Questions are for both separate science and combined science students unless indicated in the question

Q1.

This question is about Group 1 elements.

(a)   Give **two** observations you could make when a small piece of potassium is added to water.
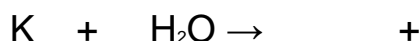
1 _____

_____

2 _____

_____

(2)

(b)   Complete the equation for the reaction of potassium with water.

You should balance the equation.

$$K \quad + \quad H_2O \rightarrow \qquad +$$

(2)

(c)   Explain why the reactivity of elements changes going down Group 1.

_____

_____

_____

_____

_____

_____

_____

_____

_____

(4)

Sodium reacts with oxygen to produce the ionic compound sodium oxide.

Oxygen is a Group 6 element.

(d)   Draw a dot and cross diagram to show what happens when atoms of sodium and oxygen react to produce sodium oxide.

Diagram

(4)

(e)   Why is oxygen described as being reduced in the reaction between sodium and oxygen?

_____

_____

(1)

(f)   Explain why sodium oxide has a high melting point.

_____

_____

_____

_____

_____

_____

(3)

(Total 16 marks)

Q2.

This question is about metals.

(a)   The table below shows information about four substances.

Substance	Melting point in °C	Boiling point in °C	Does it conduct electricity in the solid state?	Does it conduct electricity in the liquid state?
A	−117	79	No	No
B	801	1413	No	Yes
C	1535	2750	Yes	Yes
D	1610	2230	No	No

Which substance could be a metal?

Tick (✓) **one** box.

A ☐   B ☐   C ☐   D ☐

(1)

(b)   Explain why alloys are harder than pure metals.

_____

_____

_____

_____

_____

_____

(3)

(c)   A student wants to compare the reactivity of an unknown metal, **Q**, with that
of zinc.

Both metals are more reactive than silver.

The student is provided with:

•   silver nitrate solution

•   metal **Q** powder

•   zinc powder

•   a thermometer

•   normal laboratory equipment.

No other chemicals are available.

Describe a method the student could use to compare the reactivity of metal
Q with that of zinc.

Your method should give valid results.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 8 marks)

Q3.

This question is about substances used to make windows and window frames.

Figure 1 shows a window.

Figure 1
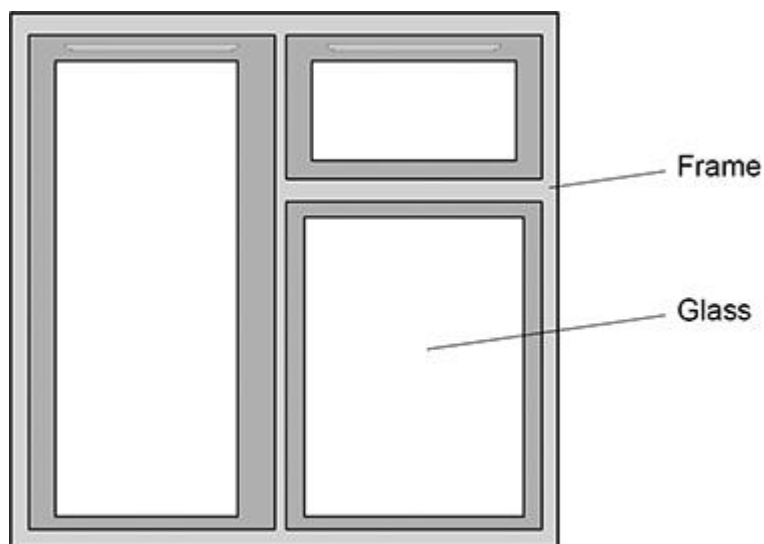
(a)　Glass is made by heating sand with **two** other materials.

Which **two** other materials are used to make glass?

Tick (✓) **two** boxes.

Clay	☐
Graphite	☐
Limestone	☐
Sodium carbonate	☐
Sodium hydroxide	☐

(2)

Window frames need to be:
* easy to install
* resistant to damage.

The polymers poly(chloroethene) and HDPE are used to make window frames.

Table 1 shows information about poly(chloroethene) and HDPE.

Table 1

Property	Poly(chloroethene)	HDPE
Density in g/cm^3	1.4	0.92
Relative strength	72	25

(b)   Suggest **one** advantage of using poly(chloroethene) compared with HDPE to make window frames.
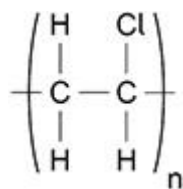
Give **one** reason for your answer.

Use **Table 1**.

Advantage _____

_____

_____

Reason _____

_____

(2)

(c)   Suggest **one** advantage of using HDPE compared with poly(chloroethene) to make window frames.

Give **one** reason for your answer.

Use **Table 1**.

Advantage _____

_____
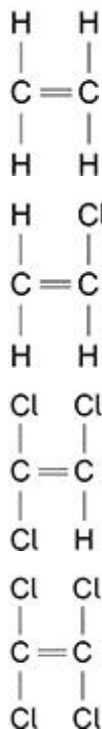
_____

Reason _____

_____

_____

(2)

(d)   **Figure 2** shows the displayed structural formula of poly(chloroethene).

Figure 2

Which monomer is used to make poly(chloroethene)?

Tick (✓) **one** box.   **(separate only)**

(1)

(e)   Chlorine gas is used to produce poly(chloroethene).

