Candidate Name	Centre Number	Candidate Number
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GCSE

240/01

ADDITIONAL SCIENCE
FOUNDATION TIER
CHEMISTRY 2

P.M. THURSDAY, 15 January 2009

45 minutes

For Examiner's use only	
Total Mark	

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

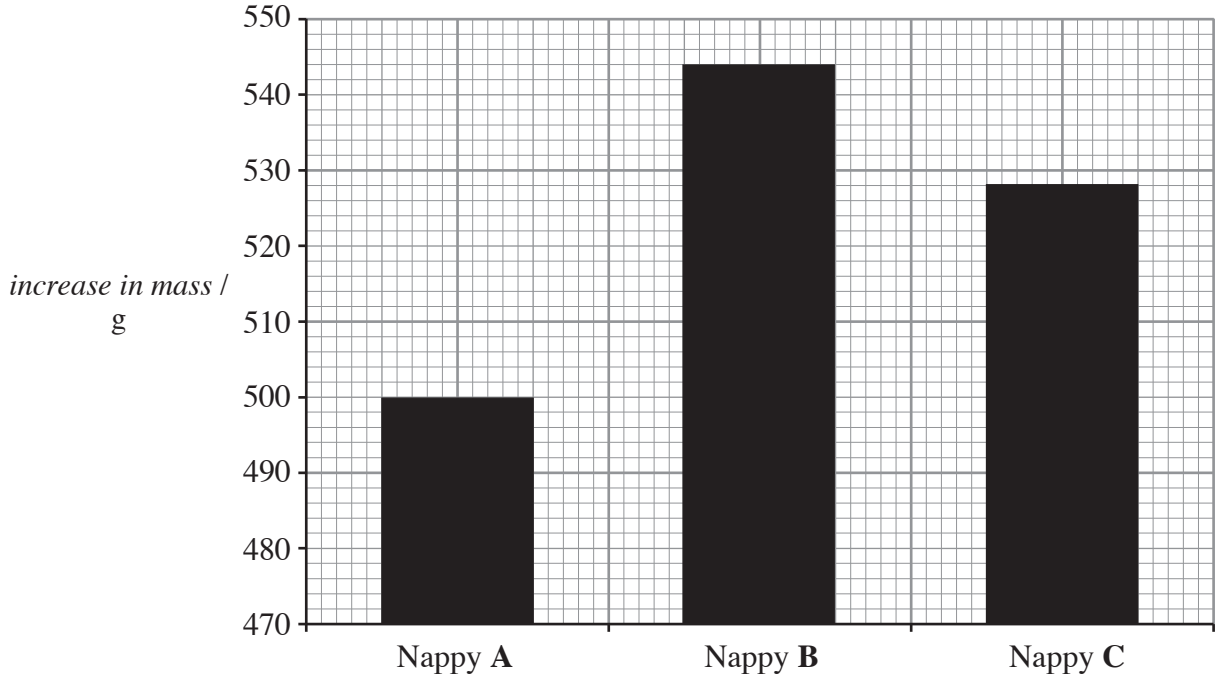
The number of marks is given in brackets at the end of each question or part-question.

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)* Three types of disposable nappy were soaked in water for 10 minutes. Their increase in mass was then recorded. The results are shown in the graph below.



(i) State which nappy, **A**, **B** or **C**, absorbed most water. [1]

.....

(ii) From the list below, choose the type of smart material that is used to produce these nappies. [1]

hydrogel	**shape memory polymer**	**thermochromic paint**

The type of material used is a ..... .

(b) Photochromic pigments change colour on exposure to light. Choose **one** use of photochromic pigments from the list below. [1]

bottles	**sunglasses**	**television screens**

Photochromic pigment is used in ..... .

(c) The following box contains some information about carbon nanotubes.

> Carbon nanotubes are flat sheets of carbon atoms rolled up to form very thin, cylindrical tubes. One use of nanotubes is in computer chips, where they are fixed in place and are not believed to be a health risk.
> However, when used as free particles, their structure is similar to that of asbestos fibres. Asbestos fibres can cause lung problems when inhaled in large amounts over long periods.

