



GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
CHEMISTRY A

Unit 2 Modules C4 C5 C6 (Higher Tier)

WEDNESDAY 18 JUNE 2008

H

A322/02

Afternoon
Time: 40 minutes

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

| | | | | |
|--|--|--|--|--|
| | | | | |
|--|--|--|--|--|

Candidate
Number

| | | | |
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| | | | |
|--|--|--|--|

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.

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.

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 | |

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

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PLEASE DO NOT WRITE ON THIS PAGE

3

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.



Arnold
Ions form.



Craig
Ions melt.



Brenda
Ions are there all the time.



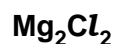
Daniel
Ions start to move freely.

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]

5

(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. | <input type="checkbox"/> |
| The bonds between the particles are strong. | <input type="checkbox"/> |
| The bonds are all on the outside of the crystal. | <input type="checkbox"/> |
| There is a very large number of bonds. | <input type="checkbox"/> |
| The particles in the crystal are held together by attraction between opposite charges. | <input type="checkbox"/> |
| The particles are arranged in a regular way. | <input type="checkbox"/> |

[3]

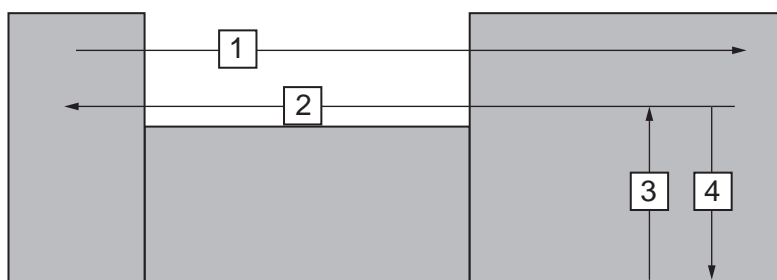
(ii) Put ticks (✓) in the boxes next to the **two** statements which explain why sodium chloride has a high melting point.

| | |
|--|--------------------------|
| Each crystal contains many molecules of NaCl. | <input type="checkbox"/> |
| The bonds between the particles are strong. | <input type="checkbox"/> |
| The bonds are all on the outside of the crystal. | <input type="checkbox"/> |
| There is a very large number of bonds. | <input type="checkbox"/> |
| The particles are arranged in a regular way. | <input type="checkbox"/> |

[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 | <input type="checkbox"/> |
| arrow 2 only | <input type="checkbox"/> |
| arrow 3 only | <input type="checkbox"/> |
| arrow 4 only | <input type="checkbox"/> |
| arrows 1 & 4 only | <input type="checkbox"/> |
| arrows 2 & 3 only | <input type="checkbox"/> |
| arrows 1 & 3 only | <input type="checkbox"/> |
| arrows 2 & 4 only | <input type="checkbox"/> |

[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 | <input type="checkbox"/> |
| arrow 2 only | <input type="checkbox"/> |
| arrow 3 only | <input type="checkbox"/> |
| arrow 4 only | <input type="checkbox"/> |
| arrows 1 & 4 only | <input type="checkbox"/> |
| arrows 2 & 3 only | <input type="checkbox"/> |
| arrows 1 & 3 only | <input type="checkbox"/> |
| arrows 2 & 4 only | <input type="checkbox"/> |

[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.

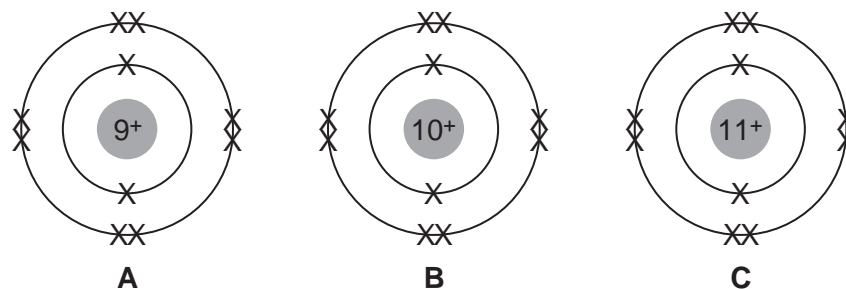
| chemical | melting point in °C | conducts electricity when solid | conducts electricity when melted | covalent | ionic | metallic |
|----------|---------------------|---------------------------------|----------------------------------|----------|-------|----------|
| A | −219 | no | no | | | |
| B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

[3]

[Total: 9]

8

- 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]

9

- 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.

