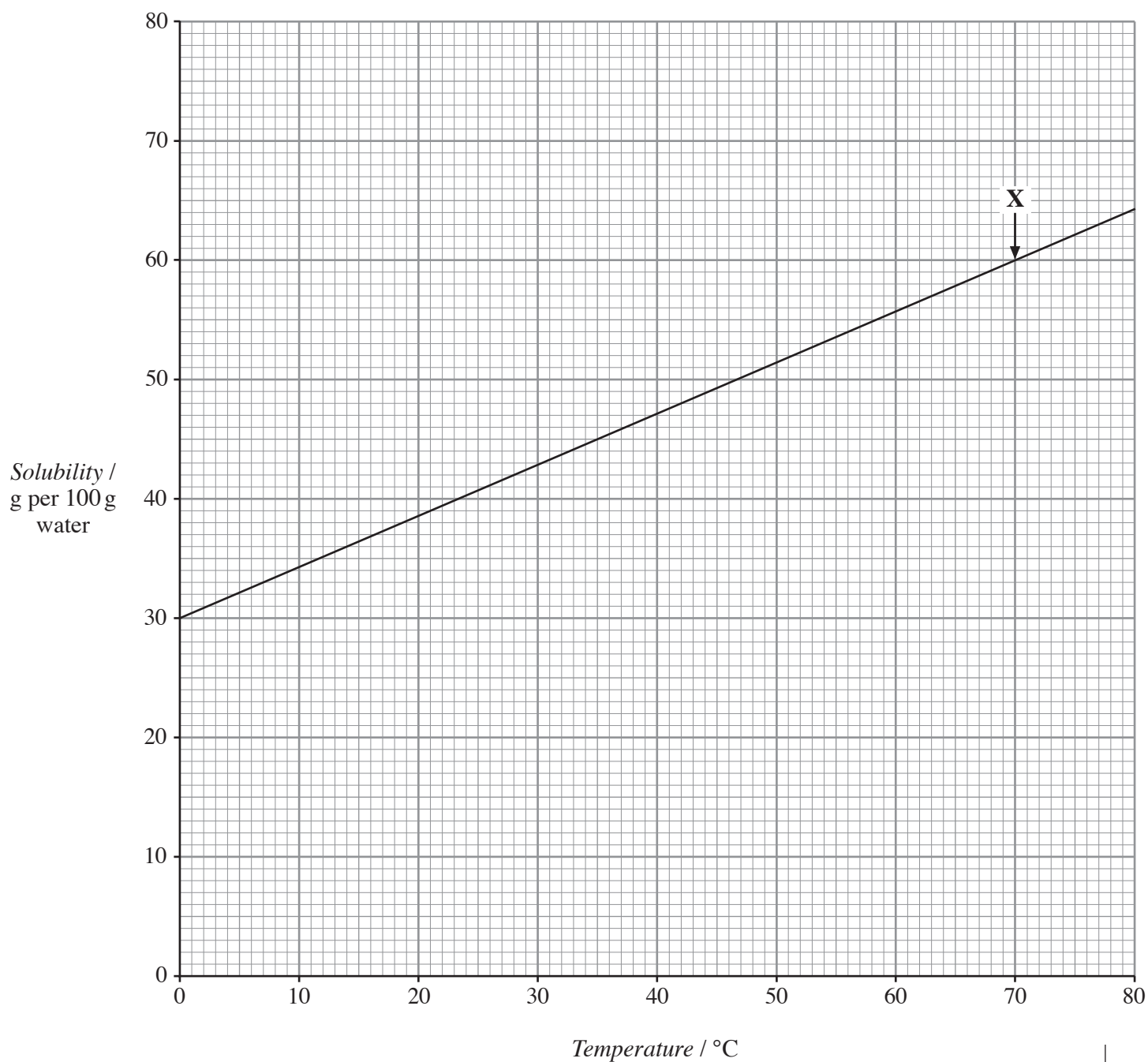
.....

[1]

- (b) Photochromic paint is a smart material. Describe the property of this paint which makes it a *'smart'* material. [1]

.....

7. The graph below shows the solubility of ammonium chloride in water at various temperatures.



Use the graph to answer parts (i) to (iii).

