All questions are for both separate science and combined science students

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 + H2O → +

(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)

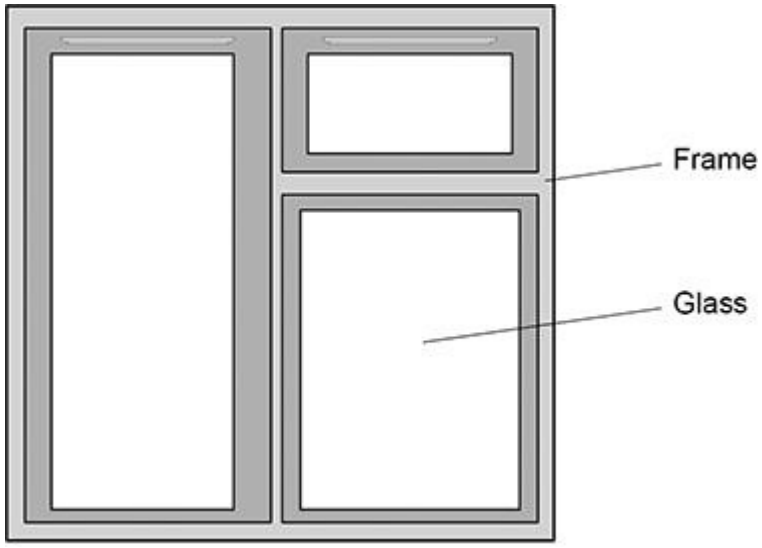
(Total 8 marks)

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/cm3	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.

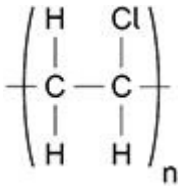
Advantage _____
_____
_____

Reason _____
_____
_____

(2)

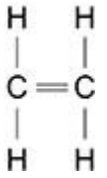
(d) Figure 2 shows the displayed structural formula of poly(chloroethene).

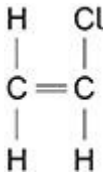
Figure 2

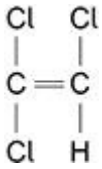


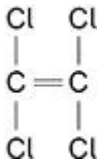
Which monomer is used to make poly(chloroethene)?

Tick (✓) one box.

 ☐

 ☐

 ☐

 ☐

(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 _____ .

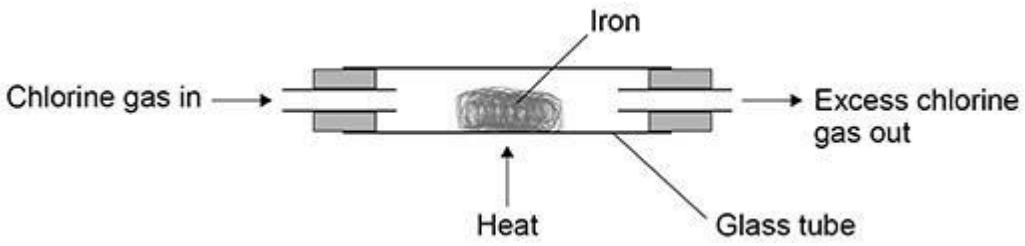
This is because the size of the molecules increases so the intermolecular forces

_____ .

(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.

$$2Fe + \_\_\_\_\_ Br2 \rightarrow 2\ FeBr3$$

(1)

(h) Calculate the relative formula mass (*M*r) of FeBr3

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?

_____

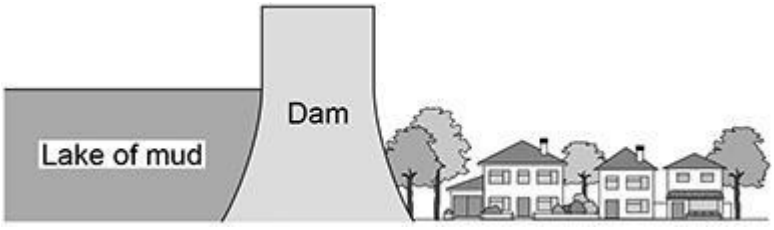
_____

(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 Na3AlF6

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.