Describe a test to identify chlorine gas.

Give the result of the test.

Test _____

_____

Result _____

_____

_____

(2)

(f)   Wood can be used instead of polymers to make window frames.

• Polymers are unreactive.

• Polymers are produced from crude oil.

- Wood breaks down in wet conditions.
- Wood is produced from trees.

Suggest **one** advantage of using polymers and **one** advantage of using wood to make window frames.

Advantage of
polymers _____

_____

Advantage of
wood _____

_____

(2)

Window frames can also be made from an alloy of aluminium.

(g)   6.00 kg of the alloy is used to make a window frame.

Table 2 shows the mass of each element in 6.00 kg of the alloy.

Table 2

Element	Mass in kg
Aluminium	5.94
Magnesium	0.04
Silicon	0.02

Calculate the percentage of aluminium in 6.00 kg of the alloy.

_____

_____

Percentage of aluminium = _____%

(2)

(h)   Why is an alloy used instead of pure aluminium to make window frames?

_____

_____

(1)
(Total 14 marks)

Q4.

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

(a)   What is the state of bromine at 100 °C?

Use **Table 1**.

Tick (✓) **one** box.

Gas

Liquid

Solid

(1)

(b)   What temperature does chlorine gas condense at to form a liquid?

Use **Table 1**.

Temperature = _____ °C

(1)

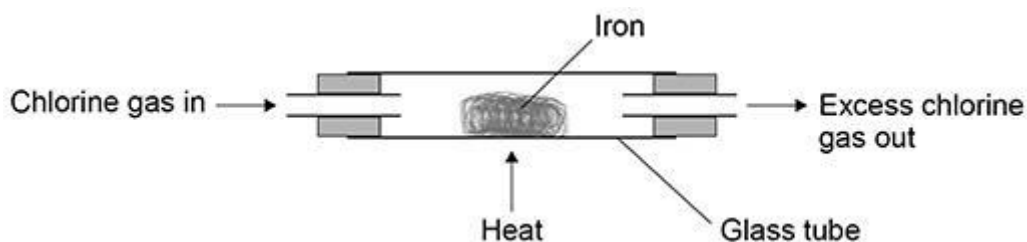(c)   Complete the sentences.

Going down Group 7 the melting points _____ .

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

_____ .

(2)

A teacher investigated the reaction of iron with chlorine.

The diagram below shows the apparatus used.

(d) Why did the teacher do the investigation in a fume cupboard?
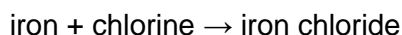
Tick (✓) **one** box.

Chlorine gas is coloured. ☐

Chlorine gas is flammable. ☐

Chlorine gas is toxic. ☐

(1)

(e) 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.

The mass of the glass tube and contents
_____

Reason
_____

_____

(2)

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

(f)   Fluorine is above chlorine in Group 7.

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

Use **Table 2**.

_____

_____

(1)

(g)   Balance the equation for the reaction between iron and bromine.

$$2Fe + \_\_\_\_\_ Br_2 \rightarrow 2\ FeBr_3$$

(1)

(h)   Calculate the relative formula mass (M_r) of $FeBr_3$

Relative atomic masses (A_r): Fe = 56 Br = 80

_____

_____

Relative formula mass (M_r) = _____

(2)
(Total 11 marks)

Q5.

This question is about aluminium.

(a)   Aluminium is a metal.

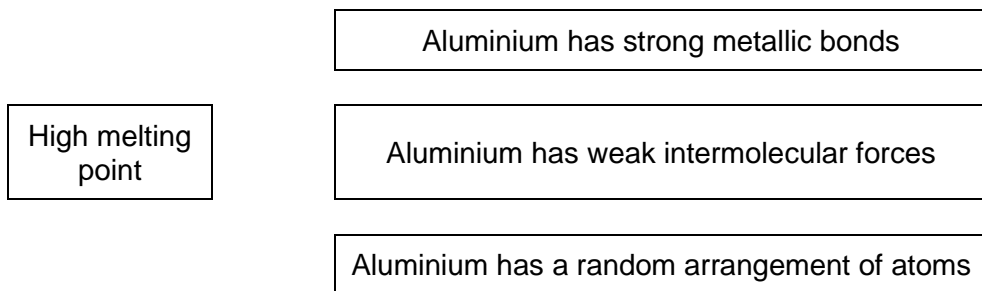Draw **one** line from each property of aluminium to the correct reason for that property.

Property   **Reason**

Aluminium has delocalised electrons

Conducts
electricity

Aluminium has layers of atoms which can slide

Aluminium has strong metallic bonds

High melting point		Aluminium has weak intermolecular forces

Aluminium has a random arrangement of atoms

(2)

(b)   Aluminium can be used to make alloys.

What is meant by an 'alloy'?

_____

_____

(1)

Aluminium is extracted from bauxite.

Bauxite is a mixture which contains aluminium oxide.

(c)   Bauxite contains between 15% and 25% aluminium.
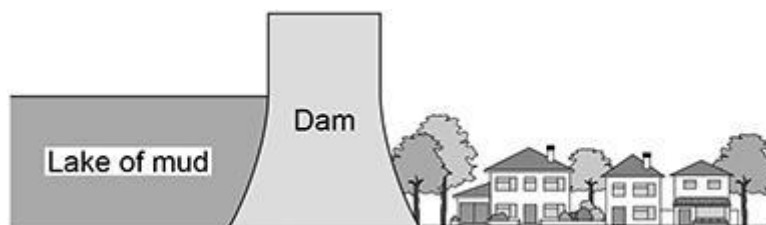
Aluminium oxide always contains 53% aluminium.