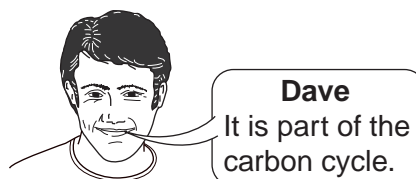
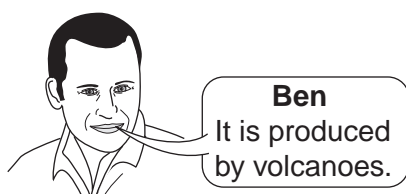
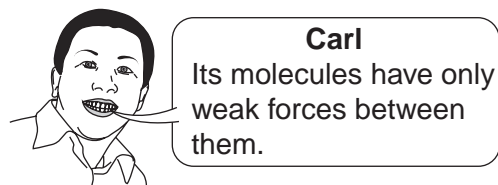
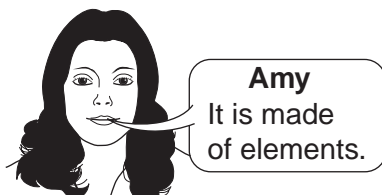
☐

[3]

[Total: 3]

6 Jenny is learning about gases.

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

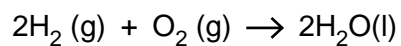


Who has suggested the best reason?

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]

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.

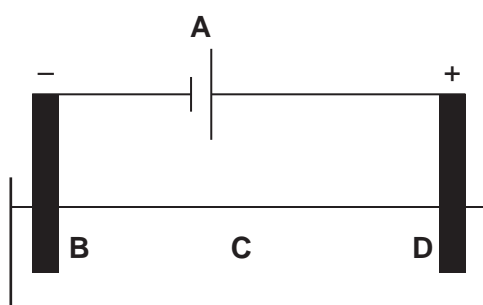
Put the **five** stages used for the extraction of iron into the correct order.

| | | | | |
|--|--|--|--|--|
| | | | | |
|--|--|--|--|--|

first stage last stage

[2]

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

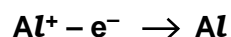
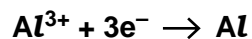


- (i) Put a ring around the letter, **A**, **B**, **C** or **D**, which shows the electrode where the aluminium metal is formed.

A B C D

[1]

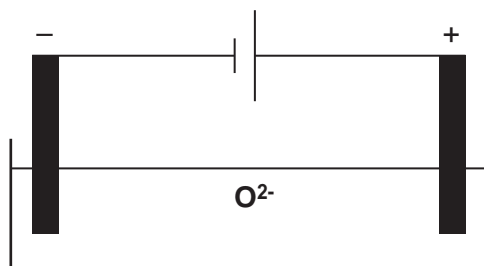
- (ii) Put a ring around the equation which shows how aluminium ions are turned into aluminium atoms.



[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]

16

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

Complete the equation for this reaction.

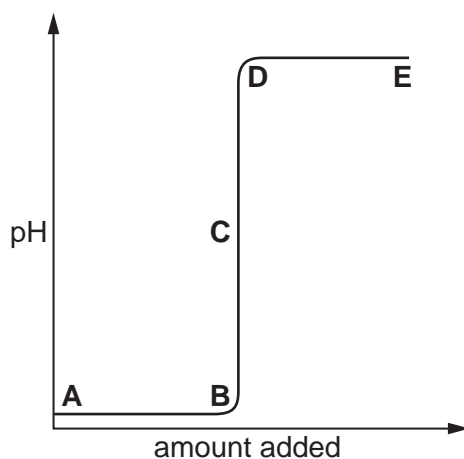


- (b) When hydrochloric acid reacts with sodium hydroxide, which pair of ions react?

- 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

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18
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* 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.