



Rewarding Learning

General Certificate of Secondary Education
2020–2021

Centre Number

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Candidate Number

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Single Award Science: Chemistry

Unit 2
Higher Tier



[GSA22]

GSA22

THURSDAY 12 NOVEMBER 2020, MORNING

TIME

1 hour.

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.

Do not write outside the boxed area on each page or on blank pages.

Complete in black ink only. **Do not write with a gel pen.**

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.

Quality of written communication will be assessed in Question 2.

A Data Leaflet, which includes a Periodic Table of the Elements, is included for your use.

13016



20GSA2201

1 (a) The table below gives some properties of the first five Group 1 elements.

Group 1 element	Melting point/°C	Boiling point/°C	Density/g/cm ³
lithium	180	1347	0.5
sodium	98	883	0.9
potassium	64	774	0.8
rubidium	39	688	1.5
caesium	28		1.8

(i) Give **one** trend shown in the melting points of Group 1 elements.

_____ [1]

(ii) Predict the boiling point of caesium.

_____ °C [1]

(iii) Mary looked at the information in the table and concluded that:

“As you go down Group 1 the density of the elements increases.”

Give **one** piece of evidence from the table that shows this conclusion is incorrect.

_____ [1]



(b) (i) Give **two** observations you would expect when potassium reacts with water.

1. _____

2. _____

_____ [2]

(ii) Using your knowledge of Group 1 metals suggest **one** difference in the reactions of potassium with water and rubidium with water.

_____ [1]

(iii) Write a word equation for the reaction of potassium with water.

potassium + water



+

[2]





[6]

[Turn over

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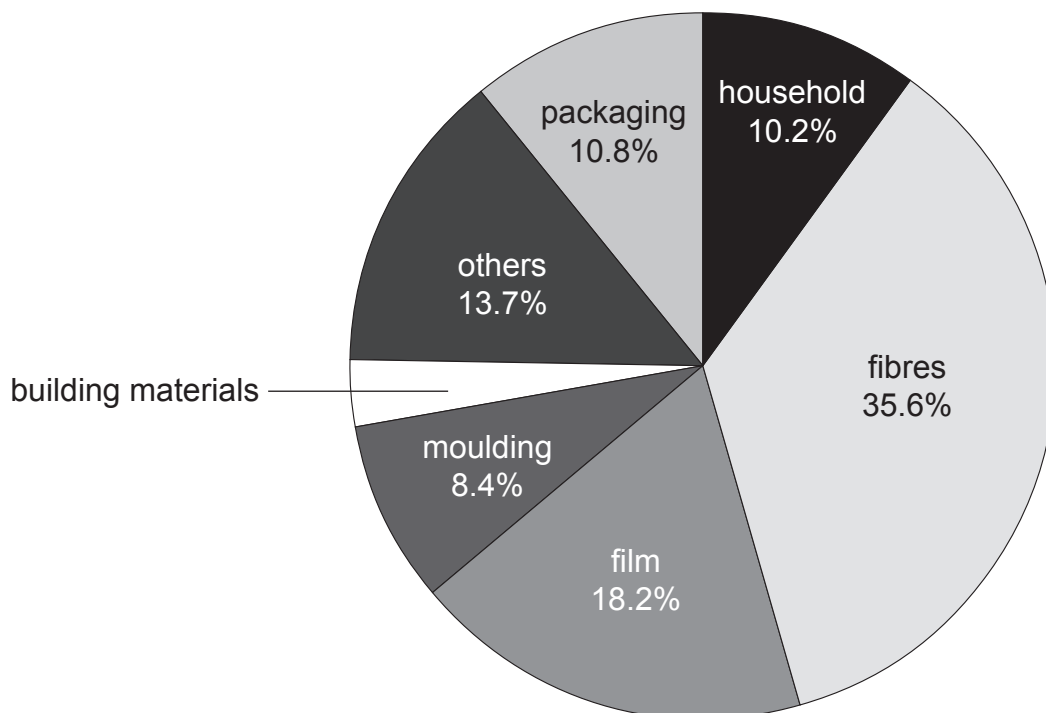


20GSA2205

- 3 (a) The formula of propene is C_3H_6 .
Name the two elements present in propene.

_____ and _____ [1]

- (b) Polypropene is a plastic made from propene. Polypropene is brittle at temperatures below $5^\circ C$, but it gets more flexible as it warms up, melting at temperatures of $127^\circ C$ or higher.
The pie chart below shows uses of polypropene.



Use this information to answer the following questions:

- (i) Calculate the percentage of polypropene used in building materials.
(Show your working out.)

_____ % [2]



(ii) Explain why packaging made from polypropene should **not** be used in very cold conditions.

[1]

(iii) Suggest **one** reason why polypropene is not suitable to make a container to hold boiling water.