How does this show that bauxite is a mixture and **not** a compound?

_____

_____

(1)

(d)   The waste material from the bauxite is stored in lakes of mud.

The lakes of mud are held in place by dams.

The **image** below shows one of these lakes.

Suggest **two** possible problems with storing the waste material in lakes of mud.

1 _____

_____

2 _____

_____

(2)

Aluminium is extracted by electrolysis.

The aluminium oxide is mixed with cryolite and melted.

The mixture is then electrolysed.

(e)   The formula of cryolite is Na_3AlF_6

Give the total number of atoms in the formula.

Number of atoms = _____

(1)

(f)   What is the reason for adding cryolite to the aluminium oxide?

Tick (✓) **one** box.

To increase the amount of aluminium extracted   ☐

To lower the melting point of the mixture   ☐

To reduce the amount of aluminium oxide needed   ☐

(1)

(g)   Complete the sentences.

Choose answers from the box.

aluminium	carbon	fluorine
oxygen	sodium	

When the molten aluminium oxide and cryolite mixture is electrolysed the product at

the positive electrode is _____.

This product reacts with the positive electrode because the positive electrode is

made of _____.

(2)

(h)   A sample of bauxite contains 25% aluminium.

Calculate the maximum mass of aluminium that can be extracted from 300 000 kg of the sample of bauxite.

Give your answer in standard form.

_____

_____

_____

_____

_____

Maximum mass (in standard form) = _____ kg

(3)

(Total 13 marks)

Q6.

This question is about structure and bonding.

(a)   Which **two** substances have intermolecular forces between particles?

Tick (✓) **two** boxes.

Diamond   ☐

Magnesium   ☐

Poly(ethene)   ☐

Sodium chloride   ☐

Water   ☐

(2)

(b)   The table below shows the structures of three compounds.
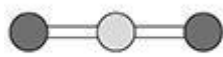
Compound	Structure
Carbon dioxide	Key ● O ○ C

Magnesium oxide	
Silicon dioxide	

Compare the structure and bonding of the three compounds:

•   carbon dioxide

•   magnesium oxide

•   silicon dioxide.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(6)
(Total 8 marks)

Q7.

This question is about the halogens.

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

Table 1

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

(a)   What is the state of bromine at 0 °C **and** at 100 °C?

Tick (✓) **one** box.

State at 0 °C	State at 100 °C	
Gas	Gas	☐
Gas	Liquid	☐
Liquid	Gas	☐
Liquid	Liquid	☐
Solid	Gas	☐
Solid	Liquid	☐

(1)

(b)   Explain the trend in boiling points of the halogens shown in **Table 1**.

_____

_____

_____

_____

_____

_____

_____

(4)

(c)   Why is it **not** correct to say that the boiling point of a single bromine
        molecule is 59 °C?

_____

_____

(1)

Iron reacts with each of the halogens in their gaseous form.

The diagram below shows the apparatus used.
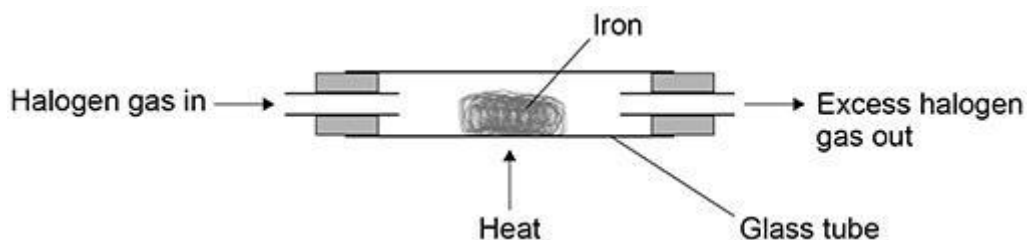
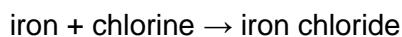(d)   Give **one** reason why this experiment should be done in a fume cupboard.

_____

_____

(1)

(e)   Explain why the reactivity of the halogens decreases going down the
        group.

_____

_____

_____

_____

_____

_____

(3)

(f)   A teacher investigated the reaction of iron with chlorine using the apparatus
        in the above diagram.

        The word equation for the reaction is:

                        iron + chlorine → iron chloride

        The teacher weighed:
        •   the glass tube
        •   the glass tube and iron before the reaction

•   the glass tube and iron chloride after the reaction.

Table 2 shows the teacher's results.

Table 2

	Mass in g
Glass tube	51.56
Glass tube and iron	56.04
Glass tube and iron chloride	64.56

Calculate the simplest whole number ratio of:

moles of iron atoms : moles of chlorine atoms

Determine the balanced equation for the reaction.

Relative atomic masses (A_r):   Cl = 35.5   Fe = 56

_____

_____

_____

_____

_____

_____

Moles of iron atoms : moles of chlorine atoms = _____ **:** _____

Equation for the reaction

_____

(6)
(Total 16 marks)

Q8.

This question is about alloys.

Bronze and brass are both alloys which contain copper.

