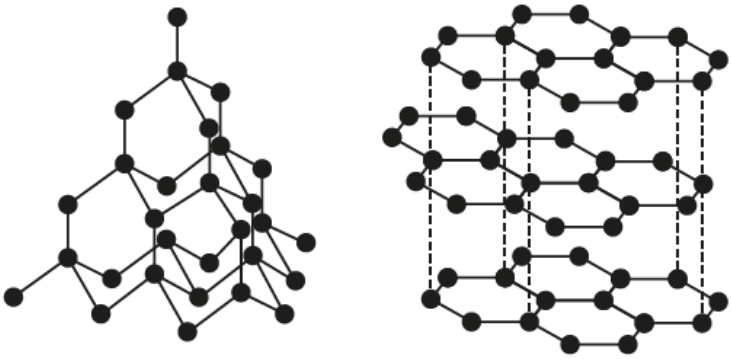
Properties of Materials – 2021/20 GCSE Gateway Chemistry Combined Science A

1. Nov/2021/Paper_J250/03/No.3

The diagrams show two different macromolecules.



Which element are these macromolecules made from?

A Carbon

B Hydrogen

C Oxygen

D Silicon

Your answer ☐ **[1]**

2. Nov/2021/Paper_J250/03/No.14

A heating curve shows how the temperature of a substance changes as it is heated.

Fig. 14.1 shows the heating curve for ice.

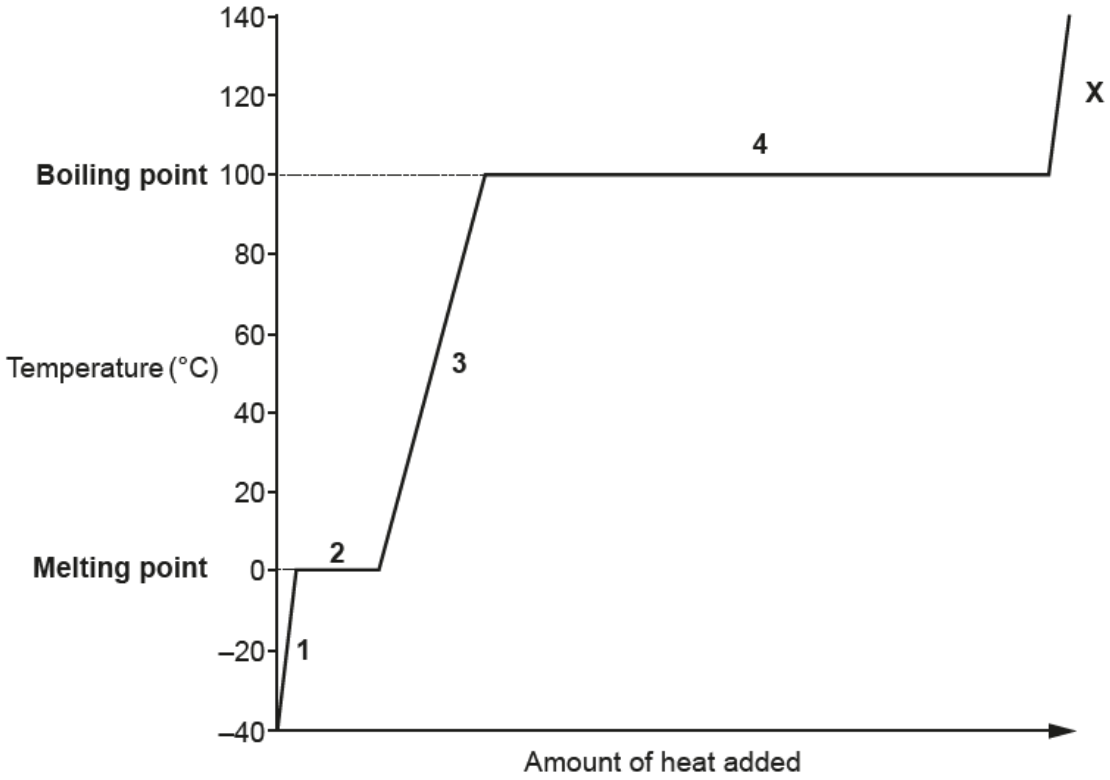


Fig. 14.1

(a) Look at the sentences, **A–D**. They describe sections **1**, **2**, **3** and **4** of the heating curve in **Fig. 14.1**.

A Heat energy is used to break the forces between the particles.

B Heat energy is used to loosen the forces between the particles.

C Heat energy is used to make the particles move past each other more.

D Heat energy is used to make the particles vibrate faster.

Match the sentences **A**, **B**, **C** or **D** to the parts of the heating curve labelled **1**, **2**, **3** and **4** by putting the correct letter in each box.

Part of the heating curve	**1**	**2**	**3**	**4**
Sentence	.....	.....	.....	.....

[3]

(b) A student wants to produce the heating curve for ice.

Fig. 14.2 shows the equipment the student uses.

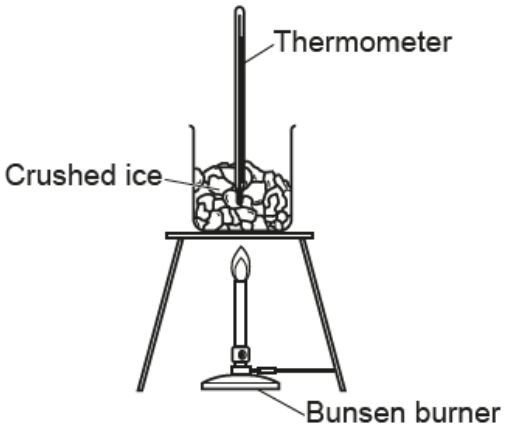


Fig. 14.2

The student slowly heats up the ice and measures the temperature every minute.

The student found they could not produce part **X** of the heating curve in **Fig. 14.1**.

Explain why.

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..... **[1]**

(c) The table shows the melting points of four different substances, **A**–**D**.

Substance	Melting point (°C)
A	–14
B	74–79
C	89
D	121–123

(i) State the letter, **A**, **B**, **C** or **D**, of **one** pure substance in the table.

..... **[1]**

(ii) State a reason for your answer to **(c)(i)** using information from the table.

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..... **[1]**

3. Nov/2020/Paper_J250/03/No.2

Look at the information about four different substances, **A**, **B**, **C** and **D**.

Substance	Melting point (°C)	Conducts electricity?
A	–30	no
B	3550	no
C	1660	yes
D	124	no

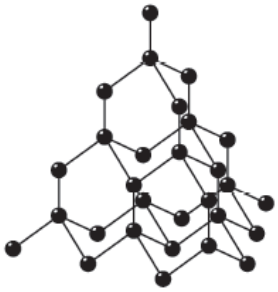
Which substance is **diamond**?

Your answer ☐ **[1]**

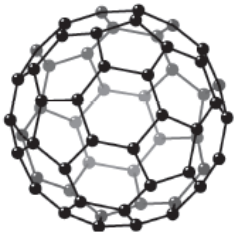
4. Nov/2020/Paper_J250/03/No.6

The diagrams show different structures of carbon.

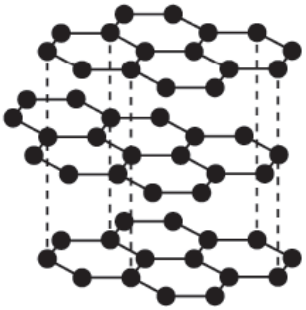
A



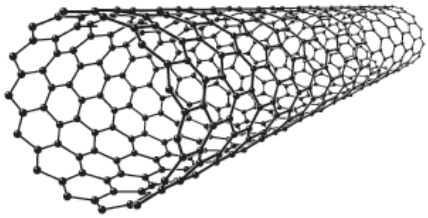
B



C



D

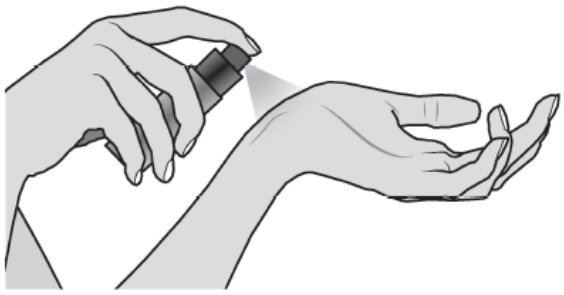


Which structure is Buckminsterfullerene?

Your answer ☐ **[1]**

5. Nov/2020/Paper_J250/03/No.16

People use perfumes to make them smell nice.



Look at the table. It shows the percentages of the different ingredients in a perfume.

Ingredient	Percentage (%)
fragrance	5.2
alcohol	74.8
colour	0.5
UV filter	0.5
water	added to make up to 100%

(a) What is the name given to a mixture, such as perfume, where the ingredients are combined in exact amounts?

..... **[1]**

(b) A bottle contains 25 g of the perfume.

Calculate the mass of water in 25 g of the perfume.

Mass of water in 25 g of perfume = ... **[2]**

(c) When the perfume is sprayed onto the skin, the alcohol evaporates very quickly.

(i) Suggest why the alcohol evaporates very quickly.

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..... **[1]**

(ii) As the alcohol evaporates, the skin starts to feel cold.

Explain why.

Use ideas about energy in your answer.

