AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.2.3.1

# Diamond

## Past-paper questions

| | |
|---|---|
| Tier | **Higher** |
| Question groups | **6** |
| Available paper years | **2010–2022** |

## Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

**Name:** _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

### 4.2.3.1 Diamond

**Question 01**

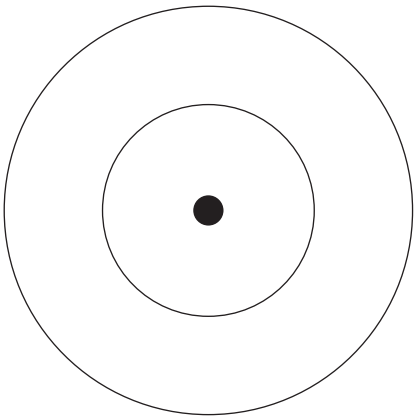
June 2010 | CHY2H | Original Q3 | Legacy

**3** Pure carbon can exist in two forms, diamond and graphite.

**3 (a)** Complete the diagram to show the electronic structure of a carbon atom.

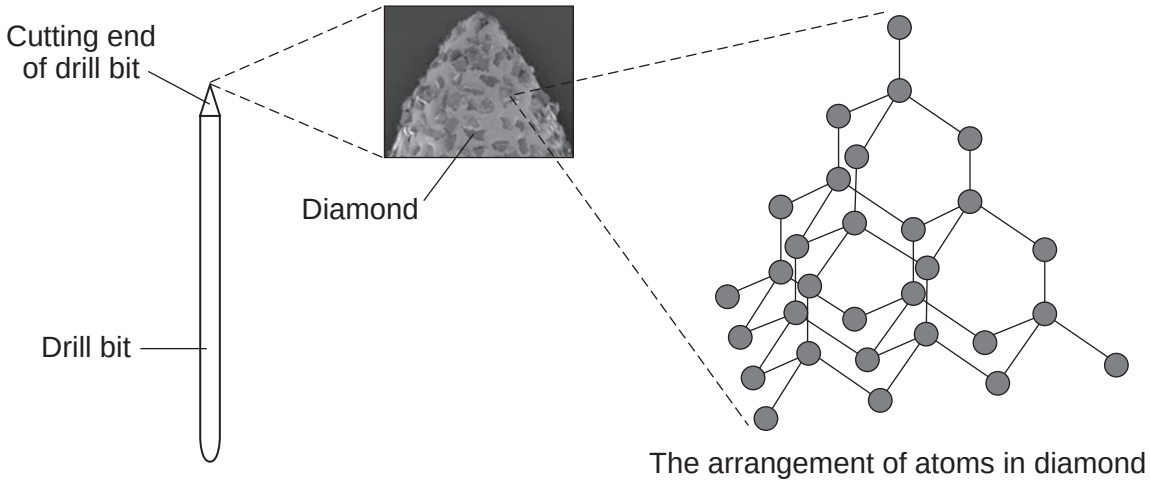
A carbon atom has 6 electrons.

Show the electrons as crosses (x).



*(1 mark)*

**3 (b)** A drill bit is used to cut holes through materials. The cutting end of this drill bit is covered with very small diamonds.



4.2.3.1 Diamond

Question 01 · continued



**3 (b) (i)** What property of diamond makes it suitable for use on the cutting end of a drill bit?

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*(1 mark)*

**3 (b) (ii)** Explain, as fully as you can, why diamond has this property. Use your knowledge of the structure and bonding of diamond and the information shown opposite to help you to answer this question.

