



*Rewarding Learning*

General Certificate of Secondary Education  
2015

Centre Number

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Candidate Number

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# Double Award Science: Chemistry

Unit C2  
Foundation Tier

[GSD51]

MV18

**TUESDAY 9 JUNE 2015, AFTERNOON**

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## TIME

1 hour 15 minutes, plus your additional time allowance.

## INSTRUCTIONS TO CANDIDATES

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

**You must answer the questions in the spaces provided.**

Complete in blue or black ink only.

Answer **all nine** questions.

## INFORMATION FOR CANDIDATES

The total mark for this paper is 90.

Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Question **5(a)**.

A Data Leaflet, which includes a Periodic Table of the Elements, is included in this question paper.

- 1 (a) Fossil fuels contain carbon and are non-renewable. Circle **three** fossil fuels in the list below. [3 marks]

coal

sulfur

oil

wood

peat

hydrogen

- (b) Complete the sentence below by choosing one word from each box.  
Put a circle around the correct word in each box.  
[2 marks]

During combustion a fuel reacts with

hydrogen
oxygen
sulfur dioxide

to release

carbon
nitrogen
energy

**(c)** This part of the question is about the reactions of oxygen with carbon and copper.

**(i)** Give two observations you could make when carbon is burned in a plentiful supply of oxygen. [2 marks]

1. \_\_\_\_\_

2. \_\_\_\_\_

**(ii)** What is the name of the compound formed in the reaction of carbon with excess oxygen? [1 mark]

\_\_\_\_\_

**(iii)** When copper metal is heated in oxygen what compound is formed and what colour change would you observe in the solid? [3 marks]

Compound \_\_\_\_\_

Colour change from \_\_\_\_\_

to \_\_\_\_\_

- 2 (a) An experiment was carried out to investigate the effect of soap and of detergent on samples of hard and soft water.

Complete the results table below to show what would be observed (for each water sample) by ticking the correct answers. One has been done for you. [3 marks]

Water sample	Soap added and shaken		Detergent added and shaken	
	lather	no lather	lather	no lather
hard water				
soft water			✓	

(b) Read the passage below about hard water.

**Hard water tastes better than soft water. Hard water wastes soap and causes scum when it reacts with soap. It contains calcium ions and so it is good for bones and teeth. Hard water can cause fur or scale to form in kettles and limescale to form in hot water pipes. It is used in brewing beer and it is thought to help prevent heart disease.**

From the information given in the passage, give two advantages and two disadvantages of living in a hard water region. [4 marks]

Advantages:

1. \_\_\_\_\_
2. \_\_\_\_\_

Disadvantages:

1. \_\_\_\_\_
2. \_\_\_\_\_

- 3 (a) (i)** Exothermic processes give out heat. Complete the table below to show which processes are exothermic. The first one has been done for you. [3 marks]

Process	Exothermic Yes/No
Ice turning into water	No
Petrol burning	
Neutralising acid with alkali	
Thermal decomposition of copper carbonate	

- (ii)** When ice turns into water heat is taken in by the ice.

The word used to describe heat being taken in during the process is: \_\_\_\_\_.  
[1 mark]

- (iii)** Calcium carbonate can be broken down by heating. Complete the word equation below which describes the effect of heat on calcium carbonate. [2 marks]

calcium carbonate → +

**(b)** This part of the question is about the quarrying and uses of limestone.

**(i)** From the list below, circle **two** uses of limestone.  
[2 marks]

**fuel**

**neutralise acidity in soil**

**building material**

**manufacture of alcohol**

**(ii)** Limestone is taken from the ground by quarrying. Complete the table below, by ticking the correct boxes, to show advantages and disadvantages of quarrying limestone.

The first one has been done for you. [4 marks]

Quarrying	Advantage	Disadvantage
produces noise		✓
provides jobs		
affects natural habitats		
produces dust		
affects the local economy		

4 (a) A student prepared some hydrogen gas by reacting a metal with an acid.

(i) Complete the table below to show the test she could do to prove that the gas is hydrogen and what result she would expect. [2 marks]

Test	Result

(ii) Give two physical properties of hydrogen gas. [2 marks]

1. \_\_\_\_\_
2. \_\_\_\_\_

(b) Hydrogen gas can be used as a clean fuel.

(i) Write a word equation for the burning of hydrogen in oxygen. [2 marks]

\_\_\_\_\_

(ii) Why is hydrogen considered to be a clean fuel? [2 marks]

\_\_\_\_\_  
\_\_\_\_\_



**(c)** Apart from its use as a fuel, give one other use of hydrogen gas. [1 mark]

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- (b)** The atmosphere contains a mixture of gases.  
How was the early atmosphere formed? [2 marks]

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- (c)** The two main gases in the atmosphere make up about 99%.

- (i)** Just under 80% of the atmosphere is made up of nitrogen. Which is the second most abundant gas in our atmosphere? [1 mark]

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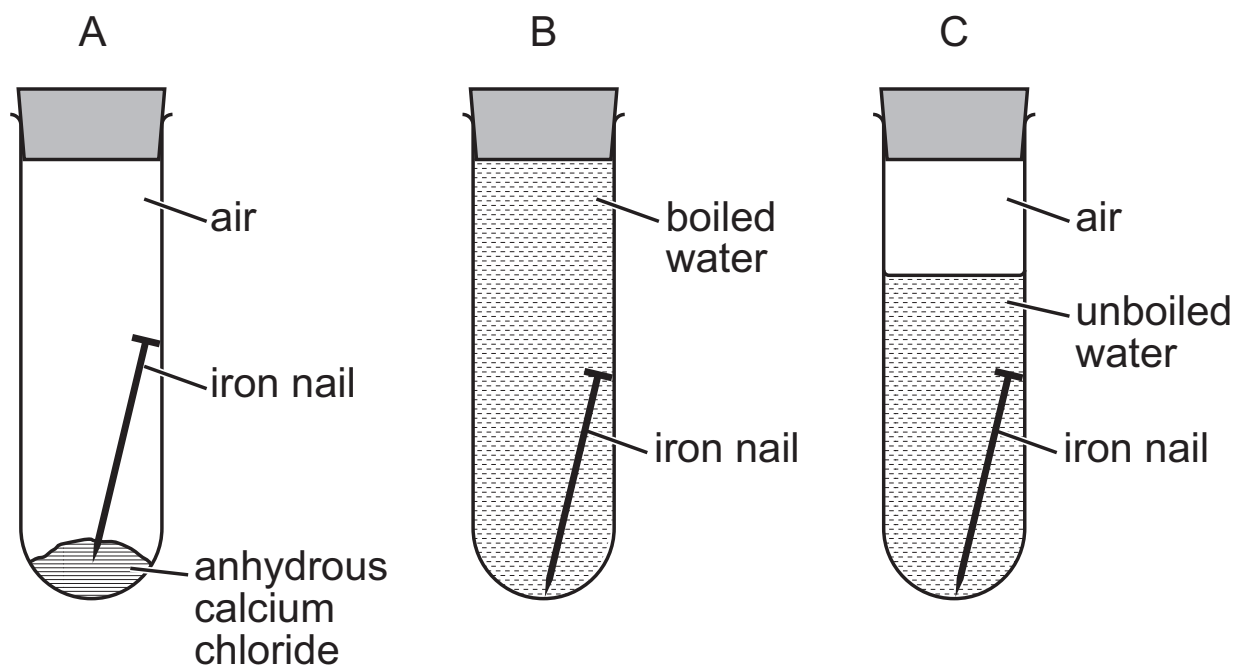
- (ii)** Which **one** of the gases below is considered to be an atmospheric gas?  
Circle the correct answer. [1 mark]

**argon**

**hydrogen**

**chlorine**

- 6 (a) A student set up 3 test tubes as shown below to investigate the conditions needed for the rusting of iron.