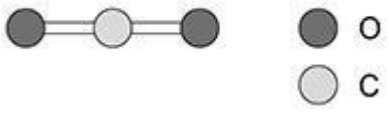
(a) Which two substances have intermolecular forces between particles?

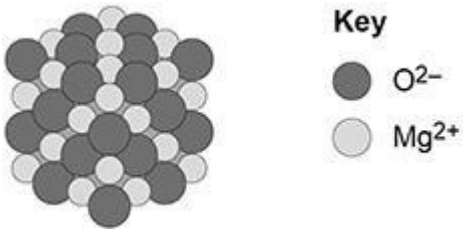
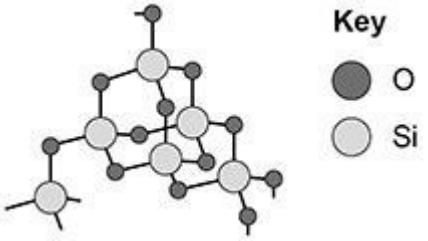
Tick (✓) two boxes.

Diamond	☐
Magnesium	☐
Poly(ethene)	☐
Sodium chloride	☐
Water	☐

(2)

(b) The table below shows the structures of three compounds.

Compound	Structure
Carbon dioxide	

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?

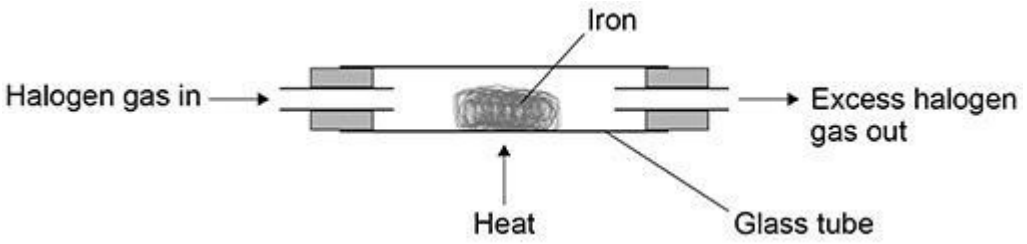
_____

_____

(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.

Aluminium ☐

Tin ☐

Zinc ☐

(1)

(b) Give one use of brass.

_____

_____

(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
- The 50% gold is 12 carat

Table below gives information about two gold rings, A and B contain only gold and silver. Complete A and B. below the table below.

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.

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.

_____

_____

(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.

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.

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.

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.

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.

_____

_____

(1)

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

You should refer to crosslinks in your answer.

_____

_____

(1)

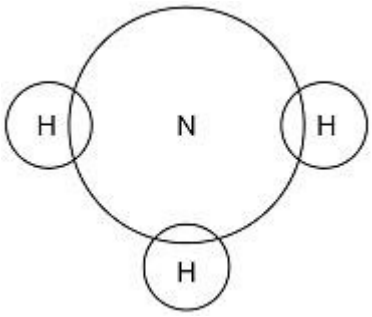
(Total 10 marks)

Q10.

This question is about ammonia, NH3

(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 ☐

Cr2O3 ☐

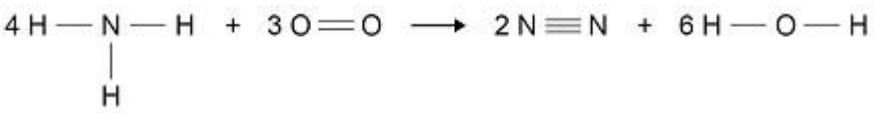
MgO ☐

Na2O ☐

(1)

Figure 2 shows the displayed formula equation for the reaction.

Figure 2



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).