(a)   Bronze is an alloy of copper and one other metal.

What is the other metal in bronze?

Tick (✓) **one** box. **(separate only)**

Aluminium ☐

Tin ☐

Zinc ☐

(1)

(b)   Give **one** use of brass. **(separate only)**

_____

_____

(1)

Alloys of gold are used to make jewellery.

(c)   The proportion of gold in an alloy is measured in carats:

- pure gold is 24 carat
- 50% gold is 12 carat.

The table below shows information about two gold rings, **A** and **B**.

A and **B** contain only gold and silver.

Complete below the table below. **(separate only)**

Gold ring	Carat	Mass of metal in grams	
		gold	silver
A		7	7
B	18	9	

(2)

(d)   Suggest **two** reasons why alloys of gold are used instead of pure gold to make jewellery.   **(separate only)**

1 _____

_____

2 _____

_____

(2)

Steels are alloys of iron.

(e)   Spoons are made of stainless steel.

Spoons:

•   are washed after use

•   must not wear away quickly.

Suggest **one** reason why stainless steel is suitable for making spoons.
(separate only)

_____

_____

                                                                                                        (1)

(f)   Steel horseshoes are shaped to fit the feet of horses.

Which type of steel is most easily shaped into horseshoes?

Tick (✓) **one** box. **(separate only)**

High carbon steel   ☐

Low carbon steel   ☐

Stainless steel   ☐

                                                                                                        (1)
                                                                                          (Total 8 marks)

Q9.

This question is about materials used to make plates.

Plates are made from ceramics, paper or poly(propene).

(a)   Paper plates are biodegradable and recyclable.

Which stage of a life cycle assessment (LCA) would contain this information?

Tick (✓) **one** box. **(separate only)**

Disposal at the end of useful life   ☐

Extracting and processing raw materials   ☐

Manufacturing and packaging   ☐

Use and operation during lifetime ☐

(1)

(b)   Which **two** processes are used to make ceramic plates?

Tick (✓) **two** boxes. **(separate only)**

Forming a composite ☐

Galvanising with zinc ☐

Heating in a furnace ☐

Melting sand and boron trioxide ☐

Shaping wet clay ☐

(2)

Poly(propene) is produced from an alkene.

(c)   Complete the sentences. **(separate only)**

The name for very large molecules such as poly(propene) is

_____.

The name of the alkene used to produce poly(propene) is

_____.

(2)

(d)   The alkene needed to make poly(propene) is produced from crude oil.

Which **two** processes are used to produce this alkene from crude oil?

Tick (✓) **two** boxes.

Chromatography ☐

Cracking ☐

Fermentation ☐

Fractional distillation ☐

Quarrying ☐

(2)

(e)   What type of bond joins the atoms in a molecule of poly(propene)?

Tick (✓) **one** box.

Covalent ☐

Ionic ☐

Metallic ☐

(1)

The table below shows information about two polymers used to make plates.

Polymer	Effect of heating the polymer
A	does not melt
B	melts at 50 °C

(f)   What type of polymer is polymer **A**?

Use the table above. **(separate only)**

_____

_____

(1)

(g)   Why does polymer **A** behave differently to polymer **B** when heated?

You should refer to crosslinks in your answer. **(separate only)**

_____

_____

(1)
(Total 10 marks)

Q10.

This question is about ammonia, NH_3

(a)   Complete the dot and cross diagram for the ammonia molecule shown in **Figure 1**.

Show only the electrons in the outer shell of each atom.

Figure 1
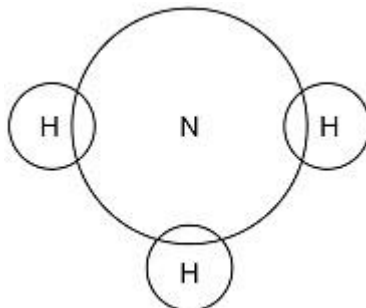
(2)

(b)   Give **one** limitation of using a dot and cross diagram to represent an ammonia molecule.

_____

_____

(1)

(c)   Explain why ammonia has a low boiling point.

You should refer to structure and bonding in your answer.

_____

_____

_____

_____

_____

_____

(3)

Ammonia reacts with oxygen in the presence of a metal oxide catalyst to produce nitrogen and water.

(d)   Which metal oxide is most likely to be a catalyst for this reaction?

Tick (✓) **one** box.

CaO ☐

Cr$_2$O$_3$ ☐

MgO ☐

Na$_2$O ☐
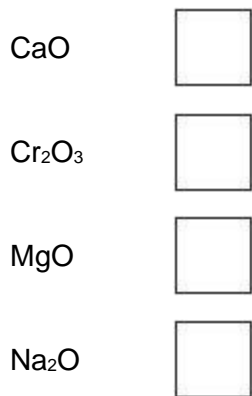
(1)

Figure 2 shows the displayed formula equation for the reaction.

Figure 2

$$4\,H-N-H \;+\; 3\,O{=}O \;\longrightarrow\; 2\,N{\equiv}N \;+\; 6\,H-O-H$$
$$\quad\quad\;\;|$$
$$\quad\quad\;\;H$$
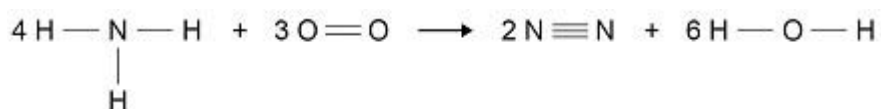
The table shows some bond energies.

Bond	N — H	O = O	N ≡ N	O — H
Bond energy in kJ/mol	391	498	945	464

(e)   Calculate the overall energy change for the reaction.

Use **Figure 2** and the table.

_____

_____

_____

_____

_____

_____

Overall energy change = _____ kJ/mol

(3)

(f)   Explain why the reaction between ammonia and oxygen is exothermic.

Use values from your calculation in part (e).

_____

_____

_____

_____

_____

(2)

(g) **Figure 3** shows the reaction profile for the reaction between ammonia and oxygen.

Complete **Figure 3** by labelling the:

•   activation energy
•   overall energy change.

Figure 3
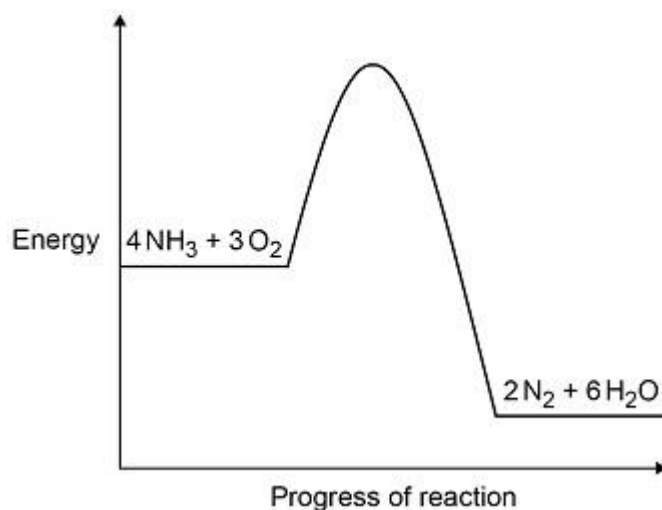
(2)
(Total 14 marks)

Q11.

This question is about mixtures.

(a) Substances are separated from a mixture using different methods.

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

Substance and mixture   **Method of separation**

Chromatography

Ethanol from ethanol and water   Crystallisation

| Salt from sea water | Electrolysis |

| The different colours in black ink | Filtration |

| | Fractional distillation |

(3)

(b)   A student filters a mixture.

Figure 1 shows the apparatus.

Figure 1
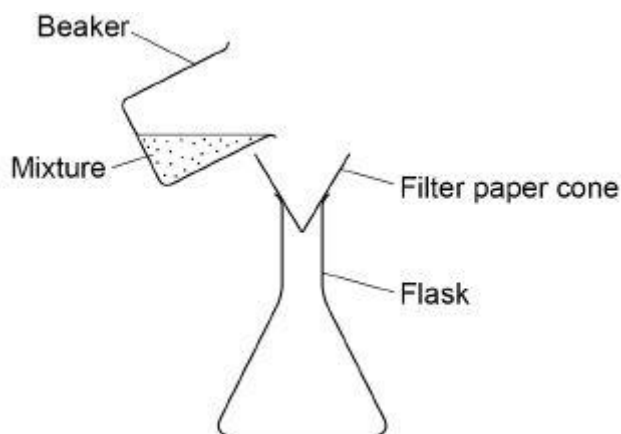
Suggest **one** improvement to the apparatus.

_____

_____

(1)

(c)   Complete the sentences.

Choose answers from the box.

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

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

_____ .

The vapour is then cooled to make it _____ .

(2)

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

Figure 2

Pure metal   **Mixture of metals**
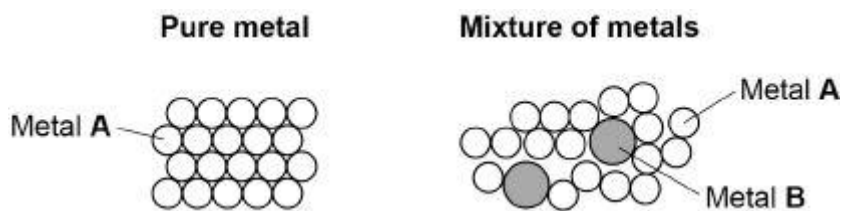
(d) Calculate the percentage of metal B atoms in the mixture of metals shown in **Figure 2**.

_____

_____

_____

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

(2)

(e) What is a mixture of metals called?

Tick **one** box.

An alloy   ☐

A compound   ☐

A molecule   ☐

A polymer   ☐

(1)

(f) Why is the mixture of metals in **Figure 2** harder than the pure metal?

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)

(g)   A nanoparticle of pure metal **A** is a cube.

Each side of the cube has a length of 20 nm.

Figure 3 shows the cube.

Figure 3
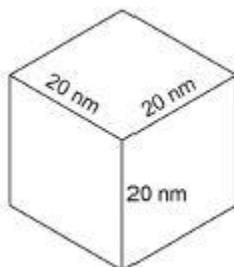
What is the volume of the nanoparticle?

Tick **one** box. **(separate only)**

20 nm^3 ☐

60 nm^3 ☐

400 nm^3 ☐

8000 nm^3 ☐

(1)
(Total 11 marks)

Q12.

This question is about Group 7 elements.

Chlorine is more reactive than iodine.

(a)   Name the products formed when chlorine solution reacts with potassium iodide solution.

