



General Certificate of Secondary Education  
2013–2014

## Double Award Science: Chemistry

Unit C1

Foundation Tier

[GSD21]

THURSDAY 15 MAY 2014, MORNING



Centre Number

71

Candidate Number

### TIME

1 hour.

### INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Write your answers in the spaces provided in this question paper.  
Answer **all ten** questions.

### INFORMATION FOR CANDIDATES

The total mark for this paper is 70.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Question 5.  
A Data Leaflet, which includes a Periodic Table of the Elements, is included in this question paper.

For Examiner's  
use only

Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Total  
Marks

- 1 A list of substances and their uses is given below.  
Draw a line from each substance to the correct use.

Substance	Use
anhydrous copper sulfate	chemical test for water
magnesium	test for an alkali
blue litmus paper	test for an acid
copper	cutting tool
diamond	high strength alloys for aircraft
	electrical wiring

[5]

Examiner Only	
Marks	Remark



3 Hydrated copper(II) sulfate is added to a beaker of water and stirred until some solid copper(II) sulfate remains at the bottom of the beaker.

(a) What colour is hydrated copper(II) sulfate?

\_\_\_\_\_ [1]

(b) Explain what is meant by the term **hydrated**.

\_\_\_\_\_ [1]

(c) Draw a labelled diagram with assembled apparatus to show how the solid copper(II) sulfate, which is left at the bottom of the beaker, is separated from the solution.

[4]

Examiner Only	
Marks	Remark

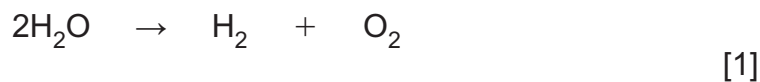
Examiner Only	
Marks	Remark

4 When electricity is passed through water containing some acid, the water decomposes (breaks down) to form the gases hydrogen and oxygen.

(a) What is the name given to the process of decomposing a compound using electricity?

\_\_\_\_\_ [1]

(b) **Balance** the equation below which describes the decomposition of water.



(c) Describe a test for hydrogen gas.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ [2]

(d) (i) Hydrogen is a **flammable** gas. Which hazard symbol shown below should be placed on a cylinder of hydrogen gas? Circle the correct hazard symbol.



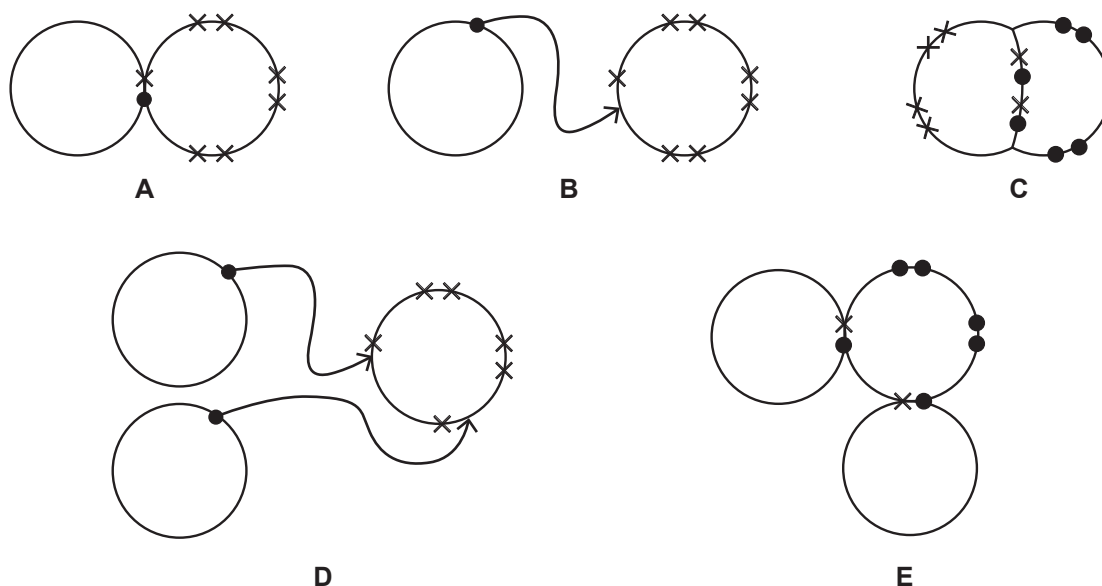
© Crown Copyright [1]

(ii) Give two reasons why hazard symbols are important.

