GCSE
CHEMISTRY

Chemistry Test 1: Atomic structure and the periodic table and Bonding, structure and the properties of matter (Higher)

Total number of marks: 34

0 3   This question is about silver iodide.

Silver iodide is produced in the reaction between silver nitrate solution and sodium iodide solution.

The equation for the reaction is:

$$AgNO_3(aq) + NaI(aq) \rightarrow AgI(s) + NaNO_3(aq)$$

0 3 . 1   A student investigated the law of conservation of mass.

This is the method used.

1. Pour silver nitrate solution into a beaker labelled **A**.

2. Pour sodium iodide solution into a beaker labelled **B**.

3. Measure the masses of both beakers and their contents.

4. Pour the solution from beaker **B** into beaker **A**.

5. Measure the masses of both beakers and their contents again.

Table 3 shows the student's results.

Table 3

	Mass before mixing in g	Mass after mixing in g
Beaker **A** and contents	78.26	108.22
Beaker **B** and contents	78.50	48.54

Explain how the results demonstrate the law of conservation of mass.

You should use data from **Table 3** in your answer.

[2 marks]

0 3 . 2   Suggest how the student could separate the insoluble silver iodide from the mixture at the end of the reaction.

[1 mark]

The student purified the separated silver iodide.

This is the method used.

1. Rinse the silver iodide with distilled water.

2. Warm the silver iodide.

0 3 . 3   Suggest **one** impurity that was removed by rinsing with water.

[1 mark]

0 3 . 4   Suggest why the student warmed the silver iodide.

[1 mark]

0 3 . 5 Calculate the percentage atom economy for the production of silver iodide in this reaction.

The equation for the reaction is:

$$AgNO_3(aq) + NaI(aq) \rightarrow AgI(s) + NaNO_3(aq)$$

Give your answer to 3 significant figures.

Relative formula masses (M_r): $AgNO_3 = 170$ $NaI = 150$ $AgI = 235$ $NaNO_3 = 85$

[4 marks]

_____

_____

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_____

Percentage atom economy (3 significant figures) = _____ %

0 3 . 6 Give **one** reason why reactions with a high atom economy are used in industry.

[1 mark]

0 4 This question is about atomic structure.

0 4 . 1 Atoms contain subatomic particles.

Table 2 shows properties of two subatomic particles.

Complete **Table 2**.

[2 marks]

Table 2

Name of particle	Relative mass	Relative charge
neutron		
		+1

An element **X** has two isotopes.

The isotopes have different mass numbers.

0 4 . 2 Define mass number.

[1 mark]

0 4 . 3 Why is the mass number different in the two isotopes?

[1 mark]

0 4 . 4 The model of the atom changed as new evidence was discovered.

The plum pudding model suggested that the atom was a ball of positive charge with electrons embedded in it.

Evidence from the alpha particle scattering experiment led to a change in the model of the atom from the plum pudding model.
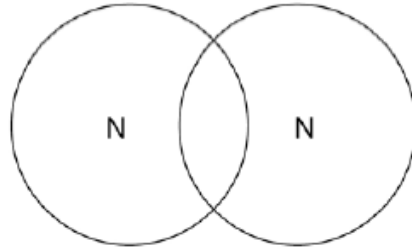
Explain how.

[4 marks]

| 0 | 6 | This question is about structure and bonding.

| 0 | 6 |.| 1 | Complete the dot and cross diagram to show the covalent bonding in a nitrogen molecule, N_2

Show only the electrons in the outer shell.

[2 marks]

| 0 | 6 |.| 2 | Explain why nitrogen is a gas at room temperature.

Answer in terms of nitrogen's structure.

[3 marks]

Graphite and fullerenes are forms of carbon.

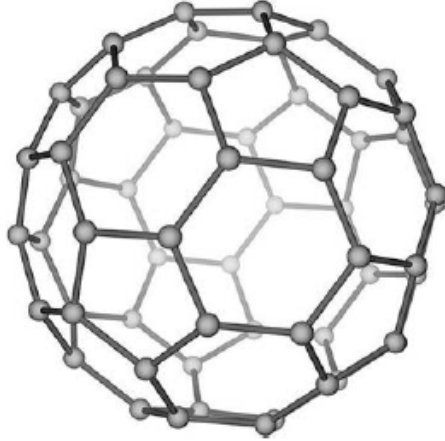| 0 | 6 |.| 3 | Graphite is soft and is a good conductor of electricity.

Explain why graphite has these properties.

Answer in terms of structure and bonding.

[4 marks]

0 6 . 4 **Figure 5** shows a model of a Buckminsterfullerene molecule.

Figure 5

A lubricant is a substance that allows materials to move over each other easily.
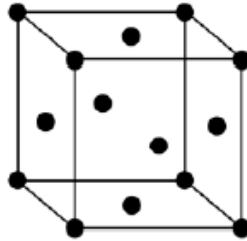
Suggest why Buckminsterfullerene is a good lubricant.

Use **Figure 5**.

[2 marks]

Silver can form cubic nanocrystals.

Figure 6 represents a silver nanocrystal.

Figure 6

| 0 | 6 |.| 5 | A silver nanocrystal is a cube of side 20 nm

Calculate the surface area to volume ratio of the nanocrystal.

[3 marks]

_____

_____

_____

_____

_____

Surface area to volume ratio = _____

| 0 | 6 |.| 6 | Silver nanoparticles are sometimes used in socks to prevent foot odour.

Suggest why it is cheaper to use nanoparticles of silver rather than coarse particles of silver.

[2 marks]