Use the information above to help you answer the following questions.

(i) Name the element from which nanotubes are made. [1]

.....

(ii) State why the use of nanotubes in computer chips is not believed to pose a health risk. [1]

.....

(iii) State and explain why some people are concerned about the use of nanotubes as free particles. [2]

.....

.....

2. The following table shows some information about three common metals.

Metal	***Properties***	***Uses***
Aluminium	Low density, good conductor of heat and electricity and resistant to corrosion.	Overhead power cables, saucepans, cooking foil, drinks cans, aeroplanes and window frames.
Copper	Attractive colour, good conductor of heat and electricity, malleable and ductile.	Ornaments, jewellery, electrical wires, water pipes and bases of saucepans.
Titanium	Hard, strong, high melting point, low density and resistant to corrosion.	Aircraft industry, medical applications, jewellery and golf clubs

(i) Use the information in the table to give a reason for each of the following uses of metals:

I. aluminium for window frames; [1]

.....

II. copper for electrical wiring; [1]

.....

III. titanium in the aircraft industry. [1]

.....

(ii) Give **one** medical use of titanium. [1]

.....

Examiner only

3. Fertilisers are made from ammonia.

(i) Complete the following **word** equation to show the fertiliser made when ammonia reacts with nitric acid. [1]

ammonia + nitric acid ⟶ .....

(ii) Complete the following **word** equation to show the acid used to produce ammonium sulphate. [1]

ammonia + ... ⟶ ammonium sulphate

(iii) State the **type** of reaction taking place in (i) and (ii) above. [1]

.....

(iv) Give **one** advantage and **one** disadvantage of using fertilisers. [2]

Advantage .....

.....

Disadvantage .....

.....

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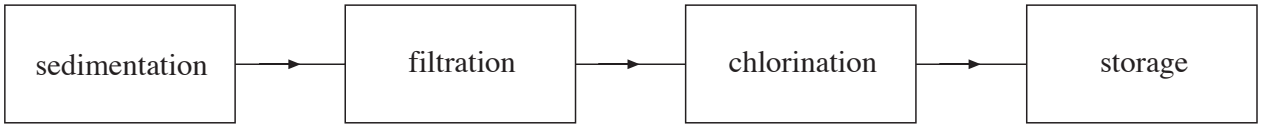
4. *(a)* Water from a reservoir is treated to make it safe to drink. The following flow chart shows some of the stages involved in this water treatment.



Using the flow chart above, state the stage at which

(i) smaller particles are removed, [1]

.....

(ii) bacteria are killed, [1]

.....

(iii) large solid particles are allowed to settle. [1]

.....

(b) Water is sometimes described as ***hard*** water.

You are provided with two different samples of water.
Describe how you would use soap solution to show which water sample is the harder.
Include in your answer ways in which this would be made a fair test. [5]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

5. *(a)* The following table shows the observations made when some metals were added to solutions of compounds of other metals.

Metal	***Solution***	***Observations***
zinc	copper sulphate	Brown deposit on the zinc. The solution gradually loses its blue colour.
copper	zinc sulphate	No reaction.
magnesium	zinc sulphate	Magnesium ribbon coated in dark solid.
zinc	magnesium sulphate	No reaction.

(i) Use the information in the table to place the metals, zinc, copper and magnesium in order of reactivity – most reactive first. [2]

Most reactive .....

.....

Least reactive .....

(ii) Name the products formed when zinc reacts with copper sulphate solution. [2]

..... and .....

(b) Iron is extracted from its ore, iron oxide, by heating with carbon. The process taking place is shown in the equation below.

iron oxide + carbon $\longrightarrow$ iron + carbon monoxide

(i) State, giving a reason for your choice, which is the more reactive, iron or carbon. [1]

More reactive .....

Reason .....

.....

