



Rewarding Learning

General Certificate of Secondary Education  
2017–2018

Centre Number

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Candidate Number

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# Single Award Science Chemistry

Unit 2  
Higher Tier

[GSA22]



**THURSDAY 22 FEBRUARY 2018, MORNING**

**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 eight** questions.

**INFORMATION FOR CANDIDATES**

The total mark for this paper is 60.  
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.  
A Data Leaflet, which includes a Periodic Table of the elements, is provided.  
Quality of written communication will be assessed in Question 8.

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

<b>Total Marks</b>	
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1 Shown below is part of Mendeleev's table of elements.

I									
H	II	III	IV	V	VI	VII			
Li	Be	B	C	N	O	F			
Na	Mg	Al	Si	P	S	Cl			
K	Ca		Ti	V	Cr	Mn	Fe	Co	Ni
Cu	Zn			As	Se	Br			

(a) In what order did Mendeleev set out the elements?

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

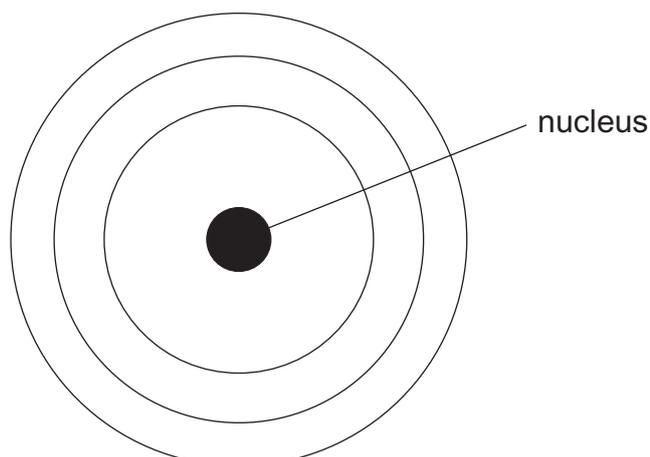
(b) Name the Group of elements in the modern Periodic Table that was **not** in Mendeleev's table. Suggest **one** reason why this Group was not in his table.

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

(c) Using the Data Leaflet provided and your knowledge, name **one** element that is now placed in a different position to where it was placed in Mendeleev's table.

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

(d) Magnesium is in Group 2 of the Periodic Table. Complete the diagram below to show the electronic configuration (structure) of a magnesium atom.



[1]

Examiner Only	
Marks	Remark

2 Calcium metal and calcium hydroxide both react with hydrochloric acid.

- (a) Complete the table below by ticking (✓) the boxes to show the products formed in the reaction between calcium metal and hydrochloric acid.

Reaction	Products formed			
	a salt	water	hydrogen	carbon dioxide
calcium hydroxide and hydrochloric acid	✓	✓		
calcium metal and hydrochloric acid				

[2]

- (b) When calcium metal is added to hydrochloric acid, there is an increase in temperature. What name is given to this **type** of reaction that gives out heat?

