

Candidate Name	Centre Number	Candidate Number
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General Certificate of Secondary Education

240/01

**ADDITIONAL SCIENCE
FOUNDATION TIER (Grades G-C)
CHEMISTRY 2**

P.M. FRIDAY, 18 January 2008

(45 minutes)

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	5	
2.	5	
3.	6	
4.	8	
5.	11	
6.	8	
7.	7	
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.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

Answer all questions.

1. The box below contains information about smart materials.

Smart materials have properties which change according to the surroundings. Smart materials may respond to changes in conditions such as temperature, light or pH. Examples of this type of material include:

- thermochromic paint, which changes colour when heated;
- photochromic paint, which changes colour on exposure to light.

Other smart materials, such as memory alloys, are able to change back to their original shape, e.g., some smart springs that have lost their shape will regain their shape by placing them in boiling water.

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

- (i) State what is meant by a *smart material*. [1]

.....

.....

- (ii) Give **two** conditions that may cause a smart material to change. [2]

..... and

- (iii) State the difference between thermochromic paint and photochromic paint. [1]

.....

.....

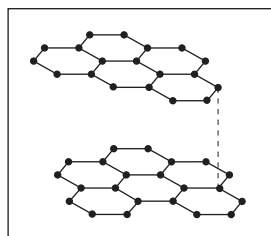
- (iv) State how a smart spring can regain its original shape. [1]

.....

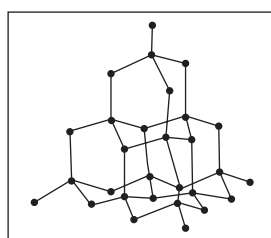
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2. The following diagrams show the structures of some substances.

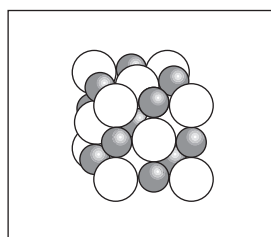
- (i) Draw a line from each structure to the correct name of the substance. One has already been done for you. [3]



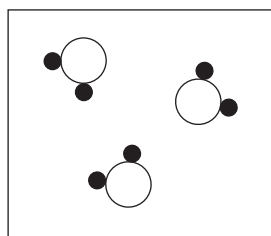
graphite



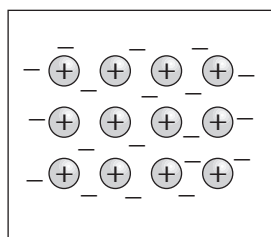
a metal



diamond



sodium chloride



water

- (ii) Name the **two** substances above which are different forms of carbon. [2]

..... and

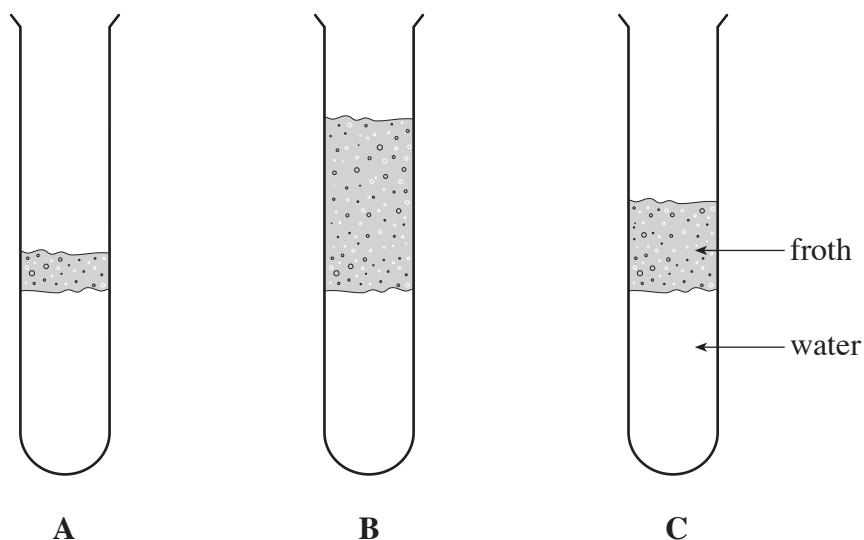
3. Water is often described as being hard or soft.

(i) Using the metal ions listed in the box below, choose **two** that cause hardness in water. [2]

calcium	copper	iron	magnesium	sodium
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..... and

(ii) 5 cm³ of each of three types of water, labelled **A**, **B** and **C**, were mixed with 10 drops of soap solution. Each was shaken 20 times. The results obtained are shown below.