_____

_____

(1)

(b)   Explain why chlorine is more reactive than iodine.

_____

_____

_____

_____

_____

_____

(3)

(c)   Chlorine reacts with hydrogen to form hydrogen chloride.

Explain why hydrogen chloride is a gas at room temperature.

Answer in terms of structure and bonding.

_____

_____

_____

_____

_____

_____

(3)

(d)   Bromine reacts with methane in sunlight.

The diagram below shows the displayed formulae for the reaction of
bromine with methane.
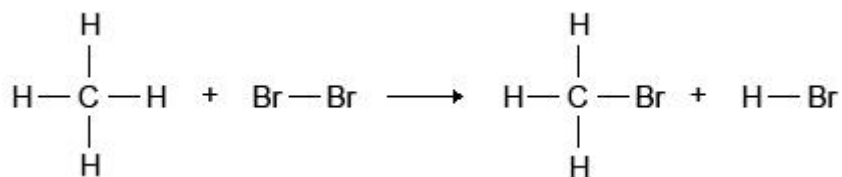
The table below shows the bond energies and the overall energy change in
the reaction.

	C—H	Br—Br	C—Br	H—Br	Overall energy change
Energy in kJ/mol	412	193	**X**	366	−51

Calculate the bond energy **X** for the C—Br bond.

Use the diagram and the table above.

_____

_____

_____

_____

_____

_____

_____

Bond energy **X** = _____ kJ/mol

(4)

(Total 11 marks)

Q13.

This question is about alloys of copper.

(a)   Complete the sentence.

Choose the answer from the box.   **(separate only)**

aluminium	iron	magnesium	tin

Bronze is an alloy of copper and _____.

(1)

Brass is an alloy of copper and zinc.

The table shows the percentage by mass of copper and zinc in two types of brass.

Type of brass	Percentage (%) by mass	
	Copper	**Zinc**
Red brass	90	10
Yellow brass	**X**	30

(b)   Calculate value **X** in the table above. **(separate only)**

_____

Percentage by mass **X** = _____ %

(1)

(c)   Calculate the mass of copper in 1100 g of red brass. **(separate only)**

_____

_____

Mass = _____ g

(2)

(d)   What is meant by an alloy?

_____

_____

(1)

(e)   Brass contains layers of atoms which can slide over each other.

Explain why red brass is softer than yellow brass.

Use the table above and your own knowledge. **(separate only)**

_____

_____

_____

_____

(2)

(f)   Some musical instruments are made of brass.

Parts of these instruments can be gold plated.

What is the carat number of pure gold?

Tick (✓) **one** box. **(separate only)**

9 ☐   18 ☐   22 ☐   24 ☐

(1)
(Total 8 marks)

Q14.

This question is about different substances and their structures.

(a)   Draw **one** line from each statement to the diagram which shows the structure.

                   Statement   **Structure**

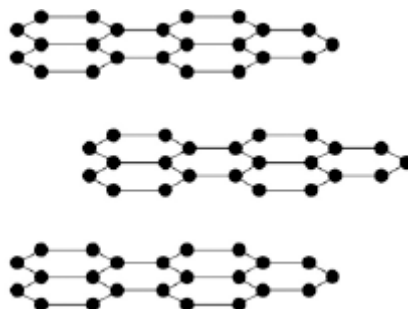|	
The substance is a gas	
The substance is a liquid	
The substance is ionic	
The substance is a solid metal	
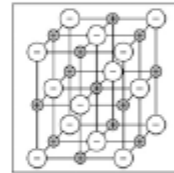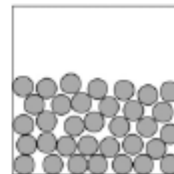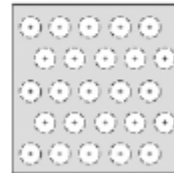
(4)

(b)   **Figure 1** shows the structure of an element.

Figure 1

What is the name of this element?

Tick **one** box.

Carbon   ☐

Chloride   ☐

Nitrogen ☐

Xenon ☐

(1)

(c)   Why does this element conduct electricity?

Tick **one** box.
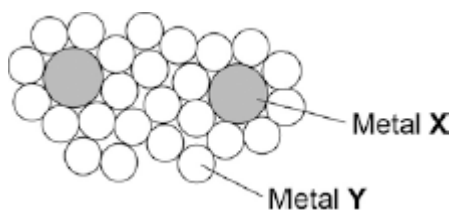
It has delocalised electrons ☐

It contains hexagonal rings ☐

It has weak forces between the layers ☐

It has ionic bonds ☐

(1)

(d)   **Figure 2** shows the structure of an alloy.

Figure 2

Explain why this alloy is harder than the pure metal **Y**.

_____

_____

_____

_____

(2)

(e)   What percentage of the atoms in the alloys are atoms of **X**?

_____

_____

_____

_____

(2)

(f)   What type of substance is an alloy?

Tick **one** box.

Compound   ☐

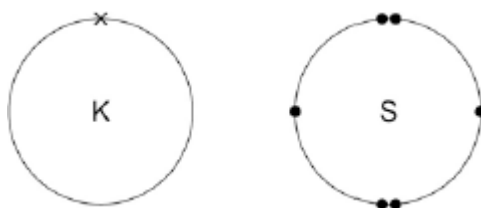Element   ☐

Mixture   ☐

(1)
(Total 11 marks)

Q15.