[1]

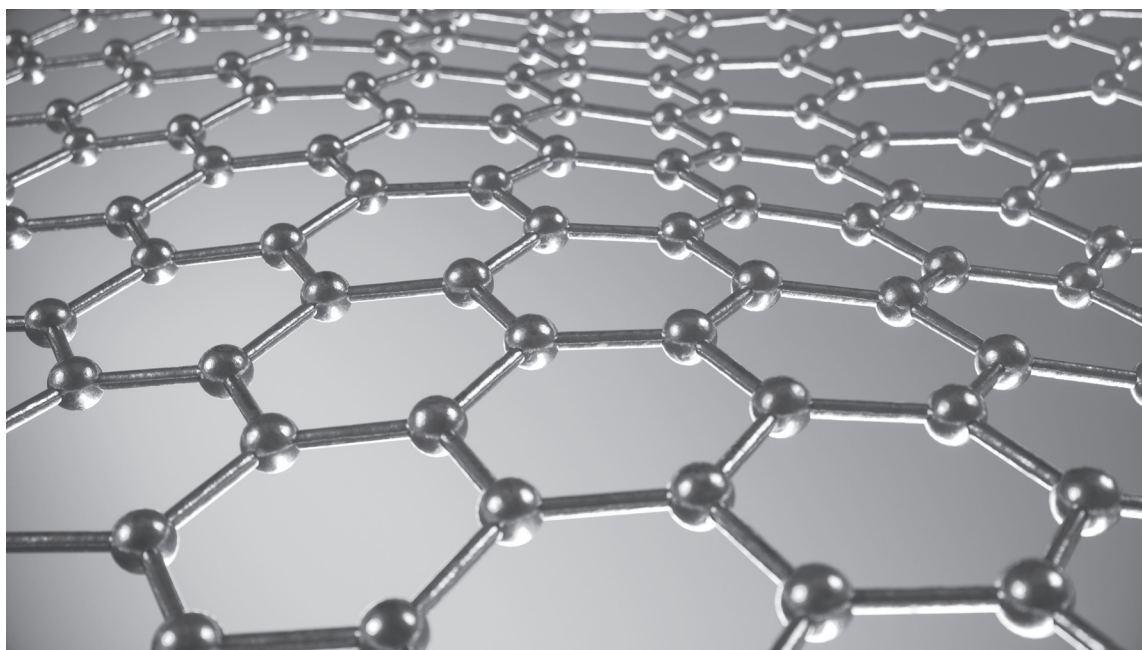
(c) Polypropene is non-biodegradable. What is meant by the term **non-biodegradable**?

[2]

[Turn over



- 4 Graphene is a carbon-based material, discovered by scientists in 2004. It is a one-atom thick layer of carbon as shown below.



© Getty Images

- (a) Give **two** properties of graphene that make it suitable for use in solar cells.

1. _____

2. _____ [2]



(b) Nanotechnology involves the design and use of nanomaterials to replace traditional products. For example, some modern sun creams contain nanoparticles of zinc oxide.

(i) What size is a nanoparticle?

_____ m [1]

(ii) Give **one** benefit of using nanoparticles of zinc oxide in sun cream.

_____ [1]

(iii) Explain why some people are concerned about the use of nanoparticles in sun cream.

_____ [1]

[Turn over



5 (a) Aluminium is an element which has 13 electrons.

(i) In the space below draw a diagram to show the electronic configuration of aluminium.

[1]

(ii) Using your understanding of atomic structure, explain why an atom of aluminium has no electrical charge (is neutral).

_____ [1]

(iii) Aluminium's mass number is 27. What is meant by the term **mass number**?

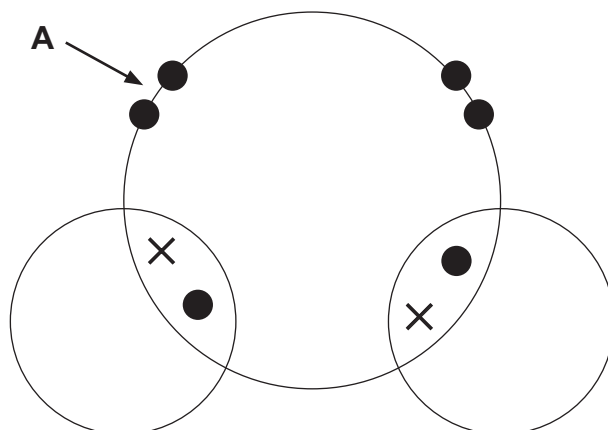
_____ [1]

(iv) Explain why aluminium is found in Group 3 of the Periodic Table.

_____ [1]



(b) The covalent bonding in a molecule of water (H_2O) is shown below.



(i) What name is given to the pair of electrons labelled **A** in the diagram above?

_____ [1]

(ii) How many covalent bonds are shown in the diagram above?

_____ [1]

(iii) What is meant by the term **covalent bond**?

_____ [1]

(iv) Name **one** molecule, apart from water, that has covalent bonding.

_____ [1]

[Turn over



6 Most modern houses have doors made from polyvinyl chloride (PVC).



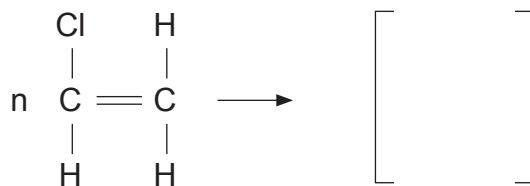
Source: Principal Examiner

(a) Polyvinyl chloride (PVC) is made by the polymerisation of chloroethene. What is meant by the term **polymerisation**?

[2]



(b) (i) Complete the balanced symbol equation for the polymerisation of chloroethene.



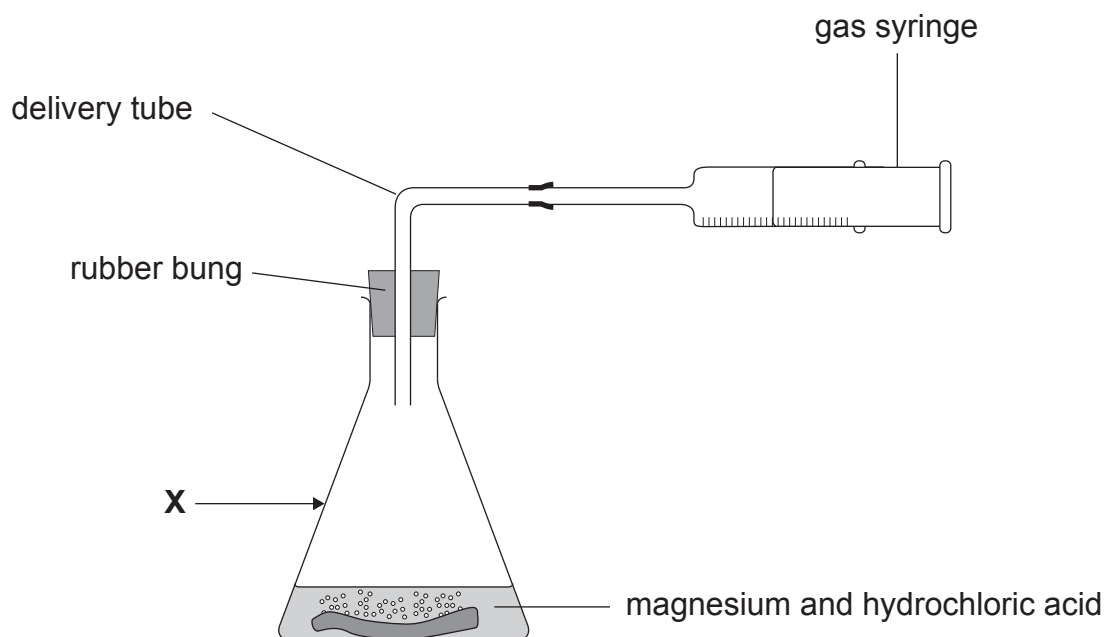
[2]

(ii) Explain why chloroethene is **not** a hydrocarbon.

[1]



- 7 (a) The rate of the reaction between magnesium and dilute hydrochloric acid was investigated using the apparatus shown below.



Source: Principal Examiner

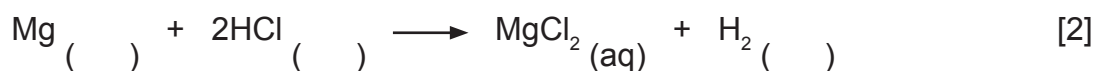
- (i) What name is given to the piece of apparatus labelled X in the diagram above?

_____ [1]

- (ii) The gas collected during this investigation is hydrogen. Describe the test for hydrogen.

_____ [1]

- (iii) Complete the symbol equation below for the reaction of magnesium with hydrochloric acid by adding the state symbols.



8 Methane is an alkane and is used as a fuel in gas cookers.



Source: Principal Examiner

(a) Complete the balanced symbol equation below to show the combustion of methane (CH_4).



[3]



(b) Complete the table below about some alkanes.

Alkane	Molecular formula	Structure
methane	CH_4	$\begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{H} \\ \\ \text{H} \end{array}$
ethane		$\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array}$
	C_4H_{10}	

[3]

THIS IS THE END OF THE QUESTION PAPER



DO NOT WRITE ON THIS PAGE

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

Total Marks	
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Examiner Number

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