_____

_____

_____

_____

_____

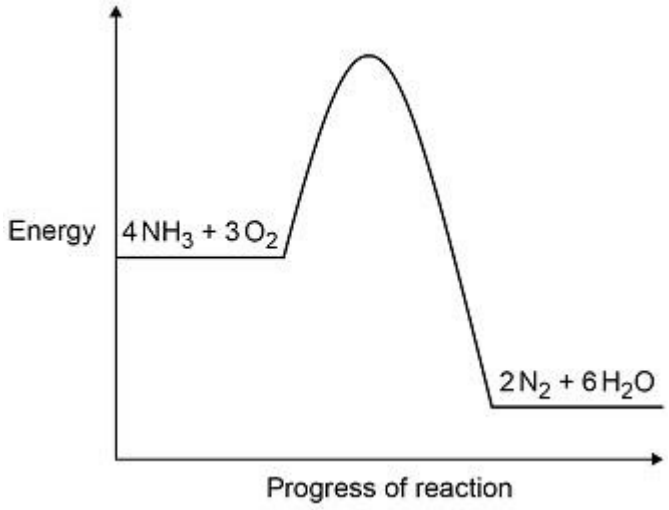
(2)

(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

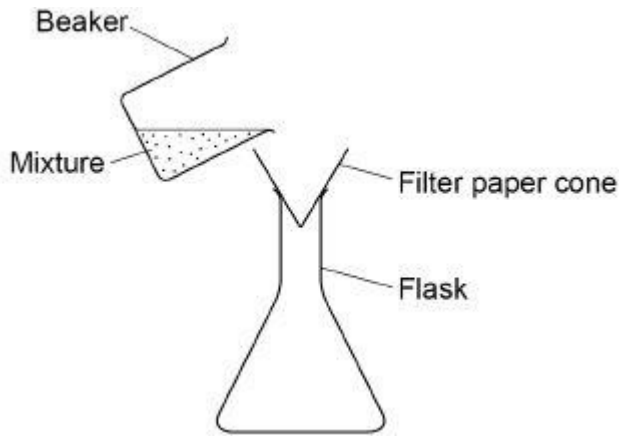
Salt from sea water	Electrolysis
The different colours in black ink	Filtration
	Fractional distillation

(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

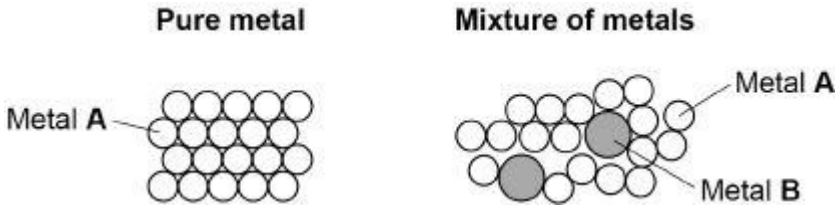
In simple distillation, the mixture is heated to make the liquid _____ .

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



(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. ☐

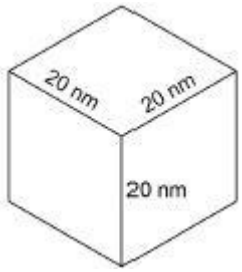
(1)

(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.

20 nm3 ☐

60 nm3 ☐

400 nm3 ☐

8000 nm3 ☐

(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.

_____

_____

_____

_____

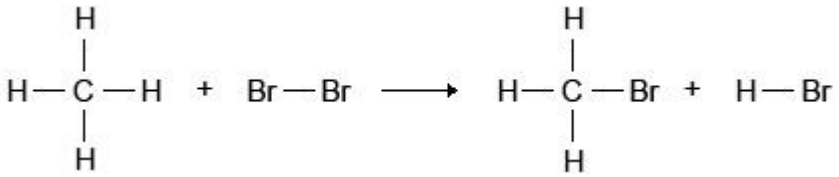
_____

_____

(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.

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.

_____

Percentage by mass X = _____ %

(1)

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

_____

_____

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.

_____

_____

_____

_____

(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.

9 ☐ 18 ☐ 22 ☐ 24 ☐

(1)

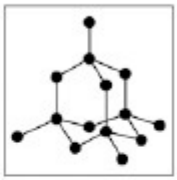
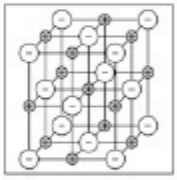
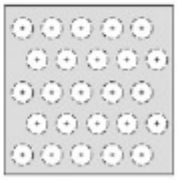
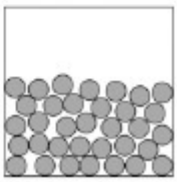
(Total 8 marks)

Q14.

This question is about different substances and their structures.

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

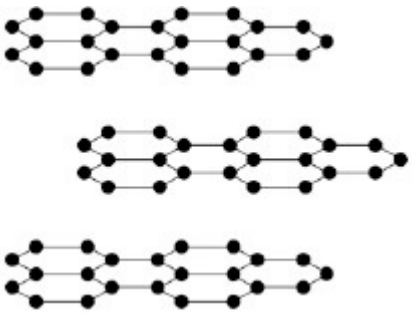
Statement	Structure

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 ☐

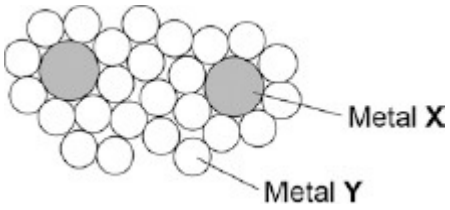
It has weak forces between the layers ☐

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 ☐

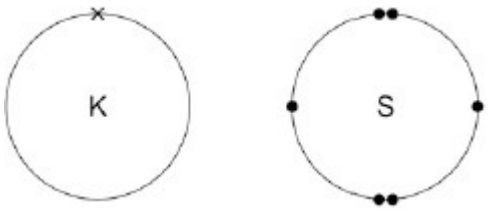
(1)

(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.

_____

_____

_____

_____

_____

_____

_____

_____

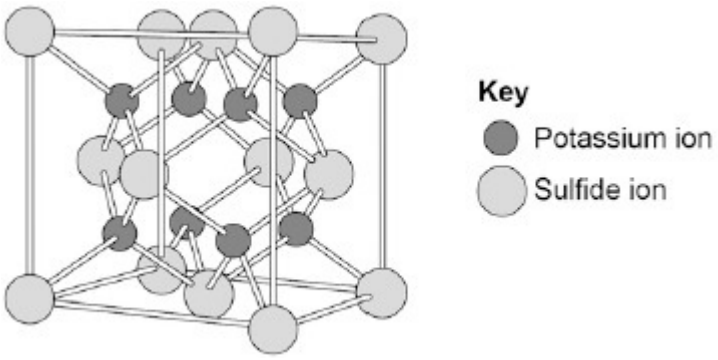
_____

_____

(5)

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

Figure 2



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

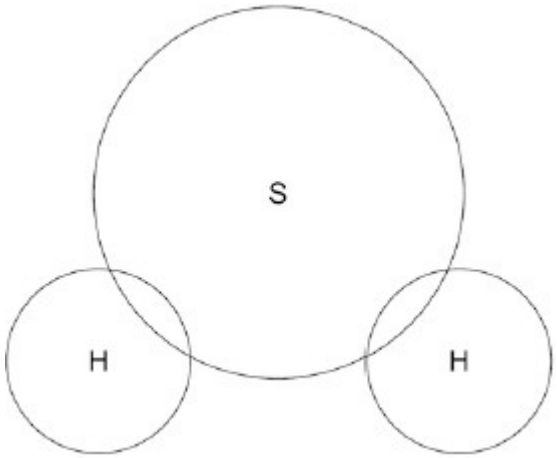
_____

_____

(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 Al2(SO4)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
Low melting point	There are no charged particles free to move
Does not conduct electricity when molten	Ions are free to move
	Weak intermolecular forces of attraction
	Electrons are free to move
	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
High boiling point	Electrons are free to move
Conduct electricity when molten	There are no charged particles free to move
	Ions are free to move
	Weak intermolecular forces of attraction
	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

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.

hundred	million	thousand

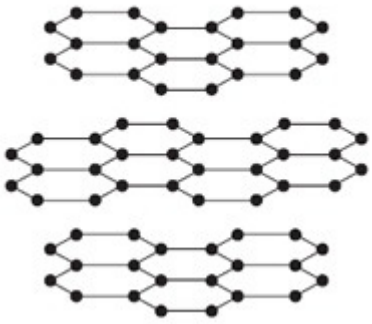
Nanoparticles contain a few _____ atoms.

(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 ☐

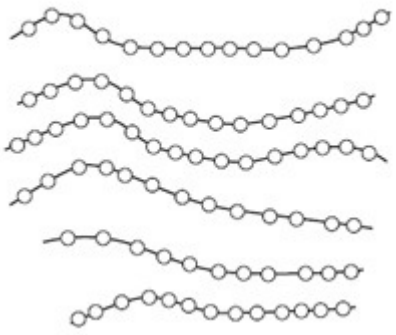
(1)

(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.

Between the polymer chains in a thermosoftening polymer there are no _____ .

(1)

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

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.

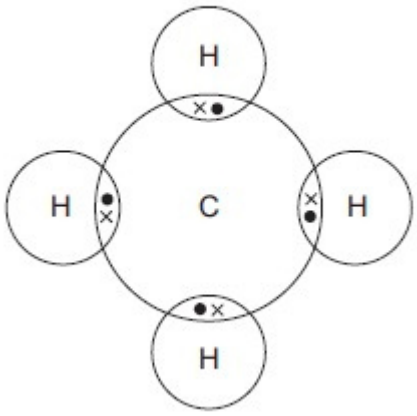
1. _____

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.

C4H ☐

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)

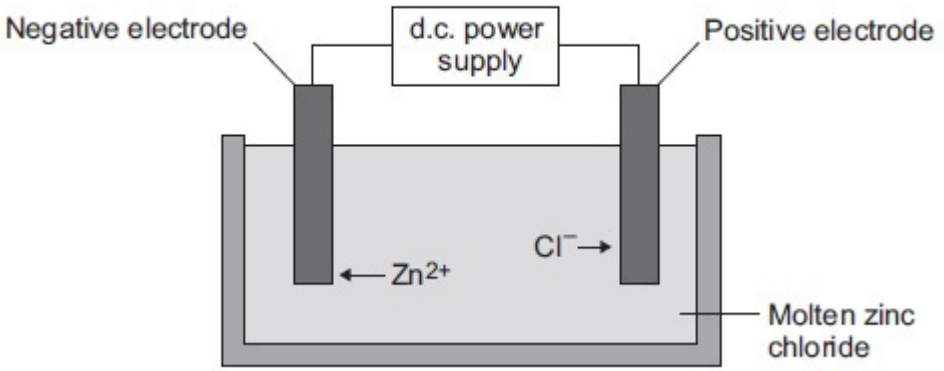
(Total 11 marks)

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.

_____

_____

_____

_____

_____

(2)

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

Tick (✓) one box.

Neutralisation ☐

Oxidation ☐

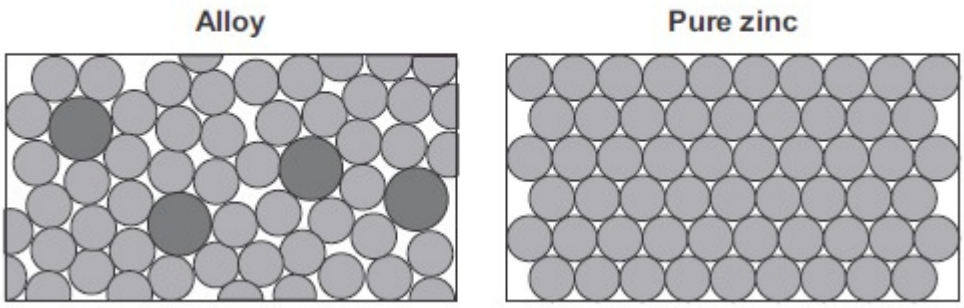
Reduction ☐

(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?

_____
_____

(1)

(Total 8 marks)