(ii) I. Explain why this method could not be used for the extraction of a reactive metal such as aluminium. [1]

.....

.....

II. Suggest a suitable method for the extraction of aluminium. [1]

.....

6. *(a)* Substances can be classified as

- metallic
- ionic
- simple molecular
- giant covalent

Use the types of substance named above to complete the following sentences.

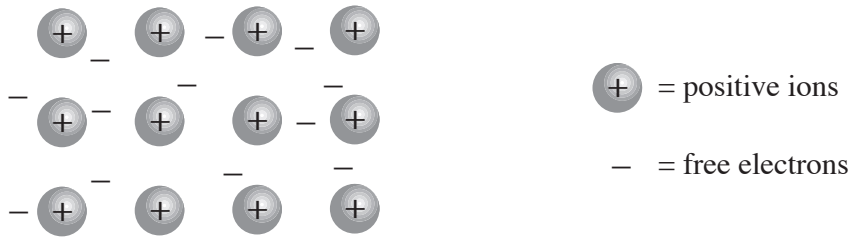
(i) Carbon dioxide is a gas at room temperature due to it being

..... . [1]

(ii) Sodium chloride conducts electricity when in solution due to it being

..... . [1]

(b) The following diagram shows the structure of a metal.



(i) Use the diagram above to explain why metals are good conductors of electricity. [1]

.....

.....

(ii) State **one** property of a metal that can be explained by the fact that the positive ions can be pulled over each other. [1]

.....

7. *(a)* Complete the following table that gives information about the atoms of some elements. [5]

The Periodic Table of Elements shown on the **back cover of this examination paper** may be of help in answering this question.

Element	*Symbol*	*Number of protons*	*Number of neutrons*	*Number of electrons*
sodium	$^{23}_{11}Na$	11	12	11
neon	$^{20}_{10}Ne$	.....	10	.....
calcium	.....	20	20	20
.....	$^{31}_{15}P$	15	.....	15

(b) (i) State what is meant by the relative atomic mass (A_r) of an element. [1]

.....

.....

(ii) Calculate the relative molecular mass (M_r) of nitric acid, HNO_3. [2]

$A_r(H) = 1$; $A_r(N) = 14$; $A_r(O) = 16$

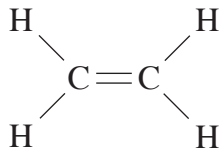
.....

.....

.....

$M_r(HNO_3)$ = ...

8. *(a)* Complete the following table to show the structural formulae for the hydrocarbons given. [2]

Name	*methane*	*ethane*	*ethene*
Formula	CH_4	C_2H_6	C_2H_4
Structural formula	.....	.....	

(b) Ethene can be produced during a process known as cracking. For example:

$$C_{12}H_{26} \longrightarrow C_{10}H_{22} + C_2H_4$$

State **two** conditions necessary for cracking to take place. [2]

..... and .....

(c) Polythene is produced from ethene.

(i) Name the process taking place when polythene is produced from ethene. [1]

.....

(ii) Give **one** use of polythene. [1]

.....

(iii) Give **one** reason why recycling of plastics, such as polythene, is important for the environment. [1]

.....

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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^{+}		

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PERIODIC TABLE OF ELEMENTS

1	2	Group										3	4	5	6	7	0
								$^{1}_{1}$H Hydrogen									$^{4}_{2}$He Helium
$^{7}_{3}$Li Lithium	$^{9}_{4}$Be Beryllium											$^{11}_{5}$B Boron	$^{12}_{6}$C Carbon	$^{14}_{7}$N Nitrogen	$^{16}_{8}$O Oxygen	$^{19}_{9}$F Fluorine	$^{20}_{10}$Ne Neon
$^{23}_{11}$Na Sodium	$^{24}_{12}$Mg Magnesium											$^{27}_{13}$Al Aluminium	$^{28}_{14}$Si Silicon	$^{31}_{15}$P Phosphorus	$^{32}_{16}$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: