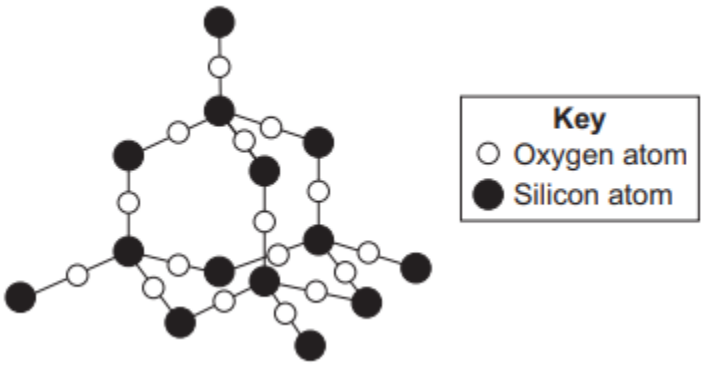
CARBON ALLOTROPES & GIANT COVALENT STRUCTURES 1

Q1. Silicon dioxide is used as a lining for furnaces.

Furnaces can be used to melt iron for recycling.

The diagram shows a small part of the structure of silicon dioxide.



Explain why silicon dioxide is a suitable material for lining furnaces.

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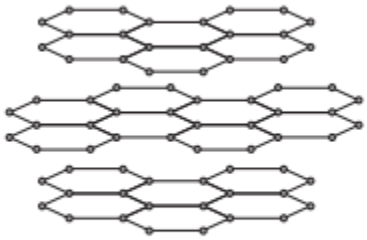
(4 marks)

Q2. Graphite and diamond are different forms of the element carbon.

Graphite and diamond have different properties. The structures of graphite and diamond are shown below.



Graphite

Diamond

(a) Graphite is softer than diamond. Explain why.

_____

_____

_____

_____

_____

_____

_____

(4 marks)

(b) Graphite conducts electricity, but diamond does not. Explain why.

_____

_____

_____

_____

_____

_____

(3 marks)

Q3. Oil rigs are used to drill for crude oil.

The drill heads contain diamonds.

Describe, as fully as you can, the structure and bonding in diamond.

_____

_____

_____

_____

_____

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_____

(4 marks)

Q4. When the glue sets it forms a giant covalent structure.

Explain why substances with giant covalent structures have high melting points.

_____

_____

_____

_____

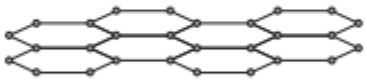
(2 marks)

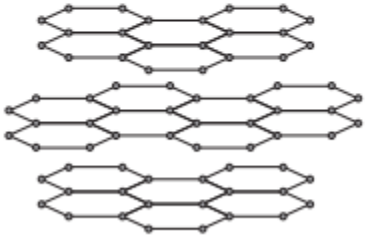
Q5. Read the information.

Graphene

Scientists have made a new substance called graphene.
The bonding and structure of graphene are similar to graphite.

Graphene is made of a single layer of the same atoms as graphite.





Graphene **Graphite**

Use the information above and your knowledge of graphite to answer the questions.

(a) This part of the question is about graphene.

Choose the correct answer to complete each sentence.

(i)

ionic	covalent	metallic

The bonds between the atoms in graphene are _____.

(1 mark)

(ii)

chromium	carbon	chlorine

Graphene is made of _____ atoms.

(1 mark)

(iii)

2	3	4

In graphene each atom bonds to ..... other atoms.

(1 mark)

(b) This part of the question is about graphite.

Graphite is used in pencils.

Explain why. Use the diagrams to help you.

_____

_____

_____

_____

(2 marks)

Q6. This label was on a container of graphite lubricant.

Super G

Graphite Lubricant

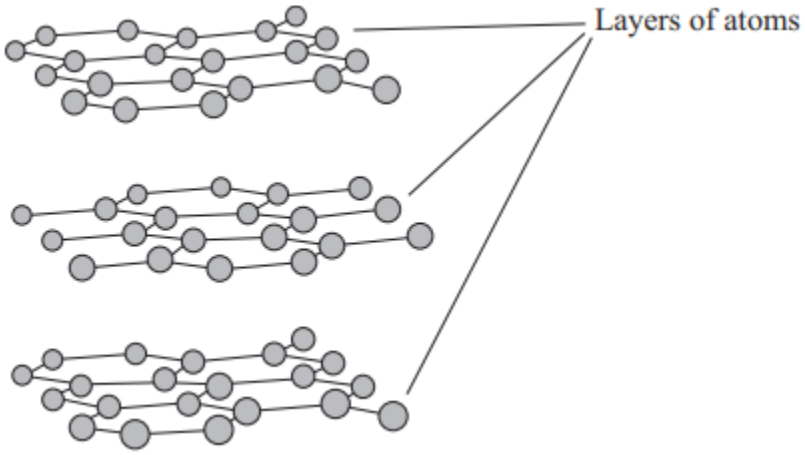
Super G forms a thin anti-friction film on metal surfaces. It provides good lubrication when metal parts rub against each other.

(a) Give one reason why a lubricant is used when metal parts rub against each other.

_____

(1 mark)

(b) The diagram shows the arrangement of atoms in graphite.



(i) Draw a ring around the type of atoms in graphite.

aluminium **carbon** **silicon**

(1 mark)

(ii) Graphite is a good lubricant because it is slippery. Use the diagram to explain why graphite is slippery.

_____

_____

_____

_____

(2 marks)

Q7. Welding blankets are placed under metals being welded. They protect the area under the welding from hot sparks or molten metal.

Some welding blankets are made from silicon dioxide.

The table lists some properties of materials.