(i) Give the

I. solubility of ammonium chloride at 40 °C,

..... g per 100 g water. [1]

II. lowest temperature at which 100 g of water can dissolve 45 g of ammonium chloride.

..... °C [1]

(ii) State, **in full**, the information that can be obtained from the point marked **X** on the graph. [1]

.....
.....

(iii) Calculate the mass of ammonium chloride solid that would form when a saturated solution in 100 g of water at 30 °C cools to 5 °C. [2]

.....

8. (a) (i) The following metals are listed in order of their reactivity.

Most reactive: magnesium
zinc
iron
Least reactive: copper

When a mixture of powdered magnesium and copper oxide is heated, a violent reaction takes place. In the reaction, the magnesium is *oxidised* to magnesium oxide.

- I. Complete the **word** equation below for the reaction between magnesium and copper oxide.

magnesium + copper oxide \longrightarrow + [1]

- II. Explain the meaning of the term *oxidised*. [1]

.....

- (ii) Tin does not react with iron oxide but it *reduces* lead oxide.

- I. Explain the meaning of the term *reduce*. [1]

.....

- II. Arrange tin, iron and lead in order of decreasing reactivity. [1]

Most reactive:

.....

Least reactive:

- (b) A pupil had four metals **A**, **B**, **C** and **D**. She placed each metal in turn into separate solutions of the nitrate of the other three. The results were:

A displaced **D**
B displaced **A**
B displaced **D**
C displaced **A**, **B** and **D**

Place the metals in order of reactivity. [2]

Most reactive:

.....

.....

Least reactive:

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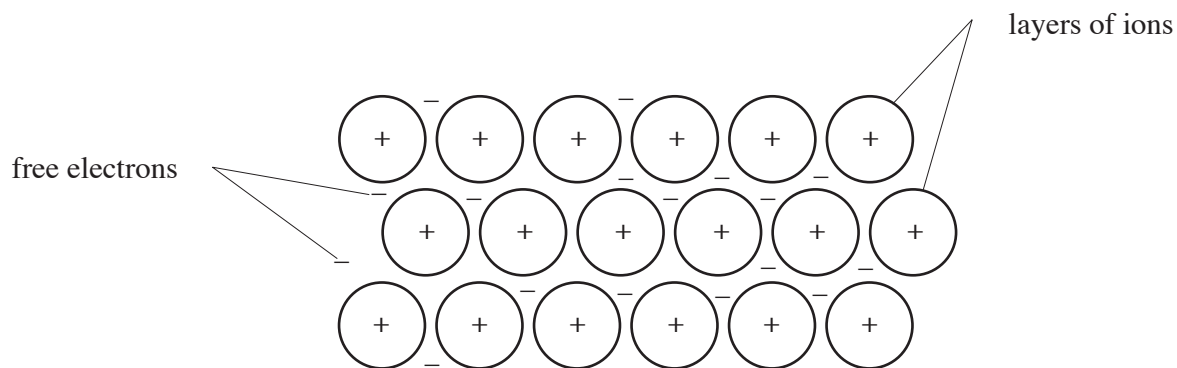
9. (i) The following table shows some properties of three different types of structures.

<i>Structure</i>	<i>Particle model</i>	<i>Melting points and boiling points</i>	<i>Electrical conductivity</i>
giant ionic	consists of charged ions	high	only when molten or in solution
giant covalent	single molecules consisting of very many atoms	high	poor
simple covalent	small molecules, each consisting of a few atoms	low	poor

Use the information above to complete the following table by stating the type of structure found in each of the substances, **A**, **B** and **C**. [2]

<i>Substance</i>	<i>Melting point / °C</i>	<i>Boiling point / °C</i>	<i>Electrical conductivity</i>	<i>Type of structure</i>
A	-182	-161	poor
B	3550	4827	poor
C	801	1413	good when dissolved

(ii) The diagram below shows a model of the structure of a metal.



State the physical property of metals which can be explained by

I. the presence of free electrons,

.....

[1]

II. layers of ions being able to slide over each other.

.....

