2.2 Bonding & Substance Properties

Question Paper

Course	AQA GCSE Chemistry
Section	2. Bonds, Structure & Properties of Matter
Topic	2.2 Bonding & Substance Properties
Difficulty	Hard

Time Allowed 60

Score /49

Percentage /100

Question 1a

This question is about the bonding in different substances.

Table 1 shows some information about substances **A – E.**

Table 1

Substance	Melting point in °C	Boiling point in °C	Does it conduct electricity when solid?	Does it conduct electricity when dissolved or molten?
A	-208	-200	No	No
B	-220	-180	No	No
C	802	1415	No	Yes
D	115	450	No	No
E	1080	2563	Yes	Yes

Use **Table 1** to answer the following questions.

Give the state symbol of substance **B** at -202 °C.

[1 mark]

Question 1b

Substance **E** can conduct electricity when solid and molten.

Explain why.

[3 marks]

Question 1c

One of the substances in the table is sodium chloride.

Identify which substance is sodium chloride.

Give a reason for your answer.

[2 marks]

Question 1d

Explain why substance **A** has a relatively low boiling point.

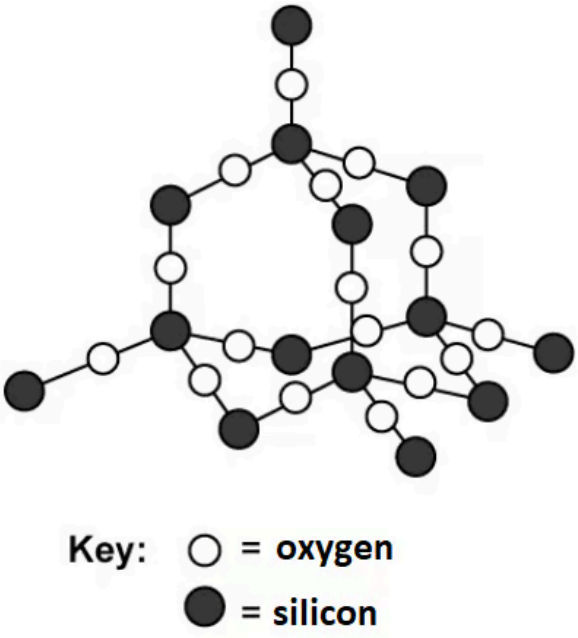
[3 marks]

Question 2a

This question is about the bonding and structure of silicon dioxide.

Figure 1 shows the structure of part of silicon dioxide.

Figure 1



Explain why silicon dioxide can be used to line furnaces.

[4 marks]

Question 2b

Explain why silicon dioxide cannot conduct electricity.

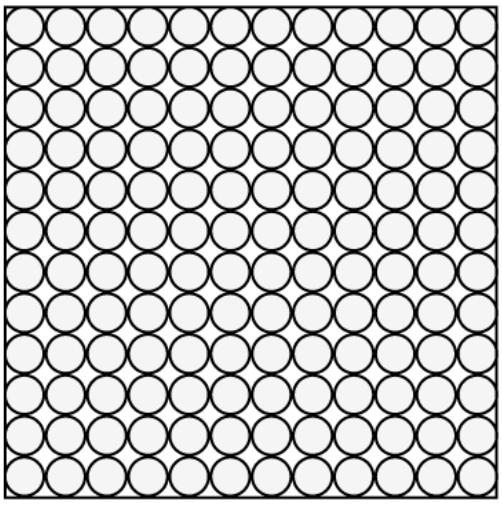
[2 marks]

Question 2c

Silicon dioxide is a solid at room temperature.

Solids can be represented using the particle model in **Figure 2.**

Figure 2



Solid

Describe **two** limitations of this model.

[2 marks]

Question 2d

Explain how, using particle theory, silicon dioxide would change state from a solid to a liquid.