1. \_\_\_\_\_  
 \_\_\_\_\_  
 2. \_\_\_\_\_  
 \_\_\_\_\_ [2]



6 Five bonding diagrams, A–E, are drawn below. **Outer electrons are shown.**



(a) Which diagram, **A**, **B**, **C**, **D** or **E**, is a dot and cross diagram of a substance with one single covalent bond?

\_\_\_\_\_ [1]

(b) (i) Which diagram, **A**, **B**, **C**, **D** or **E**, could show the transfer of electrons between atoms of sodium and oxygen to form the ionic compound sodium oxide?

\_\_\_\_\_ [1]

(ii) Name the type of particles formed when electrons are **transferred** between atoms. Circle the correct answer in the list below.

**neutrons**      **allotropes**      **ions**      **isotopes** [1]

(c) Which diagram, **A**, **B**, **C**, **D** or **E**, could show the covalent bonding between atoms of hydrogen and chlorine in hydrogen chloride?

\_\_\_\_\_ [1]

(d) Which diagram, **A**, **B**, **C**, **D** or **E**, could show the sharing of electrons in a molecule of oxygen?

\_\_\_\_\_ [1]

Examiner Only

Marks Remark





- (f) Equal sized pieces of three Group 1 metals are added to separate troughs of water which contain universal indicator.  
The observations made are recorded in the table below.

Name of Group 1 metal	Observation when the metal is added to water	Colour of universal indicator
potassium	<ul style="list-style-type: none"> <li>catches fire</li> <li>burns with a lilac flame on the surface of the water</li> <li>quickly disappears</li> </ul>	<ul style="list-style-type: none"> <li>changes colour from green to blue</li> </ul>
lithium	<ul style="list-style-type: none"> <li>floats</li> <li>moves about the surface of the water</li> <li>eventually disappears</li> </ul>	<ul style="list-style-type: none"> <li>changes colour from green to blue</li> </ul>
sodium	<ul style="list-style-type: none"> <li>melts into a silvery ball on the surface of the water</li> <li>disappears</li> </ul>	<ul style="list-style-type: none"> <li>changes colour from green to blue</li> </ul>

Read the information in the table carefully.

- (i) What happens to the reactivity of the Group 1 elements as the Group is descended? You may find your Data Leaflet helpful.

\_\_\_\_\_ [1]

- (ii) Explain fully why the universal indicator changed colour from green to blue.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ [3]

- (iii) Give one more observation which could be added to the table for **all three** reactions.

\_\_\_\_\_ [1]

- (iv) Write a **word** equation to describe the reaction between sodium and water.

\_\_\_\_\_ [2]

Examiner Only

Marks Remark





(e) A solution of  $0.05 \text{ mol/dm}^3$  acid Y was tested using a pH meter and universal indicator paper. The results are recorded in the table below.

Test	Result
pH meter	pH = 3.03
Universal indicator	orange pH = 3

(i) Explain how the colour of universal indicator is used to give a pH value.

\_\_\_\_\_  
\_\_\_\_\_ [1]

(ii) How do the results show that acid Y is a weak acid?

\_\_\_\_\_  
\_\_\_\_\_ [1]

(iii) Give one example of a weak acid.

\_\_\_\_\_ [1]

(iv) Which property of the acid is measured in the units  $\text{mol/dm}^3$ ?  
Circle the correct answer.

mass          volume          concentration          strength  
[1]

