



H

A322/02

GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
CHEMISTRY A

Unit 2 Modules C4 C5 C6 (Higher Tier)

WEDNESDAY 18 JUNE 2008

Afternoon

Time: 40 minutes

* C U P / T 4 4 8 3 7 *

Candidates answer on the question paper.

Additional materials (enclosed):

None

Calculators may be used.

Additional materials: Pencil
 Ruler (cm/mm)



Candidate
 Forename

Candidate
 Surname

Centre
 Number

| | | | | |
|----------------------|----------------------|----------------------|----------------------|----------------------|
| <input type="text"/> |
|----------------------|----------------------|----------------------|----------------------|----------------------|

Candidate
 Number

| | | | |
|----------------------|----------------------|----------------------|----------------------|
| <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
|----------------------|----------------------|----------------------|----------------------|

INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided.

FOR EXAMINER'S USE

| Qu. | Max. | Mark |
|--------------|-----------|------|
| 1 | 2 | |
| 2 | 9 | |
| 3 | 9 | |
| 4 | 2 | |
| 5 | 3 | |
| 6 | 3 | |
| 7 | 5 | |
| 8 | 3 | |
| 9 | 6 | |
| TOTAL | 42 | |

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is 42.
- The Periodic Table is printed on the back page.

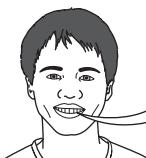
This document consists of 17 printed pages and 3 blank pages.

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

Answer **all** the questions.

1 Bobby reads that helium was discovered on the Sun in 1868. Thirty years later it was found on Earth. He asks his friends why helium was discovered on the Sun first.



Antoine

It is a man-made element,
so none existed in 1868.



Brendan

It took thirty years for the
helium to get from the
Sun to the Earth.



Carol

In 1868, new ways of
examining the light from
the Sun had just been
developed.



Delia

There is much more
helium on the Sun than
on the Earth.



Elton

Elements on the Sun
are not the same as
on the Earth.

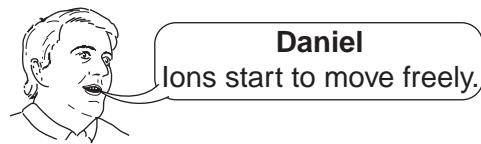
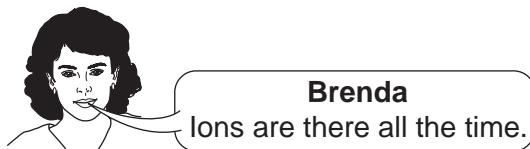
Which **two** people give the best answers?

..... and [2]

[Total: 2]

2 Many chemicals form ionic crystals.

(a) Mary asks her friends to describe what happens when ionic crystals melt.

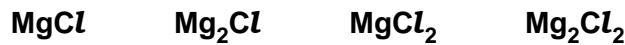


Which **two** people are correct?

..... and [2]

(b) Magnesium chloride is made of Mg^{2+} ions and Cl^- ions.

Put a (ring) around the formula of magnesium chloride.



[1]

(c) Lithium nitride is made of Li^+ ions and N^{3-} ions.

Put a (ring) around the formula of lithium nitride.



[1]

(d) Sodium chloride forms ionic crystals.

(i) Here are some statements about crystals of sodium chloride.

Write **T** in the box next to each **true** statement and **F** in the box next to each **false** one.

T (true)
or
F (false)

Each crystal contains many molecules of NaCl.

The bonds between the particles are strong.

The bonds are all on the outside of the crystal.

There is a very large number of bonds.

The particles in the crystal are held together by attraction between opposite charges.

The particles are arranged in a regular way.

[3]

(ii) Put ticks (✓) in the boxes next to the **two** statements which explain why sodium chloride has a high melting point.

Each crystal contains many molecules of NaCl.

The bonds between the particles are strong.

The bonds are all on the outside of the crystal.

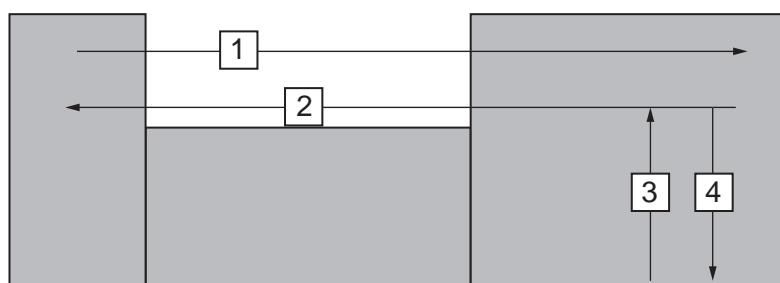
There is a very large number of bonds.

The particles are arranged in a regular way.

[2]

[Total: 9]

3 Here is an outline of the Periodic Table.



(a) Which arrow or arrows show increasing numbers of electrons?

Put a tick (✓) in the box next to the correct answer.

arrow 1 only

arrow 2 only

arrow 3 only

arrow 4 only

arrows 1 & 4 only

arrows 2 & 3 only

arrows 1 & 3 only

arrows 2 & 4 only

[1]

(b) Which arrow or arrows show electrons filling within a shell?

Put a tick (✓) in the box next to the correct answer.

arrow 1 only

arrow 2 only

arrow 3 only

arrow 4 only

arrows 1 & 4 only

arrows 2 & 3 only

arrows 1 & 3 only

arrows 2 & 4 only

[1]

(c) Here are the names of four elements in the Periodic Table.

bromine

iodine

potassium

lithium

Choose from these names to answer the following questions.

(i) Which of these elements ...

... exist as diatomic molecules?

answer and

... react with water to make hydrogen gas?

answer and

... has a melting point below room temperature?

answer [3]

(ii) Which two of these elements will react together most violently?

..... and [1]

(d) The table shows information about some different pure chemicals.

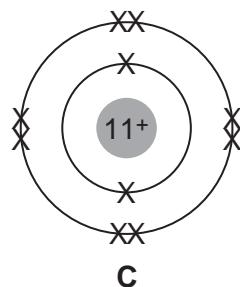
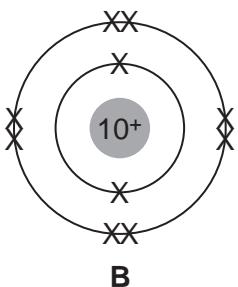
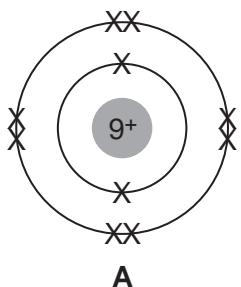
Put ticks (✓) in the correct boxes to show the type of bonding in each chemical.

| chemical | melting point in °C | conducts electricity when solid | conducts electricity when melted | covalent | ionic | metallic |
|----------|---------------------|---------------------------------|----------------------------------|----------|-------|----------|
| A | -219 | no | no | | | |
| B | -39 | yes | yes | | | |
| C | 37 | no | no | | | |
| D | 119 | no | no | | | |
| E | 804 | no | yes | | | |
| F | 1539 | yes | yes | | | |

[3]

[Total: 9]

4 The diagrams show the electronic structure and the number of protons in the nucleus for each of three types of particle.



Which letter, **A**, **B** or **C**, shows the structure of ...

... an **atom**?

answer

... the **ion** of a Group 7 element?

answer

... the **ion** of a Group 1 element?

answer [2]

[Total: 2]

5 Chemicals used in medicines are produced to high levels of purity.

Put ticks (✓) in the **three** boxes which show why.

Impurities might have side effects.

Manufacturers can charge more for pure chemicals.

That way the dose is the same every time.

Each medicine is designed to do one job only.

Otherwise it would be impossible to test new medicines properly.

All substances work better if they are as pure as possible.

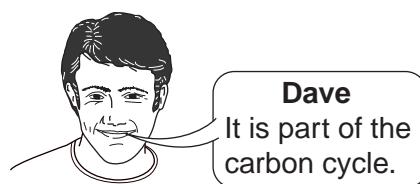
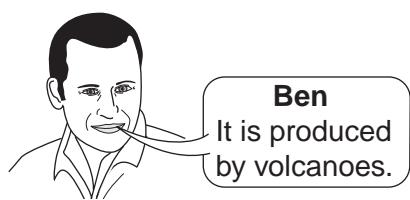
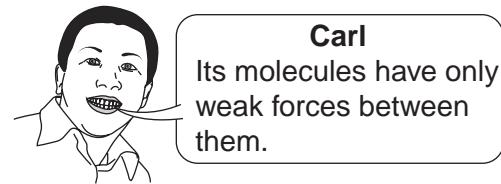
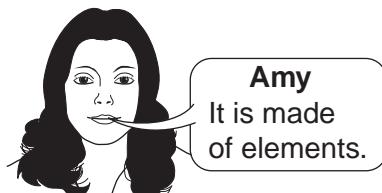
Tablets can be made smaller if the chemicals are purer.

[3]

[Total: 3]

6 Jenny is learning about gases.

(a) She asks her friends why air is a gas.

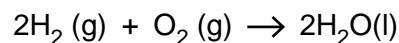


Who has suggested the best reason?

answer.....[1]

11

(b) The equation for the reaction between hydrogen gas and oxygen gas is:



(i) How much hydrogen will react with 8 g of oxygen gas?

Put a (ring) around the correct answer.

(relative atomic mass: H = 1, O = 16)

1 g 4 g 18 g 36 g

[1]

(ii) How much water will be formed when 6 g of hydrogen react?

Put a (ring) around the correct answer.

18 g 36 g 48 g 54 g

[1]

[Total: 3]

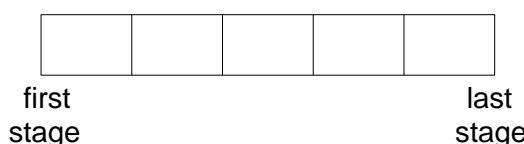
12

7 Metals can be extracted from their ores in different ways.

(a) When iron is extracted from iron ore, only **five** of these stages are used. They are in the wrong order.

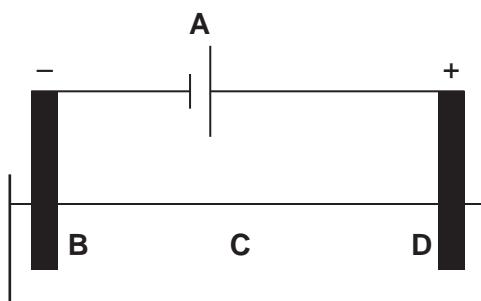
- A Crush the ore.
- B Dig the ore out of the ground.
- C Electrolyse melted iron oxide.
- D Heat iron oxide with carbon.
- E Pour the molten iron into moulds to harden.
- F Separate the mineral from the rest of the rock.

Put the **five** stages used for the extraction of iron into the correct order.



[2]

(b) Aluminium is produced by the electrolysis of aluminium oxide.

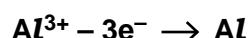
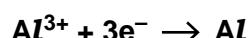
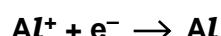


(i) Put a **ring** around the letter, **A**, **B**, **C** or **D**, which shows the electrode where the aluminium metal is formed.

A B C D

[1]

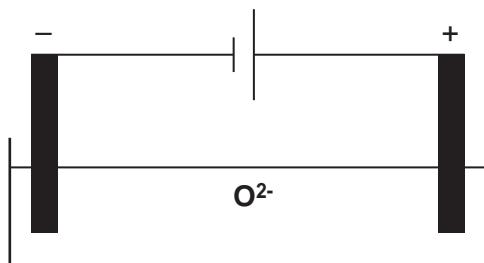
(ii) Put a **ring** around the equation which shows how aluminium ions are turned into aluminium atoms.



[1]

13

(iii) Draw an arrow on the diagram below to show the direction of movement of the oxide ion.



[1]

[Total: 5]

8 Bobby reacts solutions of two chemicals.

He measures the rate of the reaction and how much product is made.

(a) Bobby asks his friends what **rate of reaction** means.



Adrian

It is the total amount of chemical that reacts.



Bertram

It is how far down an element is in the Periodic Table.



Caroline

It is the amount of energy given out during the reaction.



Denise

It is the amount of chemical that reacts each second.

Who is correct?

answer [1]

(b) Bobby repeats the experiment.

He uses the same volumes of solution but doubles the concentration of each chemical.

Here are some statements about the particle collisions in the new reaction and about the change that Bobby observes.

Draw **one** straight line from the correct **collision statement** about the new reaction to the **change** that Bobby observes.

collision statement
(choose one only)

There are more particle collisions every second.
The number of reacting collisions during the whole reaction stays the same.

There are more particle collisions every second.
The number of reacting collisions during the whole reaction increases.

Particles move faster and collide harder.
The number of reacting collisions during the whole reaction increases.

Particles move faster and collide harder.
The number of reacting collisions during the whole reaction stays the same.

change
(choose one only)

The rate increases.
The amount of product increases.

The rate increases.
The amount of product stays the same.

The rate does not increase.
The amount of product increases.

The rate does not increase.
The amount of product stays the same.

[2]

[Total: 3]

9 (a) Naomi reacts sulfuric acid with sodium hydroxide.

Complete the equation for this reaction.

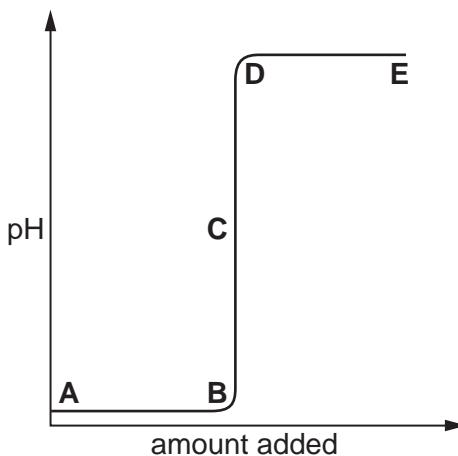


(b) When hydrochloric acid reacts with sodium hydroxide, which pair of ions react?

- A H^+ and Cl^-
- B H^+ and OH^-
- C H^+ and H^+
- D Na^+ and OH^-

answer..... [1]

(c) Naomi measures the pH as she adds one reactant to the other.



The chemicals in the flask change as they react.

What can you say about the amount of acid and alkali at stages A, C and E?

Draw a straight line from each **letter** to the correct **statement**.

| letter | statement |
|--------|---|
| A | There is lots of acid and lots of alkali. |
| C | There is lots of acid and no alkali. |
| E | There is no acid and lots of alkali. |
| | There is no acid and no alkali. |
| | There is some acid and some alkali. |

[3]

[Total: 6]

END OF QUESTION PAPER

17

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

18

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

PLEASE DO NOT WRITE ON THIS PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (OCR) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

OCR is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

The Periodic Table of the Elements

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 0 |
|--------------------------|--------------------|-----------------------|----------------------------|----------------------|-------------------------|----------------------|----------------------|
| 7 Li lithium 3 | 9 Be beryllium 4 | 11 B boron 5 | 12 C carbon 6 | 14 N nitrogen 7 | 16 O oxygen 8 | 19 F fluorine 9 | 20 Ne neon 10 |
| 23 Na sodium 11 | 24 Mg magnesium 12 | 27 Al aluminum 13 | 28 Si silicon 14 | 31 P phosphorus 15 | 32 S sulfur 16 | 35.5 Cl chlorine 17 | 40 Ar argon 18 |
| 39 K potassium 19 | 40 Ca calcium 20 | 45 Sc scandium 21 | 48 Ti titanium 22 | 51 V vanadium 23 | 52 Cr chromium 24 | 55 Mn manganese 25 | 56 Fe iron 26 |
| 85 Rb rubidium 37 | 88 Sr strontium 38 | 89 Y yttrium 39 | 91 Zr zirconium 40 | 93 Nb niobium 41 | 96 Mo molybdenum 42 | 101 Ru ruthenium 44 | 103 Rh rhodium 45 |
| 133 Cs caesium 55 | 137 Ba barium 56 | 139 La* lanthanum 57 | 178 Hf hafnium 72 | 181 Ta tantalum 73 | 184 W tungsten 74 | 186 Re rhenium 75 | 190 Os osmium 76 |
| [223] Fr francium 87 | [226] Ra radium 88 | [227] Ac* actinium 89 | [261] Rf rutherfordium 104 | [262] Db dubnium 105 | [264] Sg seaborgium 106 | [268] Bh bohrium 107 | [271] Hs hassium 108 |
| [272] Rg roentgenium 111 | | | | | | | |

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

1 H hydrogen 1

| | | | | | |
|-------------------|------------------|--------------------|-------------------|---------------------|---------------------|
| 11 B boron 5 | 12 C carbon 6 | 14 N nitrogen 7 | 16 O oxygen 8 | 19 F fluorine 9 | 20 Ne neon 10 |
| 27 Al aluminum 13 | 28 Si silicon 14 | 31 P phosphorus 15 | 32 S sulfur 16 | 35.5 Cl chlorine 17 | 40 Ar argon 18 |
| 55 Cu copper 29 | 59 Ni nickel 28 | 63.5 Zn zinc 30 | 70 Ga gallium 31 | 75 Ge germanium 32 | 80 Br bromine 35 |
| 65 Cd cadmium 48 | 106 Ag silver 47 | 115 In indium 49 | 119 Sn tin 50 | 122 Sb antimony 51 | 127 Te tellurium 52 |
| 119 Hg mercury 80 | 201 Au gold 79 | 204 Pb lead 82 | 209 Bi bismuth 83 | 210 Po polonium 84 | 210 At astatine 85 |
| 222 Rn radon 86 | | | | | |

Elements with atomic numbers 112-116 have been reported but not fully authenticated

* The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.