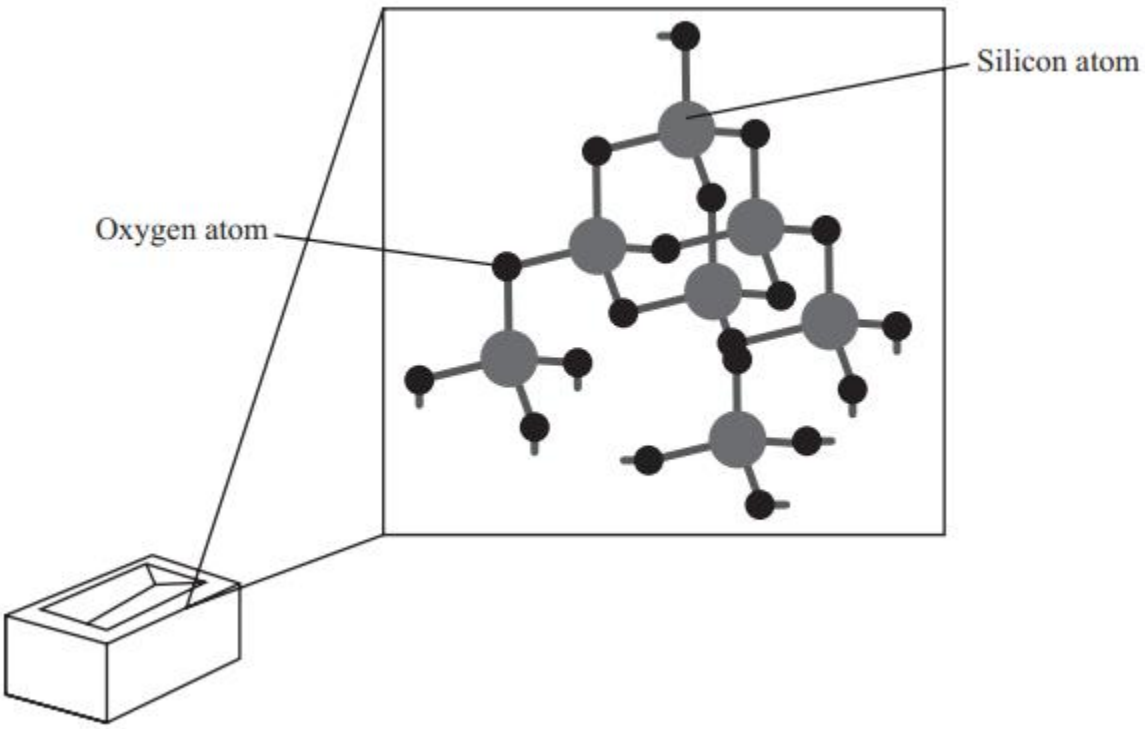
Two of these are properties of materials used to make welding blankets.

Tick (✓) the two correct properties.

Property	Tick (✓)
High melting point	
Reacts with sparks	
Not flammable	
Low boiling point	

(2 marks)

Q8. Bricks made from silica (silicon dioxide) are used to line furnaces that operate at high temperatures. Part of the structure of silica is shown in the diagram.



Use words from the box to complete the sentences.

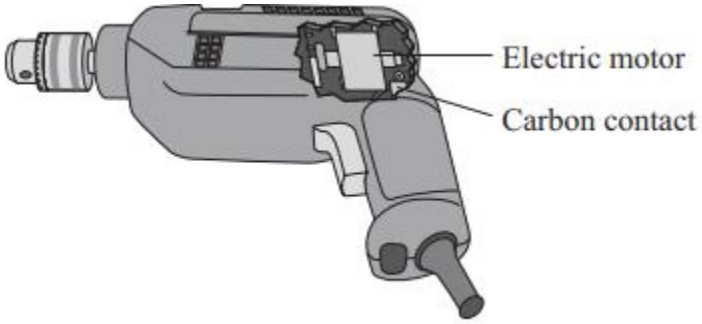
covalent	**giant**	**low**	**small**
four	**high**	**six**	**weak**

One reason for using silica to make bricks for high-temperature furnaces is that silica has a ..... melting point.

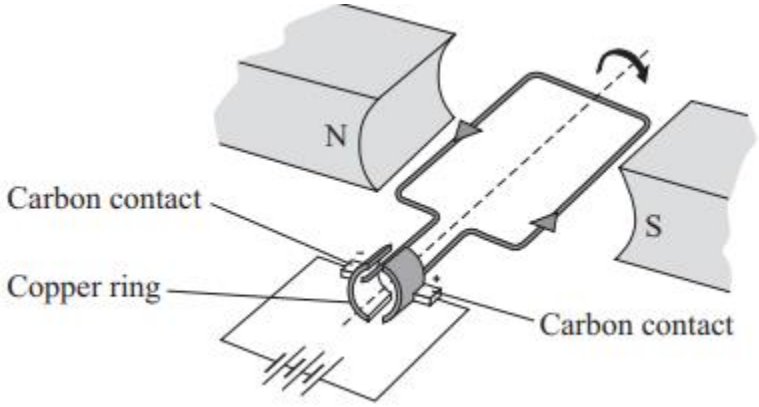
Silica has this property because it is a ..... structure in which each silicon atom is joined to ..... oxygen atoms by ..... bonds.

(4 marks)

Q9. This drill contains an electric motor.



The diagram below shows the main parts of an electric motor.



The carbon contacts are made of graphite. Springs push the contacts against the copper ring. The carbon contacts conduct electricity to the copper ring. The copper ring rotates rapidly but does not stick or become worn because the graphite is soft and slippery.

Using this information give two properties that make graphite suitable for making the carbon contacts.

_____

_____

_____

_____

_____

(2 marks)

Total marks (34)