

Chemical bonds, ionic, covalent and metallic – GCSE Chemistry

1. No.3

0 3

This question is about carbon.

0 3

. 1

Which type of substance is carbon?

[1 mark]

Tick (✓) **one** box.

Compound

☐

Element

☐

Mixture

☐

0 3

. 2

Carbon has isotopes with mass numbers 12, 13 and 14.

Complete the sentences.

Choose answers from the box.

[2 marks]

electrons

ions

molecules

neutrons

protons

The isotopes of carbon have the same number of _____.

The isotopes of carbon have a different number of _____.

0 3 . 3

12 g of carbon contains 6.02×10^{23} atoms.

Which expression is used to calculate the mass of one atom of carbon?

[1 mark]

Tick (✓) **one** box.

$$\frac{12}{6.02 \times 10^{23}}$$

☐

$$\frac{6.02 \times 10^{23}}{12}$$

☐

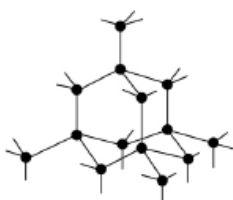
$$12 \times 6.02 \times 10^{23}$$

☐

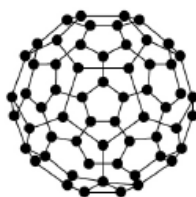
0 3 . 4

Figure 2 shows diagrams that represent different forms of carbon.

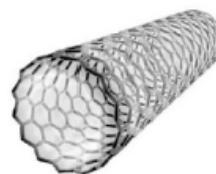
Figure 2



A



B



C

Which diagram in **Figure 2** represents Buckminsterfullerene?

[1 mark]

Tick (✓) **one** box.

A

☐

B

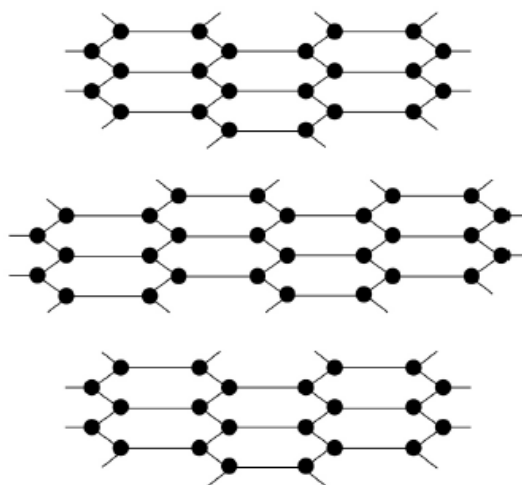
☐

C

☐

0 3 . 5 Figure 3 represents part of the structure of graphite.

Figure 3



Draw **one** line from each property of graphite to the structural feature that is the reason for that property.

[2 marks]

Property

Structural feature

Graphite conducts electricity.

Graphite has hexagonal rings of carbon atoms.

The bonds between carbon atoms in the layers are strong.

Graphite is soft.

There are no covalent bonds between layers of atoms.

There are delocalised electrons in graphite.

2. No.5

0 5

This question is about small particles.

0 5

. 1

Which type of particle is often referred to as dust?

[1 mark]

Tick (✓) **one** box.

Coarse particle

☐

Fine particle

☐

Nanoparticle

☐

0 5

. 2

A spherical coarse particle has a diameter of 4000 nm.

A spherical fine particle has a diameter of 200 nm.

How many times larger is the diameter of the coarse particle than the diameter of the fine particle?

[1 mark]

Tick (✓) **one** box.

2 times

☐

5 times

☐

20 times

☐

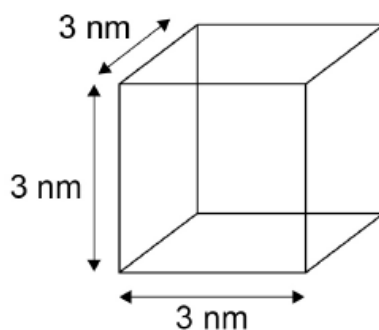
50 times

☐

0 5 . 3

Figure 6 represents a cubic nanoparticle.

Figure 6



The volume of the cubic nanoparticle is 27 nm^3 .

Calculate:

- the surface area of the cubic nanoparticle
- the simplest whole number ratio of surface area : volume for the cubic nanoparticle.

Use the equation:

$$\text{surface area of cubic nanoparticle} = 6 \times \text{surface area of one face}$$

[4 marks]

Surface area of cubic nanoparticle = _____ nm^2

Simplest whole number ratio of surface area : volume = _____ : 1

Titanium oxide is used in some sun creams.

0 5 . 4

Which is an advantage of using nanoparticles of titanium oxide rather than normal-sized particles of titanium oxide in sun creams?

[1 mark]

Tick (✓) **one** box.

A smaller mass of nanoparticles is needed to be effective.

☐

Nanoparticles cost more than the same mass of normal-sized particles.

☐

Nanoparticles have a lower surface area to volume ratio than normal-sized particles.

☐

0 5 . 5

Titanium oxide contains Ti^{4+} ions and O^{2-} ions.

What is the formula of titanium oxide?

[1 mark]

Tick (✓) **one** box.

TiO_2 ☐

TiO_4 ☐

Ti_2O ☐

Ti_4O_2 ☐

3. No.10

1	0
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This question is about titanium dioxide (TiO_2).

1	0
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.	1
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Self-cleaning windows are coated with a layer of nanoparticles of titanium dioxide.

Titanium dioxide:

- helps sunlight break down dirt particles
- attracts water, so dirt is washed away by rain.

Nanoparticles of titanium dioxide are used instead of fine particles of titanium dioxide for coating self-cleaning windows.

Suggest **two** reasons why.

[2 marks]

1 _____

2 _____
