

2.3 Structure & Bonding of Carbon

Question Paper

Course	AQA GCSE Chemistry
Section	2. Bonds, Structure & Properties of Matter
Topic	2.3 Structure & Bonding of Carbon
Difficulty	Medium

Time Allowed	50
Score	/40
Percentage	/100

Question 1a

Figure 1 shows the structure of the diamond.

Figure 1



Diamond melts at temperatures above 4,800 °C.

Explain why its melting point is so high.

[2 marks]

Question 1b

Diamond is an extremely hard substance.

Explain why, in terms of its bonding and structure.

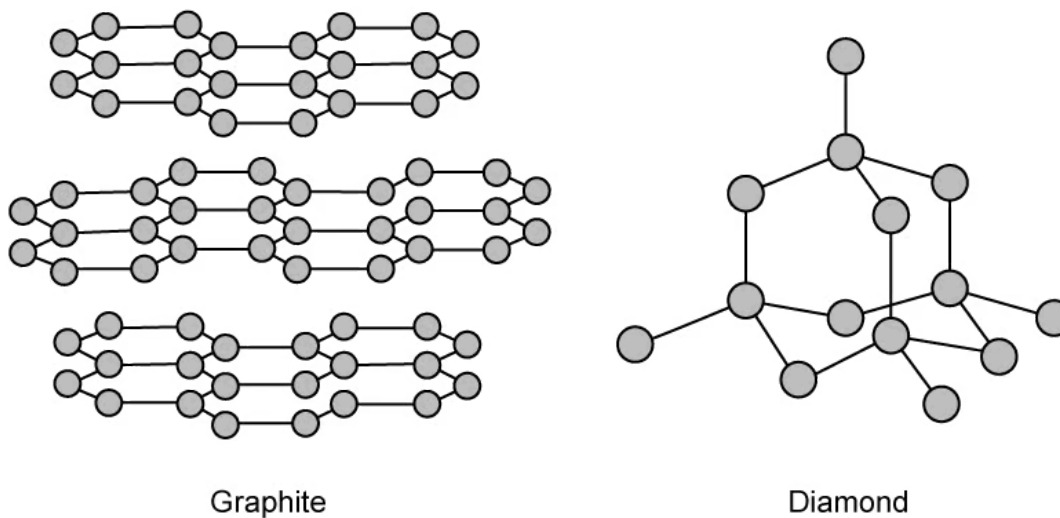
[3 marks]

Question 2a

Graphite and diamond are different physical forms of the element carbon and have different properties.

Their structures are shown in **Figure 1** below.

Figure 1



State the term used to describe elements which can have different physical forms while being in the same state.

[1 mark]

Question 2b

Graphite is a much softer material than diamond.

Explain why.

[4 marks]

Question 2c

Graphite is an electrical conductor but diamond is not.

Explain why.

[4 marks]

Question 3a

Using your knowledge of the structure and bonding in graphite, justify its use in the “lead” filling in pencils.

[3 marks]

Question 3b

Using your knowledge of the structure and bonding in graphite, justify its use as electrodes in electrolysis.

[3 marks]

Question 4a

Graphene is a substance made from carbon which consists of a single layer of graphite just one atom thick.

Scientists have recently developed a method to produce large sheets of a substance called graphene.

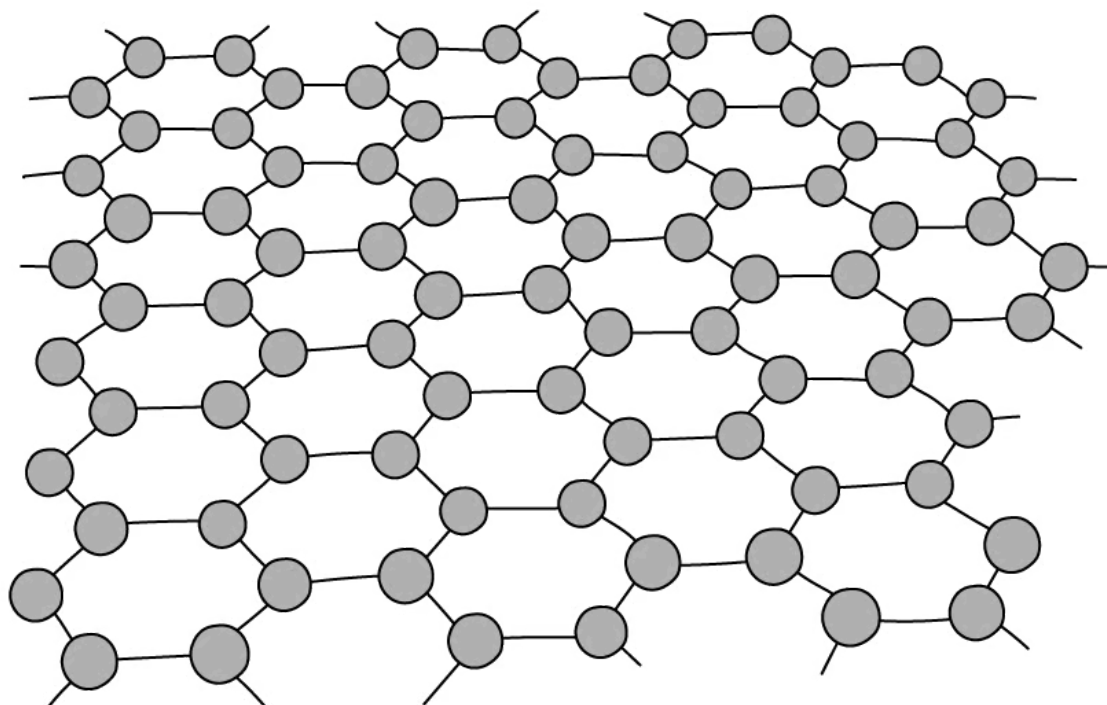
State **two** properties of graphene.