- (i) After a week, which was the only test tube, A, B or C to have a rusty nail? [1 mark]

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- (ii) How did the student make the test fair? [1 mark]

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- (iii) Why had the water in test tube B been boiled? [1 mark]

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- (iv) What **two** conditions are necessary for the rusting of iron to occur? [1 mark]

\_\_\_\_\_ and \_\_\_\_\_

**(b)** Magnesium reacts with steam to give two products.

**(i)** Complete the word equation for the reaction of magnesium with steam. [2 marks]

magnesium + steam → +

**(ii)** Describe **one** observation you would make during this reaction. [1 mark]

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**(c)** Magnesium powder reacts quickly with copper(II) sulfate solution.

**(i)** Describe two things you would expect to **see** happening in this reaction. [2 marks]

1. \_\_\_\_\_

2. \_\_\_\_\_

**(ii)** What does this reaction tell you about the reactivity of magnesium compared to that of copper? [1 mark]

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**(d)** This part of the question is about the reaction of iron with sulfur.

When a mixture of sulfur powder and iron filings is placed in a boiling tube and then heated a chemical reaction takes place.

**(i)** When the mixture is heated an orange-red glow is seen in the boiling tube. What is observed when the heating is stopped? [2 marks]

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**(ii)** Write a balanced symbol equation for the reaction between iron and sulfur. [2 marks]

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**(Questions continue overleaf)**

7 This question is about relative atomic mass, relative formula masses and using mole calculations.

(a) What do you understand by the **relative atomic mass** of an element? [3 marks]

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(b) Calculate the relative formula mass of each of the following substances.

(Relative atomic masses:

H = 1, O = 16, Na = 23, Al = 27, S = 32)

(i) Sulfur dioxide  $\text{SO}_2$  [1 mark]

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(ii) Sodium sulfate  $\text{Na}_2\text{SO}_4$  [1 mark]

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(iii) Aluminium hydroxide  $\text{Al}(\text{OH})_3$  [1 mark]

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**(c)** Silver nitrate ( $\text{AgNO}_3$ ) has a relative formula mass of 170.

**(i)** How many moles of silver nitrate are there in 340 g of the substance? [1 mark]

Answer \_\_\_\_\_ moles

**(ii)** What is the mass of 0.3 moles of silver nitrate? [1 mark]

Answer \_\_\_\_\_ g

- 8 Calcium carbonate powder reacts with excess dilute hydrochloric acid to form carbon dioxide, water and calcium chloride solution.