[1]

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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⁺		

PERIODIC TABLE OF ELEMENTS

1 2**Group****3****4****5****6****7****0**

$\begin{matrix} 1 & \text{H} \\ 1 & \end{matrix}$ Hydrogen

$\begin{matrix} 7 & \text{Li} \\ 3 & \end{matrix}$ Lithium	$\begin{matrix} 9 & \text{Be} \\ 4 & \end{matrix}$ Beryllium											$\begin{matrix} 19 & \text{K} \\ 19 & \end{matrix}$ Potassium	$\begin{matrix} 20 & \text{Ca} \\ 20 & \end{matrix}$ Calcium	$\begin{matrix} 21 & \text{Sc} \\ 21 & \end{matrix}$ Scandium	$\begin{matrix} 22 & \text{Ti} \\ 22 & \end{matrix}$ Titanium	$\begin{matrix} 23 & \text{V} \\ 23 & \end{matrix}$ Vanadium	$\begin{matrix} 24 & \text{Cr} \\ 24 & \end{matrix}$ Chromium	$\begin{matrix} 25 & \text{Mn} \\ 25 & \end{matrix}$ Manganese	$\begin{matrix} 26 & \text{Fe} \\ 26 & \end{matrix}$ Iron	$\begin{matrix} 27 & \text{Co} \\ 27 & \end{matrix}$ Cobalt	$\begin{matrix} 28 & \text{Ni} \\ 28 & \end{matrix}$ Nickel	$\begin{matrix} 29 & \text{Cu} \\ 29 & \end{matrix}$ Copper	$\begin{matrix} 30 & \text{Zn} \\ 30 & \end{matrix}$ Zinc	$\begin{matrix} 31 & \text{Ga} \\ 31 & \end{matrix}$ Gallium	$\begin{matrix} 32 & \text{Ge} \\ 32 & \end{matrix}$ Germanium	$\begin{matrix} 33 & \text{As} \\ 33 & \end{matrix}$ Arsenic	$\begin{matrix} 34 & \text{Se} \\ 34 & \end{matrix}$ Selenium	$\begin{matrix} 35 & \text{Br} \\ 35 & \end{matrix}$ Bromine	$\begin{matrix} 36 & \text{Kr} \\ 36 & \end{matrix}$ Krypton
$\begin{matrix} 11 & \text{B} \\ 5 & \end{matrix}$ Boron	$\begin{matrix} 12 & \text{C} \\ 6 & \end{matrix}$ Carbon	$\begin{matrix} 13 & \text{Al} \\ 13 & \end{matrix}$ Aluminium	$\begin{matrix} 14 & \text{Si} \\ 14 & \end{matrix}$ Silicon	$\begin{matrix} 15 & \text{P} \\ 15 & \end{matrix}$ Phosphorus	$\begin{matrix} 16 & \text{S} \\ 16 & \end{matrix}$ Sulphur	$\begin{matrix} 17 & \text{Cl} \\ 17 & \end{matrix}$ Chlorine	$\begin{matrix} 18 & \text{Ar} \\ 18 & \end{matrix}$ Argon	$\begin{matrix} 19 & \text{K} \\ 19 & \end{matrix}$ Potassium	$\begin{matrix} 20 & \text{Ca} \\ 20 & \end{matrix}$ Calcium	$\begin{matrix} 21 & \text{Sc} \\ 21 & \end{matrix}$ Scandium	$\begin{matrix} 22 & \text{Ti} \\ 22 & \end{matrix}$ Titanium	$\begin{matrix} 23 & \text{V} \\ 23 & \end{matrix}$ Vanadium	$\begin{matrix} 24 & \text{Cr} \\ 24 & \end{matrix}$ Chromium	$\begin{matrix} 25 & \text{Mn} \\ 25 & \end{matrix}$ Manganese	$\begin{matrix} 26 & \text{Fe} \\ 26 & \end{matrix}$ Iron	$\begin{matrix} 27 & \text{Co} \\ 27 & \end{matrix}$ Cobalt	$\begin{matrix} 28 & \text{Ni} \\ 28 & \end{matrix}$ Nickel	$\begin{matrix} 29 & \text{Cu} \\ 29 & \end{matrix}$ Copper	$\begin{matrix} 30 & \text{Zn} \\ 30 & \end{matrix}$ Zinc	$\begin{matrix} 31 & \text{Ga} \\ 31 & \end{matrix}$ Gallium	$\begin{matrix} 32 & \text{Ge} \\ 32 & \end{matrix}$ Germanium	$\begin{matrix} 33 & \text{As} \\ 33 & \end{matrix}$ Arsenic	$\begin{matrix} 34 & \text{Se} \\ 34 & \end{matrix}$ Selenium	$\begin{matrix} 35 & \text{Br} \\ 35 & \end{matrix}$ Bromine	$\begin{matrix} 36 & \text{Kr} \\ 36 & \end{matrix}$ Krypton				
