

Atomic Structure

Question Paper 1

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|------------|---------------------------|
| Level | Edexcel |
| Subject | Chemistry |
| Exam Board | GCSE(9-1) |
| Topic | Key Concepts in Chemistry |
| Sub Topic | Atomic Structure |
| Booklet | Question Paper 1 |

Time Allowed: 48 minutes

Score: /40

Percentage: /100

1 (a) An atom of copper has an atomic number of 29 and a mass number of 63.

(i) Complete the table to show the numbers of protons, neutrons and electrons in this atom of copper.

(2)

| particle | number |
|----------|--------|
| proton | |
| neutron | |
| electron | |

(ii) Copper is in period 4 of the periodic table.

State what information this gives about the number of shells that contain electrons, in a copper atom.

(1)

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(iii) Copper exists as isotopes.

Explain what is meant by the term **isotopes**.

(2)

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(iv) A sample of copper contains

70% of copper-63 atoms and

30% of copper-65 atoms.

Use this information to calculate the relative atomic mass of copper in this sample.

(3)

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relative atomic mass of copper =

(b) Copper nitrate contains copper ions, Cu^{2+} , and nitrate ions, NO_3^- .

(i) Describe, in terms of electrons, how a copper atom, Cu, becomes a copper ion, Cu^{2+} .

(2)

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(ii) Write the formula for copper nitrate.

(1)

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(Total for Question 1 = 11 marks)

2 (a) Atoms contain protons, neutrons and electrons.

Complete the table to show the relative mass and relative charge of each particle and its position in an atom.

(3)

| | relative mass | relative charge | position in atom |
|----------|---------------|-----------------|------------------|
| proton | | +1 | |
| neutron | 1 | | in nucleus |
| electron | | | |

(b) Complete the sentence by putting a cross (☒) in the box next to your answer.

An atom of an element **always** contains

(1)

- A** more protons than neutrons
- B** equal numbers of protons and neutrons
- C** more electrons than protons
- D** equal numbers of protons and electrons

(c) The symbols for some atoms are given in the box

| | | | | | |
|----|----|---|---|----|---|
| Ca | Cl | K | N | Ne | O |
|----|----|---|---|----|---|

From the box, choose the symbol of

(i) an atom in group 2 of the periodic table

(1)

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(ii) an atom that readily forms an ion with a charge of 2-

(1)

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(d) The formula of aluminium nitrate is $\text{Al}(\text{NO}_3)_3$

(i) State the total number of atoms in the formula $\text{Al}(\text{NO}_3)_3$

(1)

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(ii) What is the most likely formula of aluminium nitride?

Put a cross (☒) in the box next to your answer.

(1)

A $\text{Al}(\text{NO}_3)_2$

B AlNO_3

C AlNO_2

D AlN

(Total for Question 2 = 8 marks)

3 (a) Chlorine has an atomic number of 17.

Chlorine-35 and chlorine-37 are two isotopes of chlorine.

(i) Complete the table to show the numbers of protons, neutrons and electrons in each of the isotopes.

(2)

| | chlorine-35 | chlorine-37 |
|---------------------|-------------|-------------|
| number of protons | | |
| number of neutrons | | |
| number of electrons | | |

(ii) A normal sample of chlorine contains only chlorine-35 and chlorine-37 atoms.

Explain why the relative atomic mass of chlorine is 35.5

(2)

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(b) Tetrachloromethane is a simple molecular, covalent compound.
The formula of its molecule is CCl_4 .

There are four electrons in the outer shell of a carbon atom.
There are seven electrons in the outer shell of a chlorine atom.

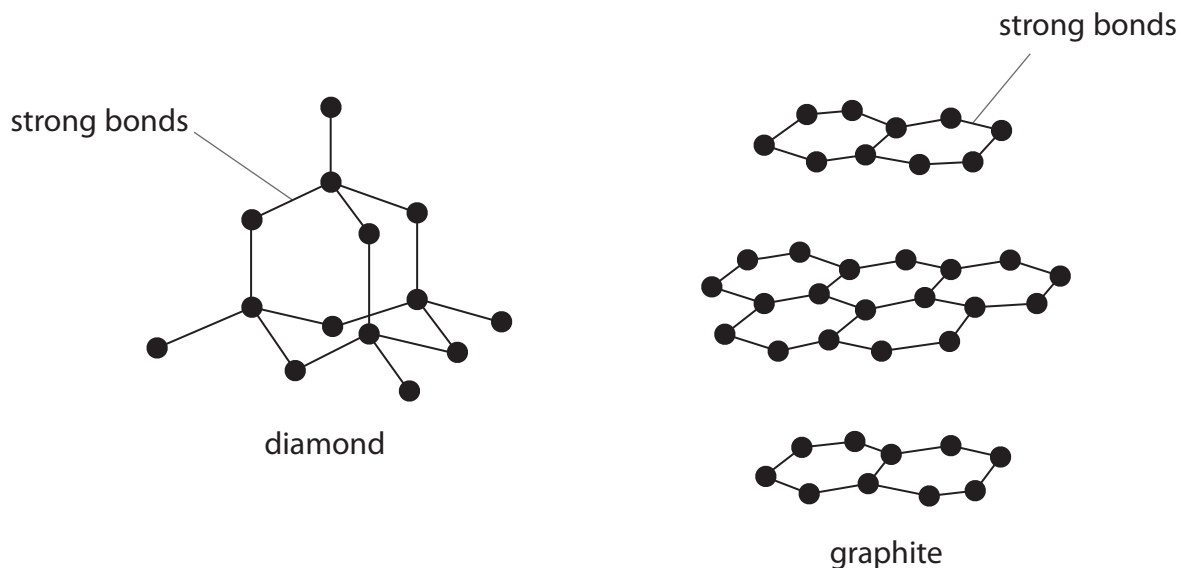
Draw a dot and cross diagram to show the bonding in a molecule of tetrachloromethane, CCl_4 .

Show outer shell electrons only.

(2)

*(c) The diagrams show the arrangements of carbon atoms in diamond and in graphite.

● = carbon atom



Compare a use of diamond with a use of graphite, explaining each use in terms of the bonding and structure. In your answer you should use information from the diagrams.

(6)

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- 4 (a) The table shows the number of electrons, neutrons and protons in particles P, Q, R, S, T and V.

| particle | number of | | |
|----------|-----------|----------|---------|
| | electrons | neutrons | protons |
| P | 1 | 0 | 1 |
| Q | 3 | 4 | 3 |
| R | 8 | 8 | 8 |
| S | 13 | 14 | 13 |
| T | 18 | 16 | 16 |
| V | 18 | 20 | 20 |

- (i) Which particle is a negatively charged ion?

Put a cross (☒) in the box next to your answer.

(1)

- A P
- B S
- C T
- D V

- (ii) Which particles are atoms of metals?

Put a cross (☒) in the box next to your answer.

(1)

- A P and R
- B Q and R
- C Q and S
- D Q, S and V

(b) Each element has an atomic number.

(i) State what is meant by **atomic number**.

(1)

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(ii) The atomic number of boron is 5.

Boron exists as two isotopes boron-10 and boron-11.

Use this information to explain why boron-10 and boron-11 are isotopes.

(2)

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(c) (i) Explain what is meant by the term relative atomic mass.

(2)

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(ii) A sample of boron contains

19.7% of boron-10.

80.3% of boron-11.

Use this information to calculate the relative atomic mass of boron.

(3)

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