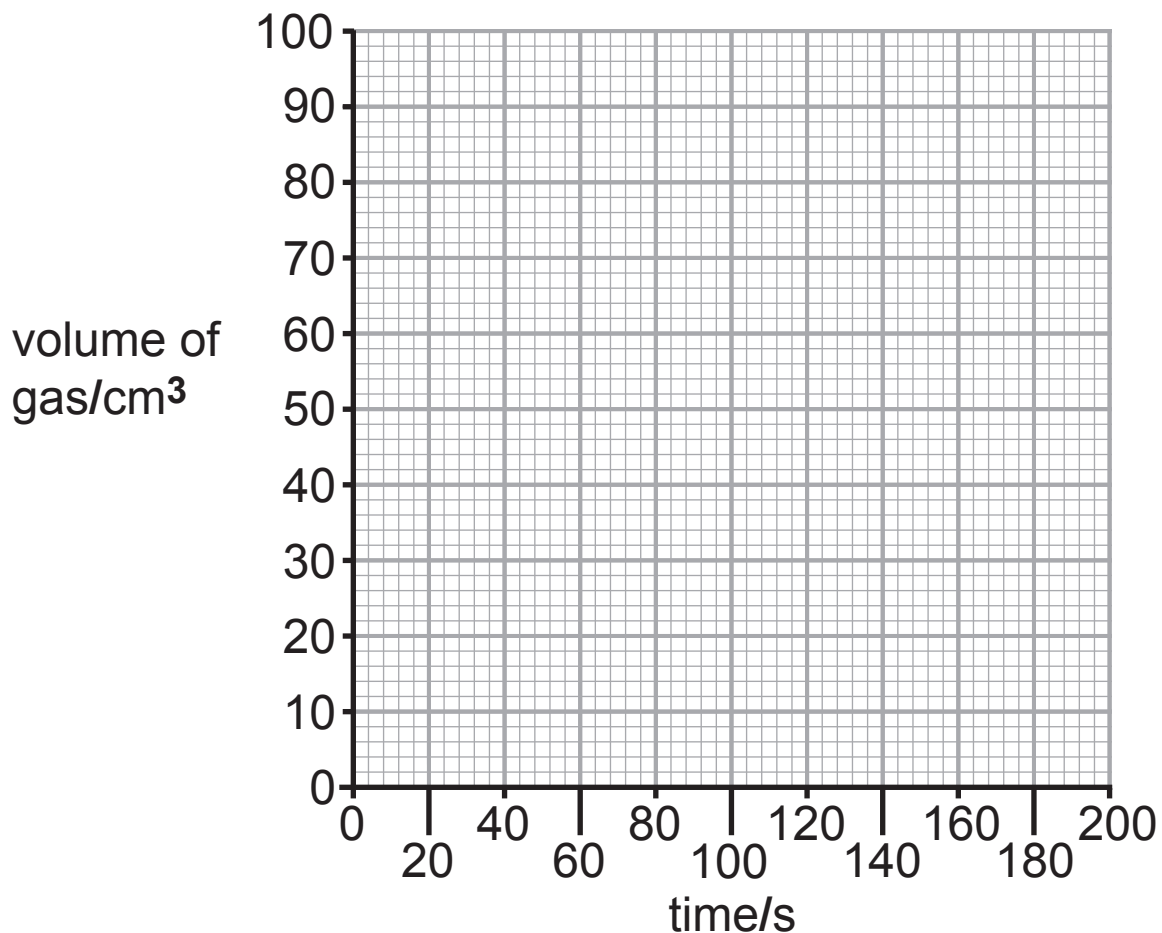


A student investigated the rate of this reaction by measuring the volume of carbon dioxide gas produced over a period of time. The total volume of gas measured at 20 second intervals is recorded in the table below.

Time/s	0	20	40	60	80	100	120	140	160
Volume/cm <sup>3</sup>	0	32	50	66	76	83	87	90	90

- (a) Name a piece of apparatus that the student could use to measure the volume of gas produced. [1 mark]
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**(b)** On the grid below, plot the results given in the table.  
Draw a curve of best fit. [3 marks]



**(c) (i)** At what time did the reaction stop? [1 mark]

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**(ii)** What volume of gas had been collected at 30 seconds? [1 mark]

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**(d)** The reaction was repeated using the same amount of calcium carbonate and the same amount of excess dilute hydrochloric acid but using a large lump of calcium carbonate instead of the powder.

What effect would this change have on:

**(i)** the rate of the reaction? [1 mark]

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**(ii)** the total volume of carbon dioxide produced?  
[1 mark]

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**(Questions continue overleaf)**

9 (a) A recent spillage of crude oil onto the shores of the USA caused serious environmental problems. It is important that oil spillages are dealt with quickly.

(i) Give **three** examples of environmental problems caused by oil spillage. [3 marks]

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

3. \_\_\_\_\_

\_\_\_\_\_

(ii) How are oil spillages cleaned up? [1 mark]

\_\_\_\_\_

\_\_\_\_\_

(b) The hydrocarbon methane is a major source of energy.

Write a word equation for the combustion of methane in a plentiful supply of air. [3 marks]

\_\_\_\_\_

(c) Ethanoic acid shows typical reactions of an acid.

(i) Describe two observations you could make when ethanoic acid is added to solid copper carbonate. [2 marks]

1. \_\_\_\_\_  
\_\_\_\_\_

2. \_\_\_\_\_  
\_\_\_\_\_

(ii) Name a metal that you could react safely with ethanoic acid to form hydrogen gas. [1 mark]

\_\_\_\_\_

(iii) Give one use of ethanoic acid. [1 mark]

\_\_\_\_\_

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

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For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	

<b>Total Marks</b>	
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Examiner Number

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