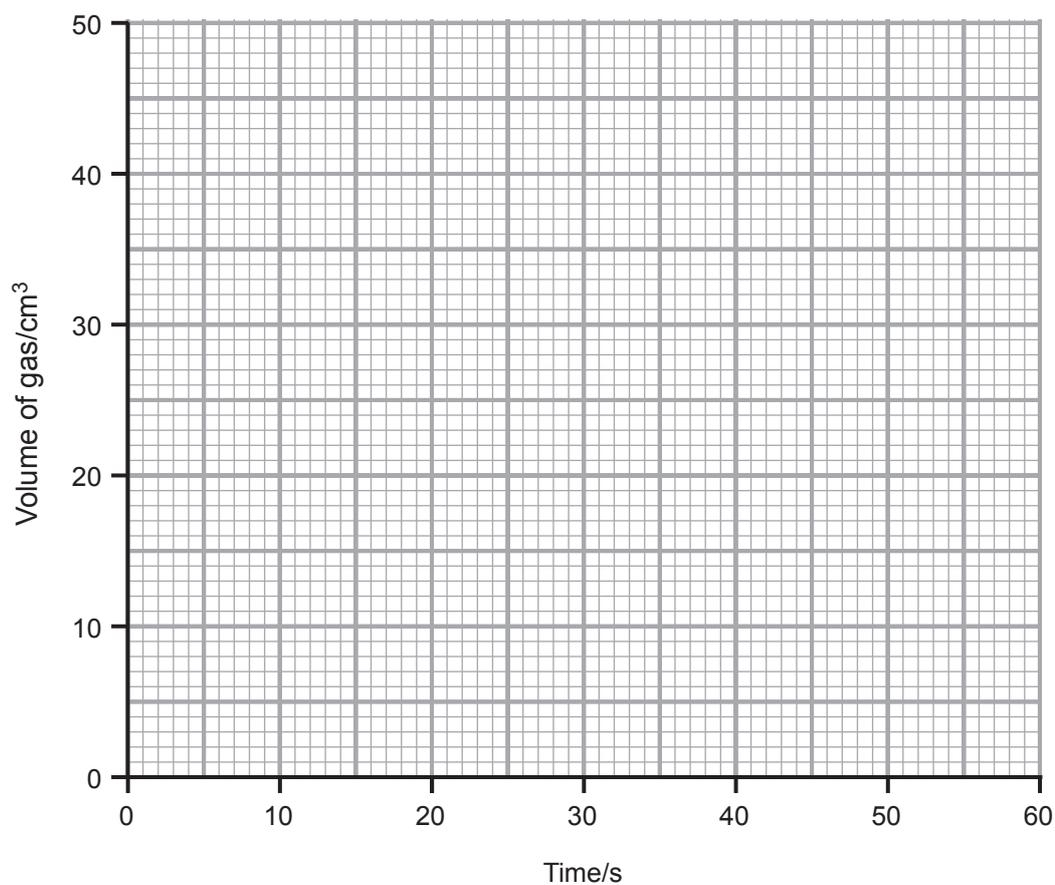
\_\_\_\_\_ [1]

Examiner Only	
Marks	Remark

- 3 When acid is added to sodium hydrogencarbonate a gas is produced. The table below shows the volume of gas produced by this reaction over 60 seconds.

Time/s	0	10	20	30	40	50	60
Volume of gas/cm <sup>3</sup>	0	18	34	45	48	48	48

- (a) On the grid below plot a **line** graph for these results.



[3]

- (b) Describe fully the trend shown by these results.

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[2]

Examiner Only	
Marks	Remark



4 (a) Describe how crude oil is formed.

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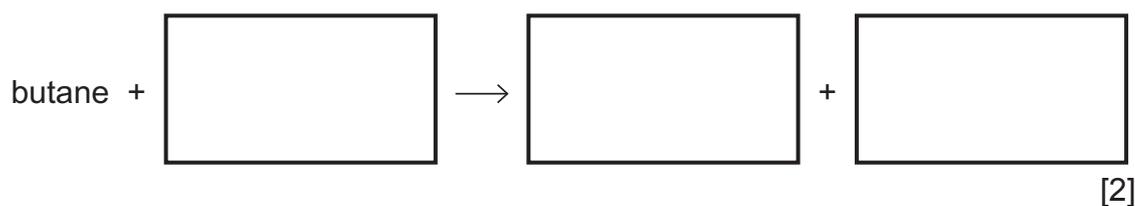
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[3]

(b) Butane is a hydrocarbon that can be extracted from crude oil. Complete the word equation for the combustion of butane.



[2]

(c) Burning hydrocarbons such as butane causes an increase in the amount of greenhouse gases. Describe **two** effects of increasing amounts of greenhouse gases.

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

---

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

---

[2]

(d) Butane has the molecular formula  $C_4H_{10}$ .

(i) In the space below draw the structural formula of butane.

[1]

Examiner Only	
Marks	Remark

(ii) Give the molecular formula for:

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

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

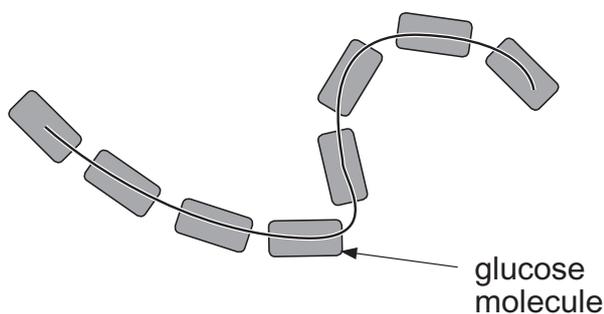
[2]

(e) Starch is a natural polymer made up of glucose molecules.

(i) What name is given to the process of making a polymer?

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

The diagram shows part of a starch polymer.

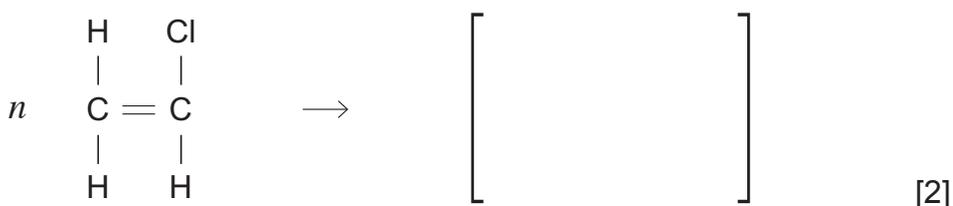


(ii) Use the diagram to explain how starch is formed from glucose.

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

(f) Polyvinylchloride (PVC) is a synthetic (man-made) polymer made from vinyl chloride.

(i) Complete the symbol equation below for the process of making PVC.



(ii) Explain why vinyl chloride is not a hydrocarbon.

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

Examiner Only

Marks Remark



(i) At what time did the reaction finish?

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

(ii) What was the total volume of gas produced by this reaction?

\_\_\_\_\_ cm<sup>3</sup> [1]

(iii) Using your answers from (i) and (ii) and the equation:

$$\text{rate} = \frac{\text{total volume of gas}}{\text{time taken for reaction to finish}}$$

calculate the rate of this reaction giving your answer to one decimal place.

\_\_\_\_\_ cm<sup>3</sup>/s [1]

(c) The student carried out the same investigation but at a higher temperature. He found that the reaction was faster. Explain, in terms of particles, why the reaction was faster.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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

(d) Apart from temperature, state **one** other factor that would increase the rate of a reaction.

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

Examiner Only

Marks Remark

6 Given below is some information about the reactions of different metals.

Metal	Reaction with cold water	Reaction with hot water or steam
A	No reaction	Reacts very slowly
B	Very slow reaction	Reacts readily
C	No reaction	No reaction
D	Violent reaction. It floats on the water surface burning with a coloured flame	Extremely violent reaction. Burns with a coloured flame
E	No reaction	Reacts slowly

- (a) Use the information in the table to put the metals (**A**, **B**, **C**, **D** and **E**) in order of **decreasing** reactivity. The first one has been done for you.

**D**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

[2]

- (b) Suggest the name of metal **D**.

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

- (c) Which metal (**A**, **B**, **C**, **D** or **E**) would be most suitable for making water pipes in a house? Explain your answer.

\_\_\_\_\_

\_\_\_\_\_

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

Examiner Only

Marks Remark

7 Electrolysis can be used to extract aluminium from its ore.

(a) What is meant by the term electrolysis?

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

(b) Oxygen is produced at the positively charged electrode during the electrolysis of aluminium ore.

(i) What name is given to the positively charged electrode?

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

(ii) Complete the half equation below to show the production of oxygen at this electrode.

$2\text{O}^{2-}$  \_\_\_\_\_ [2]

(iii) Explain fully why the positively charged electrode needs to be replaced periodically.

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

Examiner Only

Marks Remark









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