I. Place the water samples, **A**, **B** and **C**, in order of hardness. [2]

hardest

.....

softest

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

1.

2.

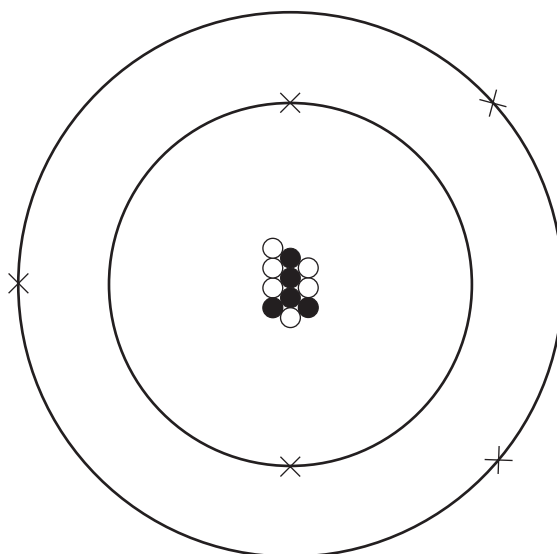
4. (a) Atoms are made up of protons, neutrons and electrons. Use information in the box below to complete the following table. [4]

-1	0	1	+1
----	---	---	----

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

<i>Particle</i>	<i>Mass</i>	<i>Charge</i>
<i>proton</i>
<i>neutron</i>	0
<i>electron</i>	negligible

- (b) (i) The following diagram shows an atom of boron.



Using the diagram above, give the number of

- I. electrons in an atom of boron, [1]
 II. protons in an atom of boron, [1]
 III. neutrons in an atom of boron, [1]

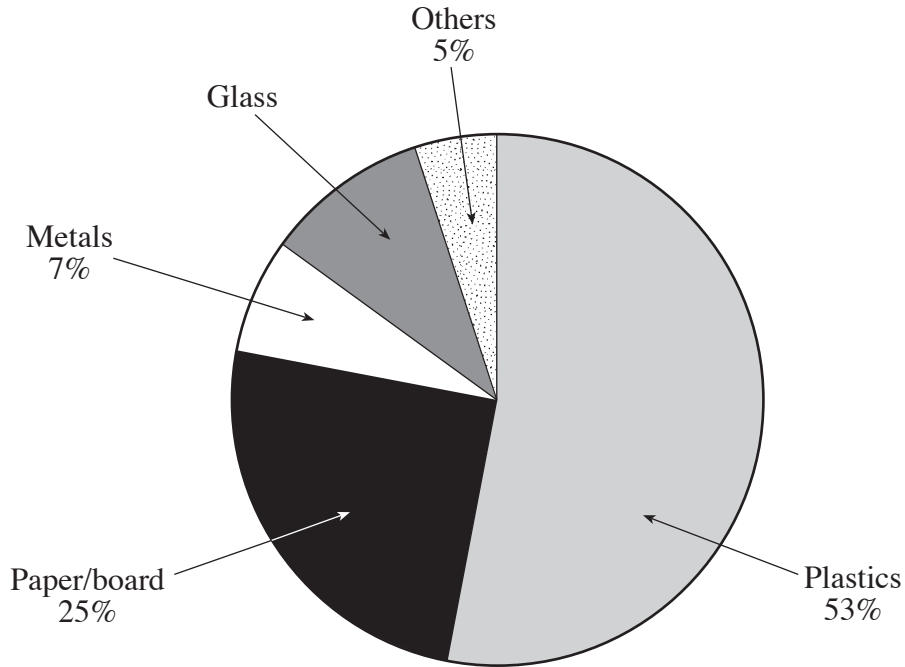
(ii)

5	6	11	16
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Choose a number from the box above to give the mass number of boron. [1]

The mass number is

5. (a) The following pie chart shows the percentage amounts of different types of material used for packaging.



- (i) Name the material that is used **most** for packaging. [1]

.....

- (ii) Use the figures above to calculate the percentage amount of glass used for packaging. [2]

answer = %

- (b) Recycling of plastic is increasingly important. Give **two** reasons, apart from cost, for this. [2]

Reason 1

.....

Reason 2

.....

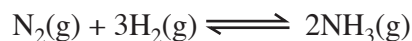
- (c) Use only the words in the following box to complete the sentences about the plastic, poly(ethene), which is commonly called polythene.

