AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 5.2.3.3

Graphene and fullerenes

Past-paper questions

Tier	**Higher**
Question groups	**2**
Available paper years	**2021–2024**

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.

5.2.3.3 Graphene and fullerenes

Question 01

November 2021 | 8464/C/1H | Original Q4

0 4 Carbon can exist in a number of different structures.

0 4 . 1 The first fullerene to be discovered was Buckminsterfullerene.

What is the formula of Buckminsterfullerene?

[1 mark]

Tick (✓) **one** box.

- C_{40} ☐
- C_{50} ☐
- C_{60} ☐
- C_{70} ☐

0 4 . 2 Graphite is a form of carbon.

Explain why graphite conducts electricity.

[2 marks]

5.2.3.3 Graphene and fullerenes

Question 01 · continued

Steel is an alloy of iron and carbon.

0 4 . 3 Explain why steel is harder than iron.

[3 marks]

0 4 . 4 Iron is alloyed with carbon and other metals to make stainless steel.

A stainless steel fork contains 71.92% iron.

Table 2 shows the mass of each element in the fork.

Table 2

Element	Iron	Carbon	Chromium	Nickel
Mass of element in g	**X**	0.05	10.44	5.80

Calculate the mass of iron (**X**) in the fork.

[4 marks]

X = _____ g

10

5.2.3.3 Graphene and fullerenes

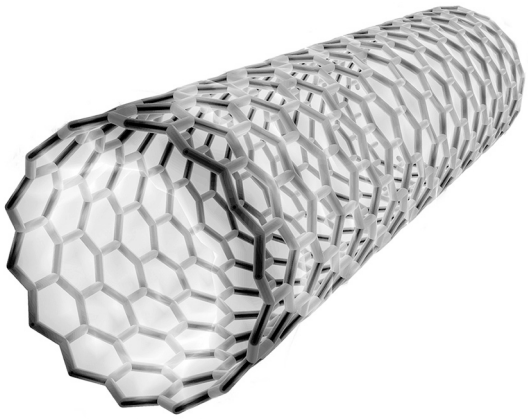
Question 02

June 2024 | 8464/C/1H | Original Q8

0 8 Carbon nanotubes are cylindrical fullerenes.

Figure 11 represents the structure of a carbon nanotube.

Figure 11



0 8 . 1 Describe the arrangement of carbon atoms in the nanotube shown in **Figure 11**.

[1 mark]

0 8 . 2 Nanotubes are used in electronics.

Give **one** other use of nanotubes.

[1 mark]

5.2.3.3 Graphene and fullerenes

Question 02 · continued

0 8 . 3 A nanotube contains 2380 carbon atoms.

Calculate the number of moles of carbon in this nanotube.

The Avogadro constant is 6.02×10^{23} per mole.

[2 marks]

Number of moles of carbon = _____ mols

0 8 . 4 Explain why carbon nanotubes can conduct electricity.

Refer to bonding between carbon atoms in your answer.

[3 marks]

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