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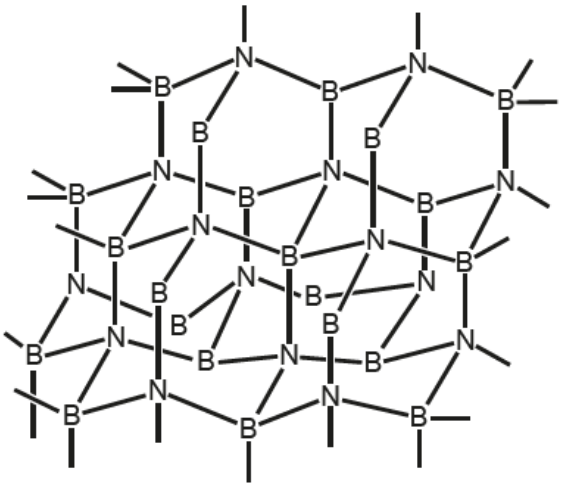
..... **[2]**

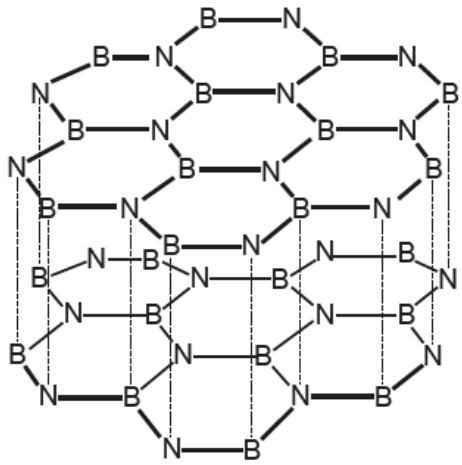
6. Nov/2021/Paper_J250/09/No.14

Boron nitride is a compound made from boron and nitrogen.

Boron nitride can exist in two different forms similar to graphite and diamond. The diagrams show the structures of two different forms of boron nitride.



Structure 1



Structure 2

Structure 1 can be used as an alternative to diamond in drill tips.

Structure 2 can be used as a lubricant when the electrical conductivity of graphite is a problem.

Both structures can be used at high temperatures.

Describe and explain the **similarities** and **differences** in the properties of the two structures of boron nitride which allow them to be used as alternatives to diamond and graphite.

Use knowledge of the structure and bonding of diamond and graphite in your answer.

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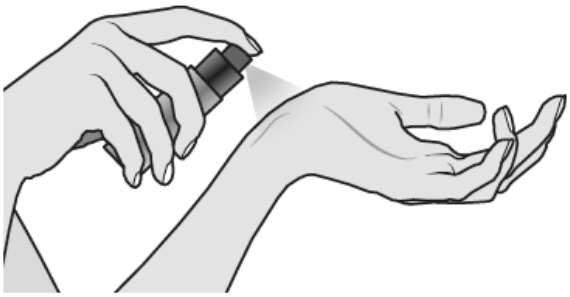
..... **[6]**

7. Nov/2020/Paper_J250/09/No.11

People use perfumes to make them smell nice.



Look at the table. It shows the percentages of the different ingredients in a perfume.

Ingredient	Percentage (%)
fragrance	5.2
alcohol	74.8
colour	0.5
UV filter	0.5
water	added to make up to 100%

(a) What is the name given to a mixture, such as perfume, where the ingredients are combined in exact amounts?

..... **[1]**

(b) A bottle contains 25 g of the perfume.

Calculate the mass of water in 25 g of the perfume.

Mass of water in 25 g of perfume = ... **[2]**

(c) When the perfume is sprayed onto the skin, the alcohol evaporates very quickly.

(i) Suggest why the alcohol evaporates very quickly.

.....

..... **[1]**

(ii) As the alcohol evaporates, the skin starts to feel cold.

Explain why.

Use ideas about energy in your answer.

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..... **[2]**

8. Nov/2020/Paper_J250/09/No.15

Diamond and chlorine are both covalently bonded.

The table shows the melting points of two substances, **X** and **Y**.

Substance	Melting point (°C)
X	3550
Y	–102

A student thinks that substance **X** is diamond and substance **Y** is chlorine.

Is the student correct?

Explain your answer using ideas about the structure and bonding in both diamond and chlorine.

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..... **[6]**

9. Nov/2020/Paper_J250/10/No.2

What is an example of a **biological** catalyst?

A A lipid

B An amino acid

C An enzyme

D A substrate

Your answer ☐ **[1]**

10. Nov/2020/Paper_J250/10/No.3

The table shows the melting and boiling points of bromine.

Melting point (°C)	Boiling point (°C)
−7	59

Which change of state happens when bromine is cooled from 65 °C to −5 °C?

A Condensation

B Evaporation

C Freezing

D Melting

Your answer ☐ **[1]**