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

cracking	ethane	ethene	monomer
	polymer	polymerisation	

- (i) The small reactive molecule used to produce polythene is [1]
- (ii) A small reactive molecule such as this is known as a [1]
- (iii) The process taking place during the production of polythene is known as
..... [1]
- (iv) Polythene is an example of a [1]
- (d) PVC and PTFE (teflon) are two other examples of plastics. Give **one** use of **each**. [2]
- Use of PVC*
- Use of PTFE*

6. (a) Ammonia is made from nitrogen and hydrogen by the Haber process.



- (i) State where the nitrogen used in this reaction comes from. [1]

.....

- (ii) State what is meant by the term *reversible reaction*. [1]

.....

.....

- (b) One of the main uses of ammonia is in the production of nitrogenous fertilisers. The table below shows the content of three types of fertiliser.

<i>Fertiliser</i>	<i>Percentage present</i>			
	<i>Nitrogen</i>	<i>Phosphate</i>	<i>Potash</i>	<i>Sulphur</i>
A	34	0	0	0
B	21	0	0	24
C	0	0	52	12

- (i) State which fertiliser, **A**, **B** or **C**, is not made from ammonia. Give a reason for your answer. [2]

Fertiliser

Reason

- (ii) One of the fertilisers, **A**, **B** or **C**, is produced when ammonia is neutralised by sulphuric acid.

- I. Give the letter of the fertiliser produced in this way and a reason for your answer. [2]

Fertiliser

Reason

- II. Give a **word** equation for the reaction taking place when ammonia solution is neutralised by sulphuric acid. [2]

.....

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- (c) The table below shows what is needed for the extraction of one tonne of iron. The cost of one tonne of each material is also shown.

<i>Raw materials</i>	<i>Amount needed / tonnes</i>	<i>Cost per tonne / £</i>
iron ore	2	40
coke	1	152
limestone	0.5	90
hot air	4	2

Calculate the cost of producing one tonne of iron.

[2]

Cost of one tonne = £

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FORMULAE FOR SOME COMMON IONS

POSITIVE IONS		NEGATIVE IONS	
Name	Formula	Name	Formula
Aluminium	Al^{3+}	Bromide	Br^-
Ammonium	NH_4^+	Carbonate	CO_3^{2-}
Barium	Ba^{2+}	Chloride	Cl^-
Calcium	Ca^{2+}	Fluoride	F^-
Copper(II)	Cu^{2+}	Hydroxide	OH^-
Hydrogen	H^+	Iodide	I^-
Iron(II)	Fe^{2+}	Nitrate	NO_3^-
Iron(III)	Fe^{3+}	Oxide	O^{2-}
Lithium	Li^+	Sulphate	SO_4^{2-}
Magnesium	Mg^{2+}		
Nickel	Ni^{2+}		
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												$\begin{matrix} 4 & \text{He} \\ & 2 \end{matrix}$ Helium			
7 3 Li Lithium	9 4 Be Beryllium											19 9 F Fluorine	20 10 Ne Neon				
23 11 Na Sodium	24 12 Mg Magnesium											32 16 S Sulphur	35 17 Cl Chlorine	40 18 Ar Argon			
39 19 K Potassium	40 20 Ca Calcium	45 21 Sc Scandium	48 22 Ti Titanium	51 23 V Vanadium	52 24 Cr Chromium	55 25 Mn Manganese	56 26 Fe Iron	59 27 Co Cobalt	59 28 Ni Nickel	64 29 Cu Copper	65 30 Zn Zinc	70 31 Ga Gallium	73 32 Ge Germanium	75 33 As Arsenic	79 34 Se Selenium	80 35 Br Bromine	84 36 Kr Krypton
86 37 Rb Rubidium	88 38 Sr Strontium	89 39 Y Yttrium	91 40 Zr Zirconium	93 41 Nb Niobium	96 42 Mo Molybdenum	99 43 Tc Technetium	101 44 Ru Ruthenium	103 45 Rh Rhodium	106 46 Pd Palladium	108 47 Ag Silver	112 48 Cd Cadmium	115 49 In Indium	119 50 Sn Tin	122 51 Sb Antimony	128 52 Te Tellurium	127 53 I Iodine	131 54 Xe Xenon
133 55 Cs Caesium	137 56 Ba Barium	139 57 La Lanthanum	179 72 Hf Hafnium	181 73 Ta Tantalum	184 74 W Tungsten	186 75 Re Rhenium	190 76 Os Osmium	192 77 Ir Iridium	195 78 Pt Platinum	197 79 Au Gold	201 80 Hg Mercury	204 81 Tl Thallium	207 82 Pb Lead	209 83 Bi Bismuth	210 84 Po Polonium	210 85 At Astatine	222 86 Rn Radon
223 87 Fr Francium	226 88 Ra Radium	227 89 Ac Actinium															

Key:

