2021 ASSESSMENT MATERIALS

GCSE
CHEMISTRY

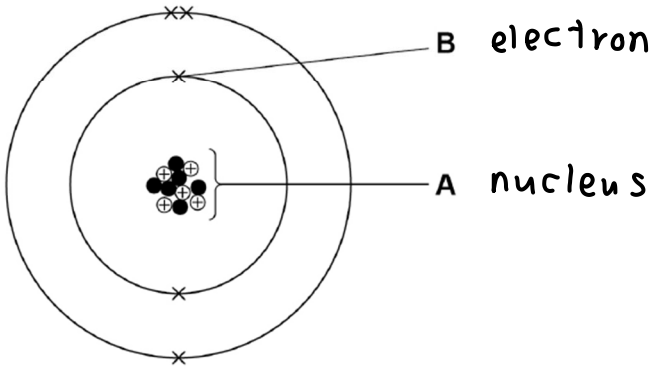
Chemistry Test 1: Atomic structure and the periodic table and Bonding, structure and the properties of matter (Foundation)

Total number of marks: 36

0 1 This question is about atomic structure.

Figure 1 represents an atom of element **Z**.

Figure 1



0 1 . 1 Name the parts of the atom labelled **A** and **B**.

Choose answers from the box.

[2 marks]

electron	neutron	nucleus	proton

0 1 . 2 Which particle has the lowest mass?

Choose the answer from the box.

[1 mark]

electron	neutron	nucleus	proton

0 1 This question is about the elements in Group 7 of the periodic table.

Table 1 shows the melting points and boiling points of some of the elements.

Table 1

Element	Melting point in °C	Boiling point in °C
Fluorine	–220	–188
Chlorine	–101	–35
Bromine	–7	59

0 1 . 1 What is the state of bromine at 100 °C?

Use **Table 1**.

[1 mark]

Tick (✓) **one** box.

Gas	✓
Liquid	
Solid	

0 1 . 2 What temperature does chlorine gas condense at to form a liquid?

Use **Table 1**.

[1 mark]

Temperature = -35 °C

0 1 . 3 Complete the sentences.

[2 marks]

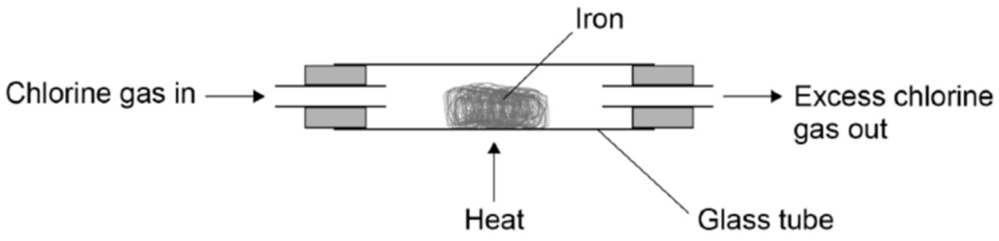
Going down Group 7 the melting points increases.

This is because the size of the molecules increases so the intermolecular forces increases.

A teacher investigated the reaction of iron with chlorine.

Figure 1 shows the apparatus used.

Figure 1



0 1 . 4 Why did the teacher do the investigation in a fume cupboard?

[1 mark]

Tick (✓) **one** box.

Chlorine gas is coloured. ☐

Chlorine gas is flammable. ☐

Chlorine gas is toxic. ☑

0 1 . 5 The word equation for the reaction is:

iron + chlorine → iron chloride

Iron chloride is a solid.

The teacher weighed the glass tube and contents:

- before the reaction
- after the reaction.

What happened to the mass of the glass tube and contents during the reaction?

Give **one** reason for your answer.

[2 marks]

The mass of the glass tube and contents increases.

Reason the mass of chlorine gas was not included before the reaction, when it reacts with iron to form iron chloride, the mass of iron chloride contributes to the increase in mass.

The teacher repeated the investigation with bromine gas and with iodine gas.

Table 2 shows the results.

Table 2

Element	Observation
Chlorine	Iron burns vigorously with an orange glow
Bromine	Iron burns with an orange glow
Iodine	Iron slowly turns darker

0 1 . 6 Fluorine is above chlorine in Group 7.

Predict what you would observe when fluorine gas reacts with iron.

Use **Table 2**.

Iron burns more vigorously with an orange glow **[1 mark]**

0 1 . 7 Balance the equation for the reaction between iron and bromine.

[1 mark]

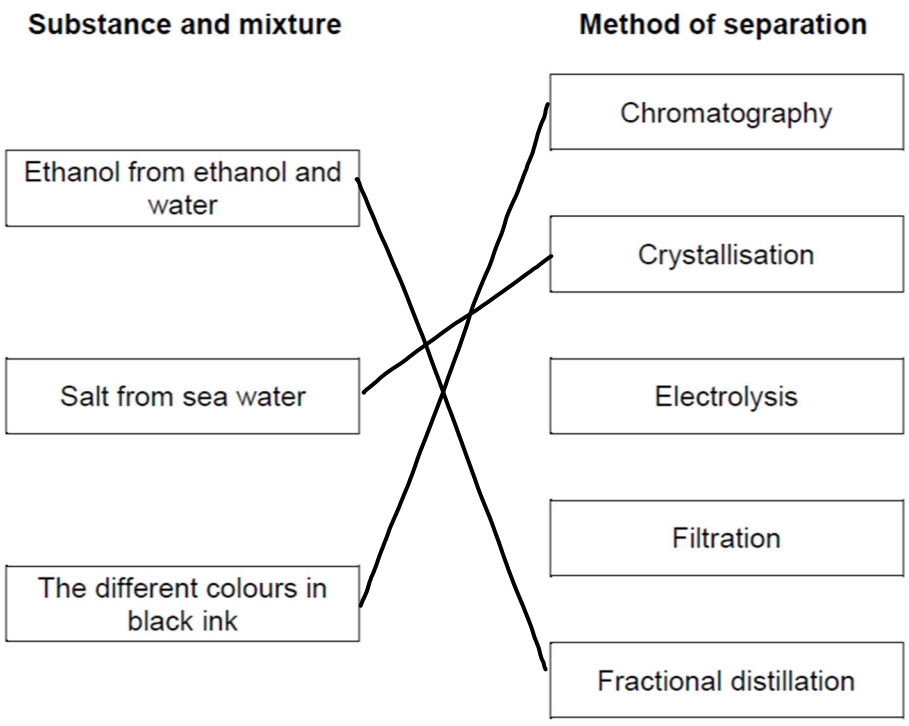
$$2Fe + \underline{3}\ Br_2 \rightarrow 2FeBr_3$$

0 1 This question is about mixtures.

0 1 . 1 Substances are separated from a mixture using different methods.

Draw **one** line from each substance and mixture to the best method of separation.

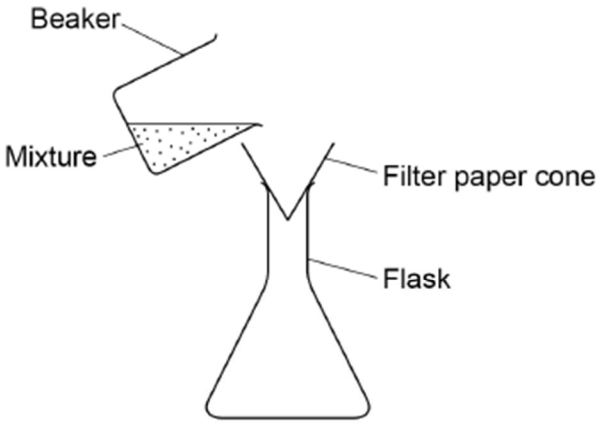
[3 marks]



0 1 . 2 A student filters a mixture.

Figure 1 shows the apparatus.

Figure 1



Suggest **one** improvement to the apparatus.

Place the filter paper cone in a filter funnel **[1 mark]**

0 1 . 3 Complete the sentences.

Choose answers from the box.

[2 marks]

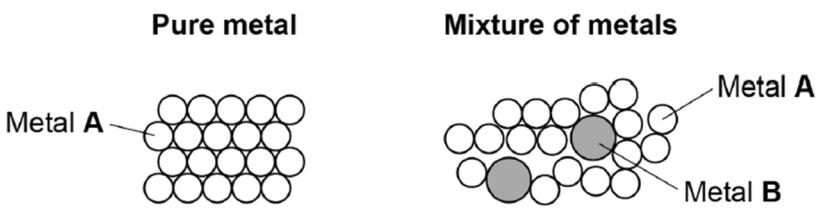
condense	**evaporate**	**freeze**	**melt**	**solidify**

In simple distillation, the mixture is heated to make the liquid evaporate.

The vapour is then cooled to make it condense.

Figure 2 shows the arrangement of atoms in a pure metal and in a mixture of metals.

Figure 2



0 1 . 4 Calculate the percentage of metal **B** atoms in the mixture of metals shown in **Figure 2**.

[2 marks]

$\frac{2}{20} \times 100 = 10\%$

Percentage of metal **B** atoms = 10 %

0 1 . 5 What is a mixture of metals called?

[1 mark]

Tick **one** box.

- An alloy ✓
- A compound
- A molecule
- A polymer

0 1 . 6 Why is the mixture of metals in **Figure 2** harder than the pure metal?

[1 mark]

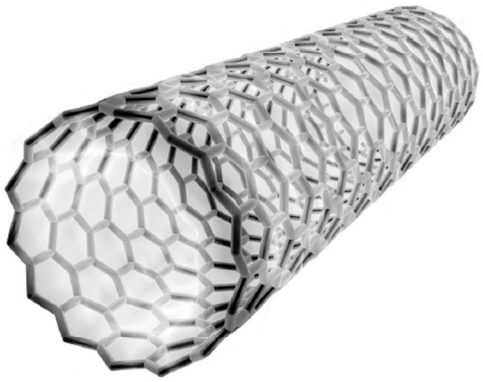
Tick **one** box.

- The atoms in the mixture are different shapes.
- The layers in the mixture are distorted. ✓
- The layers in the mixture slide more easily.
- The mixture has a giant structure.

1 0 This question is about materials and their properties.

1 0 . 1 **Figure 13** shows a carbon nanotube.

Figure 13



The structure and bonding in a carbon nanotube are similar to graphene.

Carbon nanotubes are used in electronics because they conduct electricity.

Explain why carbon nanotubes conduct electricity.

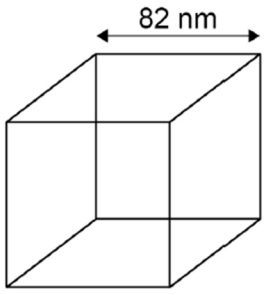
Each carbon is joined to 3 other carbon atoms by covalent bonds, so there is 1 spare electron from each carbon forming a sea of delocalised electrons. **[2 marks]**

Zinc oxide can be produced as nanoparticles and as fine particles.

1 0 . 3 A nanoparticle of zinc oxide is a cube of side 82 nm

Figure 15 represents a nanoparticle of zinc oxide.

Figure 15



Calculate the surface area of a nanoparticle of zinc oxide.

Give your answer in standard form.

[3 marks]

$82 \times 82 \times 6 = 40344\ nm^2$

$= 4.0344 \times 10^4\ nm^2$

$\simeq 4.03 \times 10^4\ nm^2$

Surface area = 4.03×10^4 nm^2

1 0 . 4 Some suncreams contain zinc oxide as nanoparticles or as fine particles.

Suggest **one** reason why it costs less to use nanoparticles rather than fine particles in suncreams.

Nanoparticles have a greater surface area for reaction to take place, so less zinc oxide is needed **[1 mark]**

0 8 This question is about structure and bonding.

0 8 . 1 Which **two** substances have intermolecular forces between particles?

[2 marks]

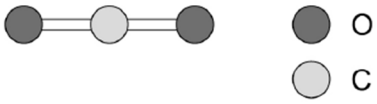
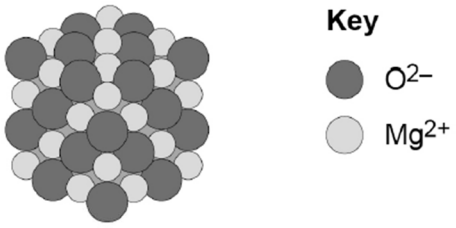
Tick (✓) **two** boxes.

Diamond	
Magnesium	
Poly(ethene)	✓
Sodium chloride	
Water	✓

0 8 . 2 **Table 5** shows the structures of three compounds.

Table 5

Diagrams not to scale

Compound	Structure
Carbon dioxide	
Magnesium oxide	
Silicon dioxide	

Compare the structure and bonding of the three compounds:

- carbon dioxide
- magnesium oxide
- silicon dioxide.

[6 marks]

Carbon dioxide has a simple covalent structure. The atoms are joined by covalent bonds, which is formed by atoms sharing pairs of electrons.

Magnesium oxide is a giant ionic compound. It has ionic bonding, which is the electrostatic force of attraction between oppositely charged ions.

Silicon dioxide has a giant covalent structure. Each silicon is joined to 4 oxygen through covalent bonds.