[2 marks]

Question 3a

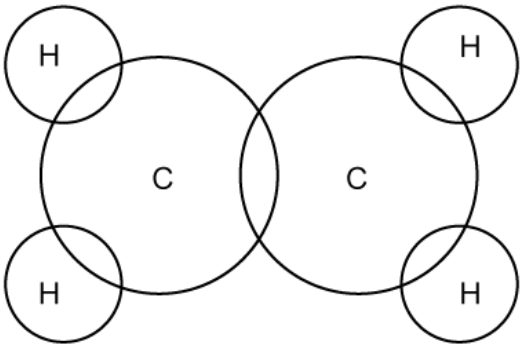
This question is about the structure and bonding in ethene.

Ethene belongs to the homologous series of alkenes and has the formula C_2H_4.

Complete the dot and cross diagram in **Figure 1** to show the bonding of ethene.

Only show the outer shell electrons.

Figure 1

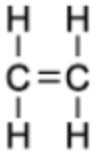
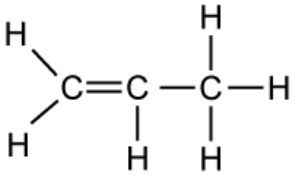
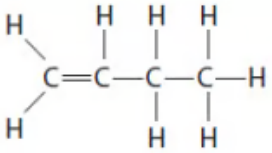


[2 marks]

Question 3b

Table 1 shows information on the boiling points and structures of ethene and two other alkenes.

Table 1

Name	Ethene	Propene	Butene
Structure			
Boiling Point in °C	-104	-47	-6.3

Use your knowledge of structure and bonding to describe and explain the trend in boiling point as the number of carbon atoms increases.

[3 marks]

Question 3c

Ethene can undergo addition polymerisation to form the polymer poly(ethene).

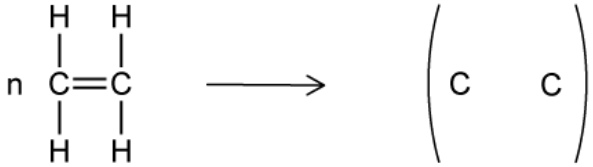
Why is poly(ethene) a solid at room temperature?

[3 marks]

Question 3d

Complete the structure for poly(ethene) in **Figure 2.**

Figure 2



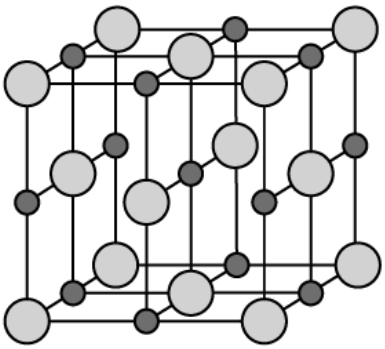
[3 marks]

Question 4a

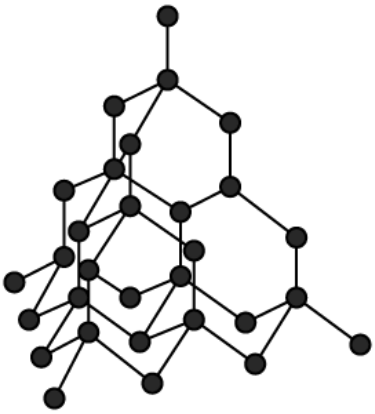
This question is about sodium chloride and diamond.

Figure 1 shows the structure of sodium chloride and diamond.

Figure 1



Sodium chloride



Diamond

Sodium chloride has a melting point of 801°C.

Explain why sodium chloride has a high melting point.

[4 marks]

Question 4b

Diamond has a melting point of 4500 °C.

Explain why diamond has a higher melting point than sodium chloride.

Refer to the structure of diamond in your answer.

[2 marks]

Question 4c

Compare the electrical conductivity of sodium chloride and diamond.

Explain your answer.

[4 marks]

Question 5a

This question is about metals and alloys.

Stainless steel is an alloy of iron, chromium and nickel.

Iron is a typical metal.

Explain why it has a high melting point.

[4 marks]

Question 5b

Explain why stainless steel is harder than the iron it is made from.

[3 marks]

Question 5c

Early hip replacement joints were made from stainless steel.

Apart from being harder, suggest **one** other property of stainless steel that made them useful as hip replacement joints.

[1 mark]

Question 5d

Explain why nickel and chromium are both good thermal conductors.

[1 mark]