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*(3 marks)*

**3 (c)** Explain why graphite is a good conductor of electricity and why diamond does **not** conduct electricity.

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*(3 marks)*

8

### 4.2.3.1 Diamond

**Question 02**

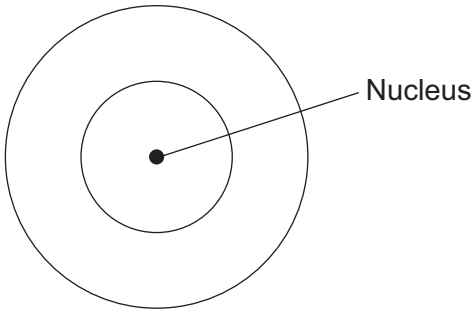
January 2012 | CH1HP | Original Q1 | Legacy

**1** The picture shows a diamond ring.




**1 (a)** Diamond is a form of carbon. A carbon atom has six electrons.

Draw the electronic structure of a carbon atom.




*(1 mark)*

**1 (b)** A gold atom has an atomic number of 79 and a mass number of 197.

Complete the table to show the name and number of each sub-atomic particle in this gold atom.

| Name | Number |
|---|---|
| Proton | 79 |
| Electron | ..... |
| ..... | ..... |

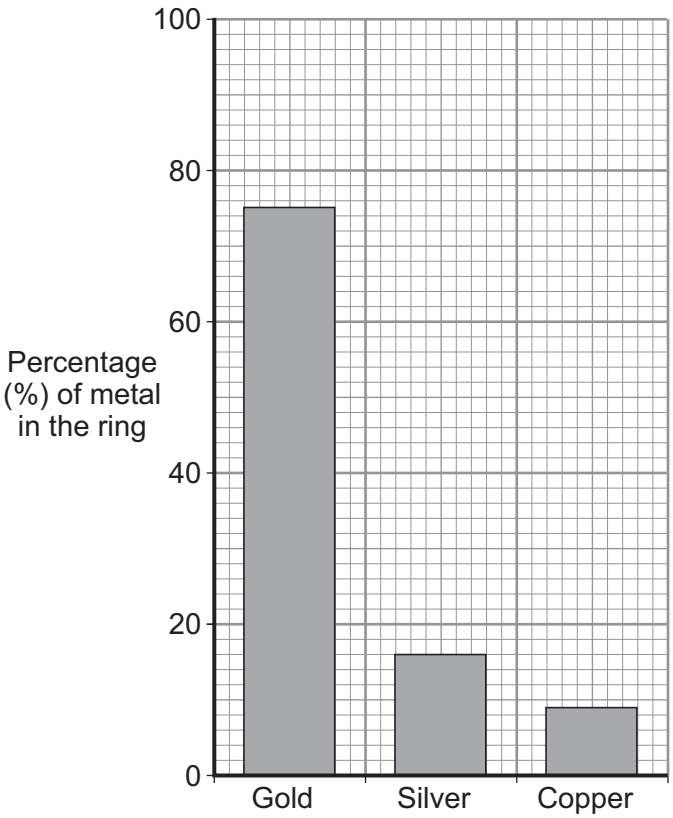
*(3 marks)*

4.2.3.1 Diamond

Question 02 · continued



**1 (c)** The bar chart shows the composition of this gold ring.




**1 (c) (i)** Give the percentage of the other two metals in this gold ring.

Silver is ..... % and copper is ..... %

*(1 mark)*

**1 (c) (ii)** This gold ring is not made from 100 % gold.

Give **two** reasons why.

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2 .....

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*(2 marks)*

7

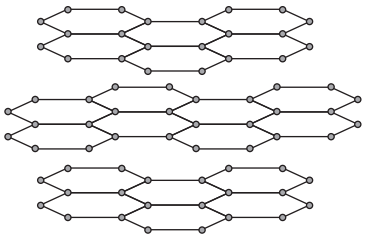
### 4.2.3.1 Diamond

**Question 03**

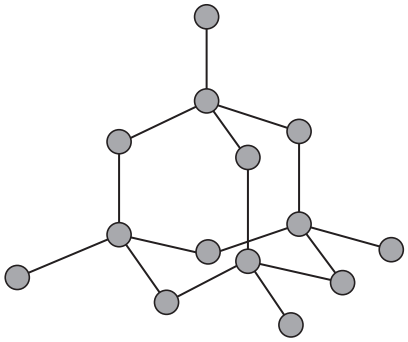
June 2012 | CH2HP | Original Q7 | Legacy

**7** 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**

**7 (a)** Graphite is softer than diamond.

Explain why.