Figure 1 shows the outer electrons in an atom of the Group 1 element potassium and in an atom of the Group 6 element sulfur.

Figure 1

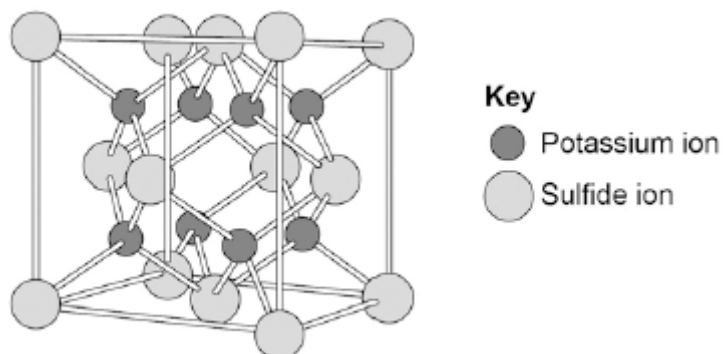(a)   Potassium forms an ionic compound with sulfur.

Describe what happens when **two** atoms of potassium react with **one** atom of sulfur.

Give your answer in terms of electron transfer.

Give the formulae of the ions formed.

_____

_____

_____

_____

_____

_____

_____

_____

_____

(5)

(b)   The structure of potassium sulfide can be represented using the ball and stick model in **Figure 2**.

Figure 2

Key

⬤ Potassium ion

◯ Sulfide ion

The ball and stick model is **not** a true representation of the structure of potassium sulfide.
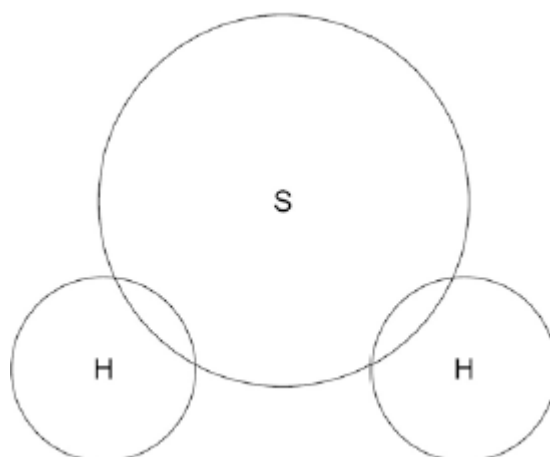
Give **one** reason why.

_____

_____

(1)

(c)   Sulfur can also form covalent bonds.

Complete the dot and cross diagram to show the covalent bonding in a molecule of hydrogen sulfide.

Show the outer shell electrons only.

(2)

(d)   Calculate the relative formula mass (M_r) of aluminium sulfate $Al_2(SO_4)_3$

Relative atomic masses (A_r): oxygen = 16; aluminium = 27; sulfur = 32

_____

_____

_____

Relative formula mass = _____

(2)

(e)   Covalent compounds such as hydrogen sulfide have low melting points
       and do **not** conduct electricity when molten.

       Draw **one** line from each property to the explanation of the property.

	Property	**Explanation of property**

| Electrons are free to move |
| There are no charged particles free to move |

| Low melting point |

| Ions are free to move |

| Weak intermolecular forces of attraction |

| Does not conduct electricity when molten |

| Bonds are weak |

| Bonds are strong |

(2)

(f)   Ionic compounds such as potassium sulfide have high boiling points and
       conduct electricity when dissolved in water.

Draw **one** line from each property to the explanation of the property.

Property　　　　　　　　　　　　　　**Explanation
of property**

| Electrons are free
to move |

| There are no
charged particles
free to move |

| High boiling point |

| Ions are free
to move |

| Weak intermolecular
forces of attraction |

| Conduct electricity
when molten |

| Bonds are weak |

| Bonds are strong |

(2)
(Total 14 marks)

Q16.

This question is about substances containing carbon atoms.

(a)　Diamond is made of carbon atoms.

(i)　Diamond is used for tips of drills.

Figure 1 shows a drill.

Figure 1

© Kershawj/iStock

Give **one** reason why diamond is used for tips of drills.

_____

_____

(1)

(ii)   Diamond nanoparticles can be made.

Use the correct answer from the box to complete the sentence. **(separate only)**

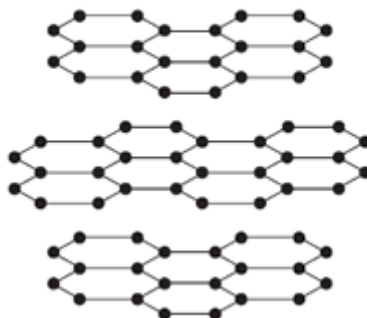| hundred	million	thousand

Nanoparticles contain a few _____ atoms.

(1)

(b)   Graphite is made of carbon atoms.

Figure 2 shows the structure of graphite.

Figure 2

(i)   What type of bonding does graphite have?

Tick (✓) **one** box.

Covalent   ☐

Ionic ☐

Metallic ☐

(1)

(ii)   How many carbon atoms does each carbon atom bond to in graphite?

Tick (✓) **one** box.

1 ☐

2 ☐

3 ☐

4 ☐

(1)

(iii)   What is a property of graphite?

Tick (✓) **one** box.

Dissolves in water ☐

Has a low melting point ☐

Soft and slippery ☐

(1)

(c)   Poly(ethene) is made of carbon and hydrogen atoms.

Poly(ethene) is a thermosoftening polymer.

Figure 3 shows the structure of a thermosoftening polymer.

Figure 3

(i)   Complete the sentence. **(separate only)**

Between the polymer chains in a thermosoftening polymer there

are no _____ .

(1)

(ii)   Use the correct answer from the box to complete the sentence. **(separate only)**

condense	dissolve	melt

Heating would cause a thermosoftening polymer to

_____ .

(1)

(iii)   Many ethene molecules react together to make poly(ethene).

Different types of poly(ethene) can be made by changing the
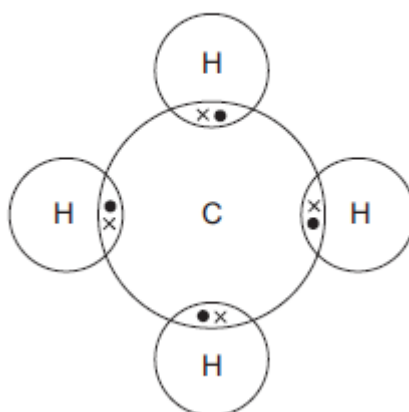conditions for the reaction.
Suggest **two** conditions that could be changed. **(separate only)**

1.
_____

2.
_____

(2)

(d)   **Figure 4** shows how the atoms are bonded in methane.

Figure 4

(i)   What is the formula for methane?

Tick (✓) **one** box.

C$_4$H   ☐

CH₄ ☐

C₄H₄ ☐

(1)

(ii) Methane has a low boiling point.

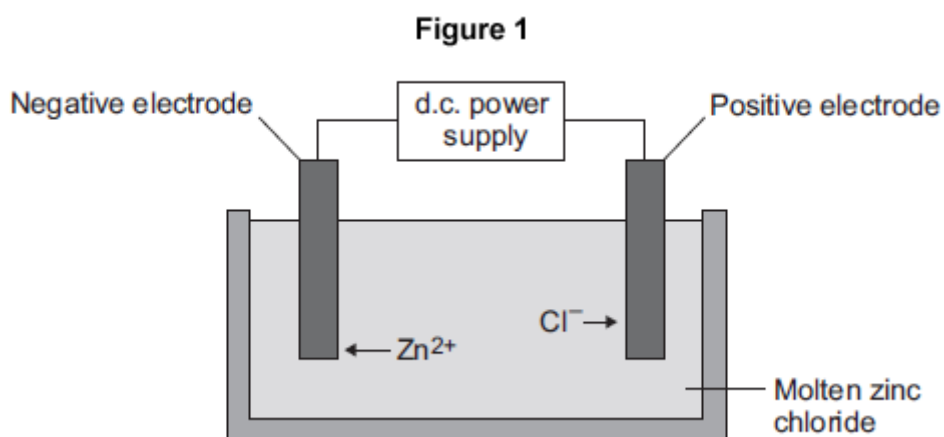What does methane consist of?

Tick (✓) **one** box.

Charged ions ☐

A giant lattice ☐

Small molecules ☐

(1)
(Total 11 marks)

Q17.

This question is about zinc.

Figure 1 shows the electrolysis of molten zinc chloride.

Figure 1

(a) Zinc chloride is an ionic substance.
Complete the sentence.

When zinc chloride is molten, it will conduct _____

(1)

(b) Zinc ions move towards the negative electrode where they gain electrons
to produce zinc.

(i) Name the product formed at the positive electrode.

_____

(1)

(ii)   Explain why zinc ions move towards the negative electrode.

_____

_____

_____

_____

(iii)   What type of reaction occurs when the zinc ions gain electrons?   **(2)**

Tick (✓) **one** box.

Neutralisation   ☐

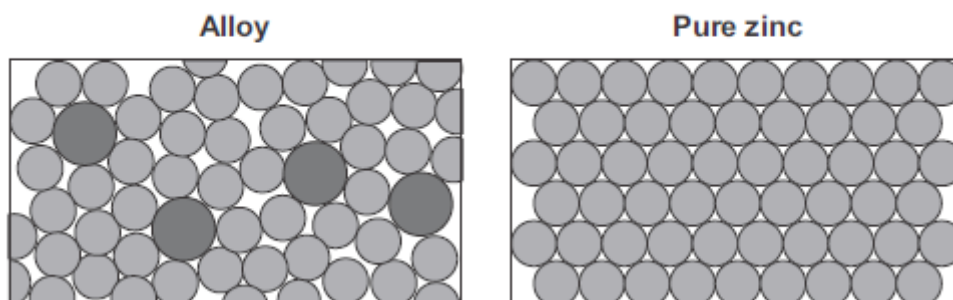Oxidation   ☐

Reduction   ☐

(1)

(c)   Zinc is mixed with copper to make an alloy.

(i)   **Figure 2** shows the particles in the alloy and in pure zinc.

Figure 2

Use **Figure 2** to explain why the alloy is harder than pure zinc.

_____

_____

_____

_____

(2)

      (ii)   Alloys can be bent. Some alloys return to their original shape when heated.

           What name is used for these alloys? **(separate only)**

_____

(1)
(Total 8 marks)