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Marks	Remark

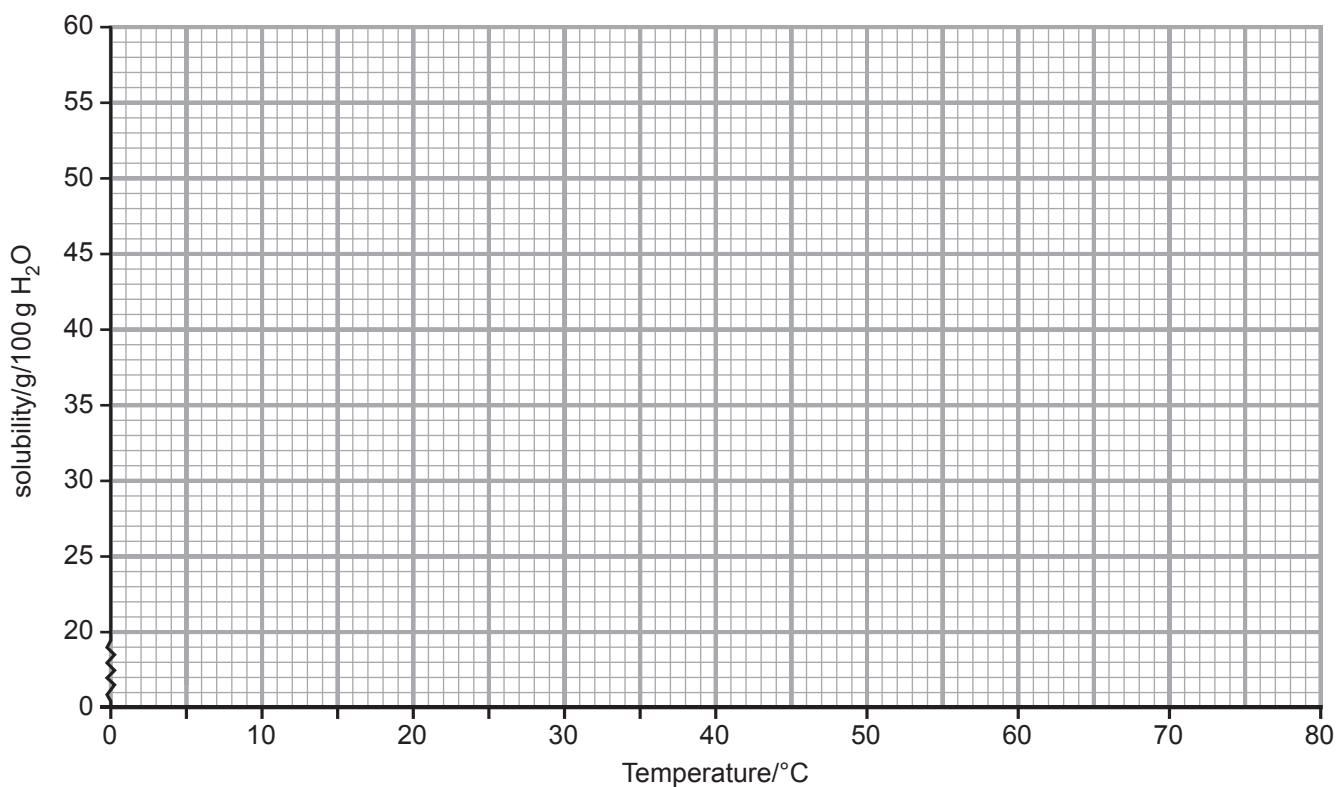
- 10 (a) An investigation was carried out to find the solubility (g/100 g H<sub>2</sub>O) of potassium chloride at different temperatures. The results are given in the table below.

Temperature (°C)	0	10	20	30	40	50	60	80
Solubility (g/100 g H <sub>2</sub> O)	27.8	30.9	34.0	37.1	40.0	42.9	45.8	51.2

- (i) At 70 °C, 12.1 g of potassium chloride will saturate 25 g of water. Calculate the solubility of potassium chloride at 70 °C. (You must show your working out.)

\_\_\_\_\_ g/100 g H<sub>2</sub>O [1]

- (ii) On the grid below draw the solubility curve for potassium chloride. [3]



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(b) The table below gives the solubility (g/100 g H<sub>2</sub>O) at different temperatures for four **solid** compounds, A, B, C and D.

Solid	Solubility (g/100 g H <sub>2</sub> O)						
	0 °C	10 °C	20 °C	30 °C	40 °C	60 °C	80 °C
A	60.0	66.7	73.9	81.8	88.7	106.0	132.0
B	12.3	16.4	18.6	25.0	31.6	40.4	49.0
C	0.22	0.24	0.25	0.26	0.26	0.24	0.23
D	79.2	85.4	94.2	105.0	119.0	158.0	187.0

(i) Use the data in the table to complete the following general rule.

For most solids the solubility \_\_\_\_\_ as the temperature \_\_\_\_\_.

[1]

(ii) One of the compounds in the table does not follow this solubility rule.

Describe fully what happens to the solubility of this solid as the temperature is increased from 0 °C to 80 °C.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [2]

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Marks	Remark

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**THIS IS THE END OF THE QUESTION PAPER**

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