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*(4 marks)*

### 4.2.3.1 Diamond

**Question 03 · continued**



**7 (b)** Graphite conducts electricity, but diamond does not.

Explain why.

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*(3 marks)*

7

### 4.2.3.1 Diamond

**Question 04**

June 2013 | CH2HP | Original Q5 | Legacy

**5** Oil rigs are used to drill for crude oil.



**5 (a)** Drill heads are made from steel. Steel is an alloy.

Explain why alloys are harder than pure metals.

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*(3 marks)*

### 4.2.3.1 Diamond

**Question 04 · continued**



**5 (b)** Drill heads also contain diamonds.

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

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*(4 marks)*

**5 (c)** Polymers are produced from crude oil.

Describe the structure and bonding in a thermosoftening polymer and explain why thermosoftening polymers melt when heated.

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*(4 marks)*

11

### 4.2.3.1 Diamond

**Question 05**

June 2016 | CH2HP | Original Q6 | Legacy

**6** This question is about the properties and uses of materials.

Use your knowledge of structure and bonding to answer the questions.

**6 (a)** Explain how copper conducts electricity.

**[2 marks]**

**6 (b)** Explain why diamond is hard.

**[2 marks]**

**6 (c)** Explain why thermosetting polymers are better than thermosoftening polymers for saucepan handles.

**[2 marks]**

6

### 4.2.3.1 Diamond

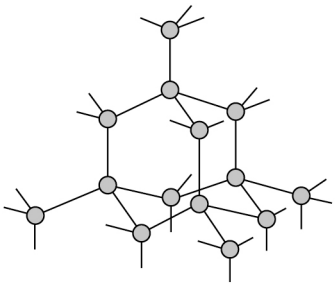
**Question 06**

June 2022 | 8462/1H | Original Q3

**0 3** This question is about different forms of carbon.

**Figure 5** represents the structure of diamond.

**Figure 5**



**Key**

○ Carbon atom

**0 3 . 1** Describe the structure and bonding of diamond.

**[3 marks]**

**0 3 . 2** Explain why diamond has a very high melting point.

**[3 marks]**

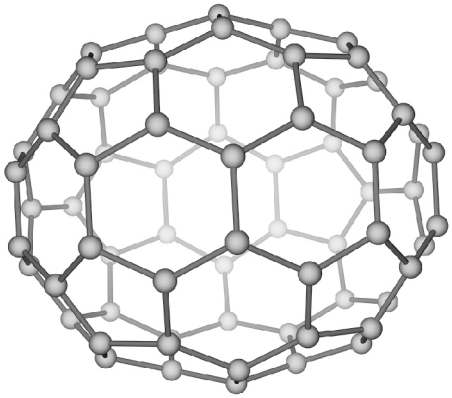
4.2.3.1 Diamond

Question 06 · continued



**Figure 6** represents the molecule $C_{70}$

**Figure 6**



**0 3 . 3** What is the name of this type of molecule?

**[1 mark]**

Tick (✓) **one** box.

Fullerene ☐

Graphene ☐

Nanotube ☐

Polymer ☐

**0 3 . 4** Molecules such as $C_{70}$ can be used in medicine to move drugs around the body.

Suggest **one** reason why the $C_{70}$ molecule is suitable for this use.

**[1 mark]**

4.2.3.1 Diamond

Question 06 · continued



**0 3 . 5** Calculate the number of $C_{70}$ molecules that can be made from one mole of carbon atoms.

The Avogadro constant = $6.02 \times 10^{23}$ per mole

**[3 marks]**

Number of molecules = _____

11