[2 marks]

Question 4b

Figure 1 below shows the structure of graphene.

Figure 1



Use your knowledge of the bonding in graphene and **Figure 1** to help you explain why graphene is such a strong material.

[3 marks]

Question 4c

Use your knowledge of the bonding in graphene and **Figure 1** to help you explain how graphene is able to conduct electricity.

[2 marks]

Question 5a

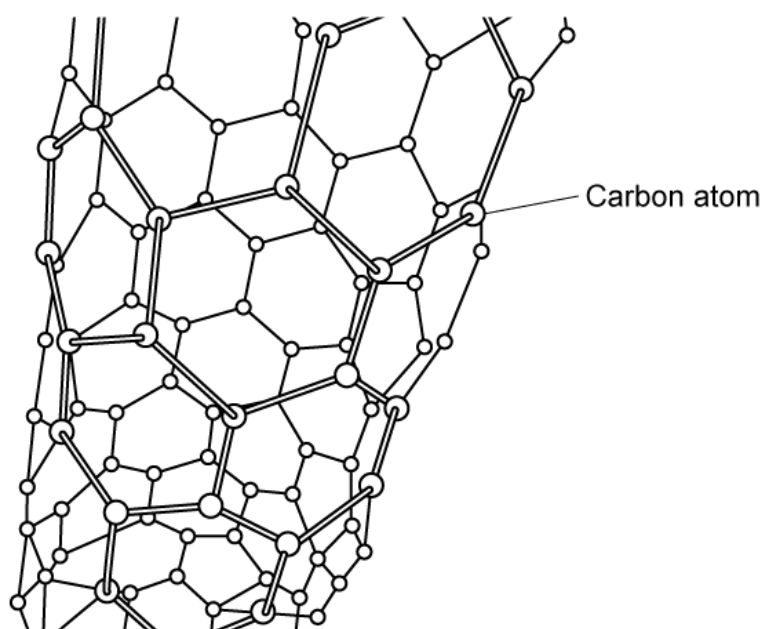
A typical passenger jet contains many kilometres of electrical wiring made from copper.

This increases the mass of the aeroplane and consequently the fuel consumption.

Research is being carried out into replacing the copper wiring with much lighter carbon nanotubes.

Figure 1 shows the structure of a carbon nanotube.

Figure 1



Suggest a method of fabricating carbon nanotubes.

[2 marks]

Question 5b

Carbon is a non-metal.

Explain how the nanotube is able to conduct electricity.

[2 marks]

Question 5c

Suggest a reason why carbon nanotubes are used as lubricants.

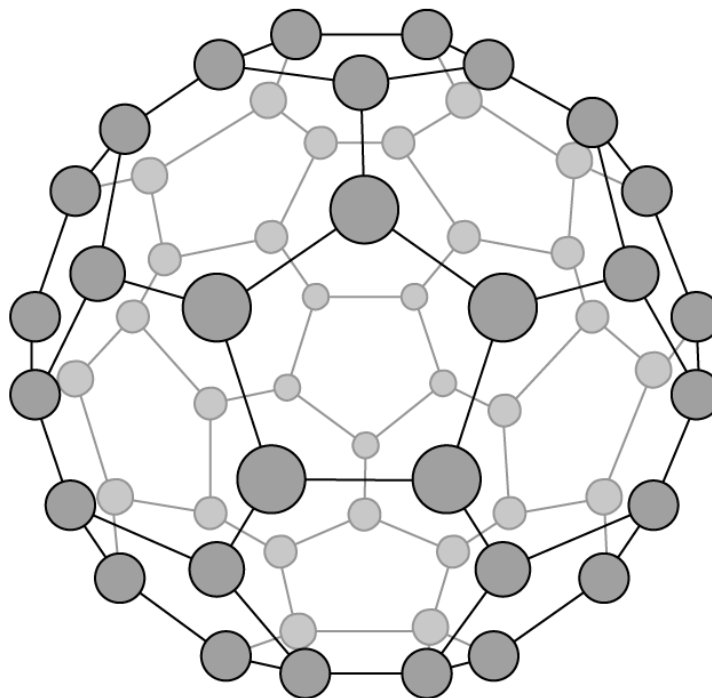
[2 marks]

Question 6a

Buckminsterfullerene (also known as buckyballs) was the first fullerene to be discovered.

The structure of buckminsterfullerene is shown in **Figure 1** below.

Figure 1



State **three** uses of fullerenes (other than lubricants).

[3 marks]

Question 6b

Using **Figure 1** above to help you, describe the bonding and structure in Buckminsterfullerene.

[2 marks]

Question 6c

Buckminsterfullerene is a slippery substance with a low melting point. Explain these observations.

[2 marks]