$\begin{matrix} 37 & \text{Rb} \\ 37 & \end{matrix}$ Rubidium	$\begin{matrix} 38 & \text{Sr} \\ 38 & \end{matrix}$ Strontium	$\begin{matrix} 39 & \text{Y} \\ 39 & \end{matrix}$ Yttrium	$\begin{matrix} 40 & \text{Zr} \\ 40 & \end{matrix}$ Zirconium	$\begin{matrix} 41 & \text{Nb} \\ 41 & \end{matrix}$ Niobium	$\begin{matrix} 42 & \text{Mo} \\ 42 & \end{matrix}$ Molybdenum	$\begin{matrix} 43 & \text{Tc} \\ 43 & \end{matrix}$ Technetium	$\begin{matrix} 44 & \text{Ru} \\ 44 & \end{matrix}$ Ruthenium	$\begin{matrix} 45 & \text{Rh} \\ 45 & \end{matrix}$ Rhodium	$\begin{matrix} 46 & \text{Pd} \\ 46 & \end{matrix}$ Palladium	$\begin{matrix} 47 & \text{Ag} \\ 47 & \end{matrix}$ Silver	$\begin{matrix} 48 & \text{Cd} \\ 48 & \end{matrix}$ Cadmium	$\begin{matrix} 49 & \text{In} \\ 49 & \end{matrix}$ Indium	$\begin{matrix} 50 & \text{Sn} \\ 50 & \end{matrix}$ Tin	$\begin{matrix} 51 & \text{Sb} \\ 51 & \end{matrix}$ Antimony	$\begin{matrix} 52 & \text{Te} \\ 52 & \end{matrix}$ Tellurium	$\begin{matrix} 53 & \text{I} \\ 53 & \end{matrix}$ Iodine	$\begin{matrix} 54 & \text{Xe} \\ 54 & \end{matrix}$ Xenon												
$\begin{matrix} 55 & \text{Cs} \\ 55 & \end{matrix}$ Caesium	$\begin{matrix} 56 & \text{Ba} \\ 56 & \end{matrix}$ Barium	$\begin{matrix} 57 & \text{La} \\ 57 & \end{matrix}$ Lanthanum	$\begin{matrix} 72 & \text{Hf} \\ 72 & \end{matrix}$ Hafnium	$\begin{matrix} 73 & \text{Ta} \\ 73 & \end{matrix}$ Tantalum	$\begin{matrix} 74 & \text{W} \\ 74 & \end{matrix}$ Tungsten	$\begin{matrix} 75 & \text{Re} \\ 75 & \end{matrix}$ Rhenium	$\begin{matrix} 76 & \text{Os} \\ 76 & \end{matrix}$ Osmium	$\begin{matrix} 77 & \text{Ir} \\ 77 & \end{matrix}$ Iridium	$\begin{matrix} 78 & \text{Pt} \\ 78 & \end{matrix}$ Platinum	$\begin{matrix} 79 & \text{Au} \\ 79 & \end{matrix}$ Gold	$\begin{matrix} 80 & \text{Hg} \\ 80 & \end{matrix}$ Mercury	$\begin{matrix} 81 & \text{Tl} \\ 81 & \end{matrix}$ Thallium	$\begin{matrix} 82 & \text{Pb} \\ 82 & \end{matrix}$ Lead	$\begin{matrix} 83 & \text{Bi} \\ 83 & \end{matrix}$ Bismuth	$\begin{matrix} 84 & \text{Po} \\ 84 & \end{matrix}$ Polonium	$\begin{matrix} 85 & \text{At} \\ 85 & \end{matrix}$ Astatine	$\begin{matrix} 86 & \text{Rn} \\ 86 & \end{matrix}$ Radon												
$\begin{matrix} 87 & \text{Fr} \\ 87 & \end{matrix}$ Francium	$\begin{matrix} 88 & \text{Ra} \\ 88 & \end{matrix}$ Radium	$\begin{matrix} 89 & \text{Ac} \\ 89 & \end{matrix}$ Actinium																											

Key:

