

Q1. Sodium reacts with water to produce hydrogen gas and a solution of sodium hydroxide.

Complete the **word** equation for this reaction (do **not** use symbols or formulae).

..... + +

(Total 3 marks)

Q2. The diagram shows part of the periodic table.

Group 1		Group 2				Group 3	Group 4	Group 5	Group 6	Group 7	Group 0
23 sodium 11	24 magnesium 12					27 aluminium 13	28 silicon 14	31 phosphorous 15	32 sulphur 16	35 chlorine 17	40 argon 18

Choose from the elements shown in the table:

(a) one metal

(1)

(b) a noble gas

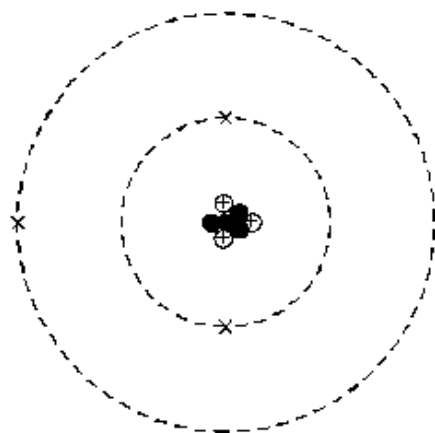
(1)

(c) a coloured gas

(1)

(Total 3 marks)

Q3. The diagram shows the structure of a lithium atom.




KEY

⊕ = proton

× = electron

(a) (i) What is represented by ●.....

(ii) What is represented by .....

(2)

(b) What is the symbol for lithium?

(1)

(Total 3 marks)

Q4. Choose words from this list to complete the sentences below.

carbonate chloride compound mixture oxide solution

(a) When two elements react, the new substance formed is called a

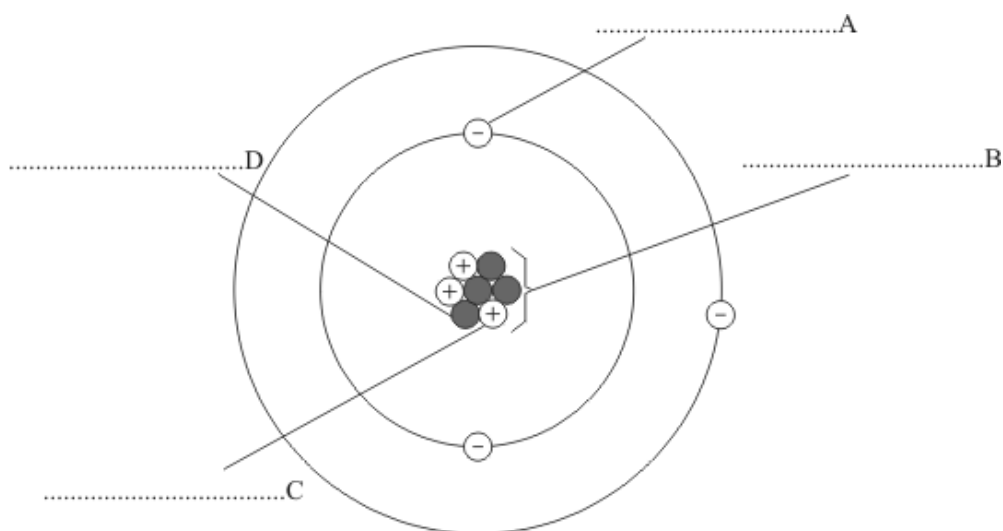
(1)

(b) The white powder formed when zinc reacts with oxygen is called zinc

(1)

(Total 2 marks)

Q5. The diagram shows an atom.



(a) On the diagram, write the names of structures **A**, **B**, **C** and **D**.

(4)

(b) To which Group of the periodic table does this atom belong?

.....

Give **one** reason for your answer.

.....

.....

(2)

- (c) Name the element which is made up of this type of atom.

.....

(1)
(Total 7 marks)

- Q6.** (a) Helium is used to fill party balloons.

Which **two** of the following are properties that make helium suitable for filling party balloons?

Place a tick (✓) in the box against each suitable property.

Coloured

☐

Exists as individual atoms

☐

Less dense than air

☐

Poor conductor of heat

☐

Very unreactive

☐

(2)

- (b) The table shows the names of some gases.

Use the correct formulae from the box to complete the table. The first one has been done for you.

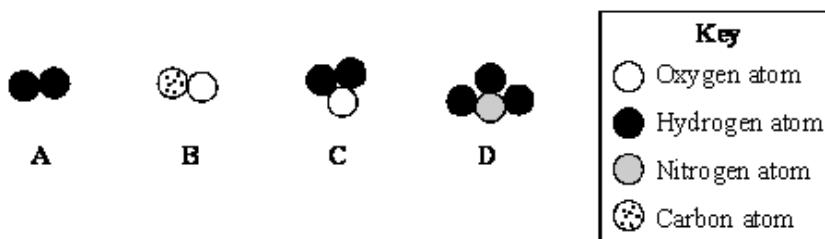
CH ₄	CO ₂	H ₂	HCl	NH ₃	O ₂
-----------------	-----------------	----------------	-----	-----------------	----------------

Gas	Formula
Oxygen	O ₂
Carbon dioxide	
Hydrogen chloride	
Ammonia	

(3)
(Total 5 marks)

Q7. The periodic table on the Data Sheet might help you to answer this question.

Diagrams **A – D** show models of four different molecules.



Complete the table to give the name and the formula of each of the molecules **A – D**.

The first one has been done for you.

Molecule	Name	Formula
A	Hydrogen	H ₂
B		
C		
D		

(Total 6 marks)

##

Sando-K is a medicine. It is given to people whose bodies contain too little of a particular element.

Sando-K is a mixture of two compounds. The formulae of the two compounds are given below.



(a) Use the Data Sheet to help you to name all the elements in these compounds.

.....

.....

.....

.....

(3)

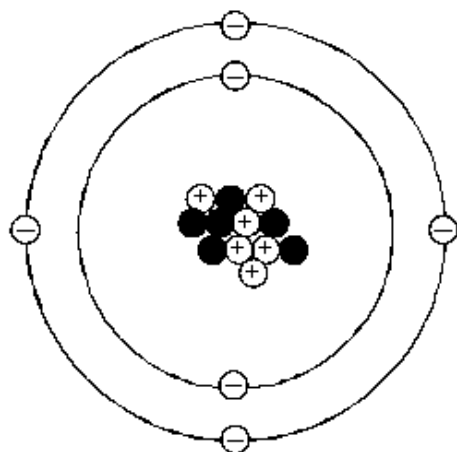
(b) Which metal do people given Sando-K need?

.....

(1)

(Total 4 marks)

- Q9.** About 100 years ago a scientist called J. J. Thomson thought that an atom was a ball of positive charge with negative particles stuck inside. Today a different model is used. The diagram shows how an atom of carbon is represented by this model.



(a) The negative particles \ominus are called electrons.

(i) What is the name of the positive particles \oplus ?

.....

(1)

(ii) What particle is represented by \bullet ?

.....

(1)

(iii) What is the central part of the atom called that contains both \oplus and \bullet ?

.....

(1)

(b) Use the model to explain why the six electrons are arranged as shown.

.....

.....

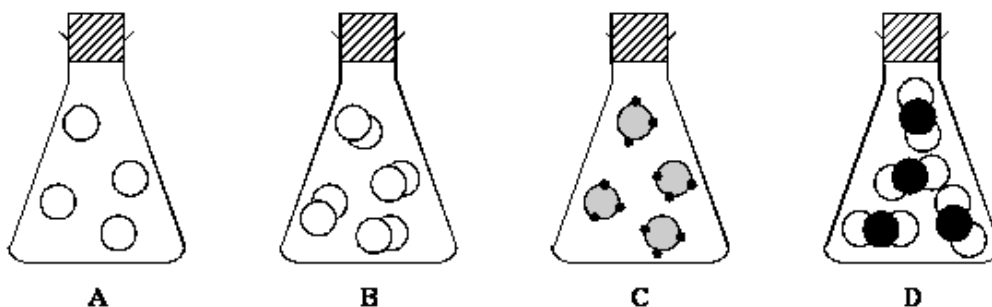
.....

.....

(2)

(Total 5 marks)

Q10. In the flasks are the particles of four different gases. (Each circle represents an atom.)



(a) Which diagram represents

(i) oxygen, O_2

(1)

(ii) steam, H_2O

(1)

(b) The gases in **A** and **B** are elements and the gases in **C** and **D** are compounds. Explain why.

.....

.....

.....

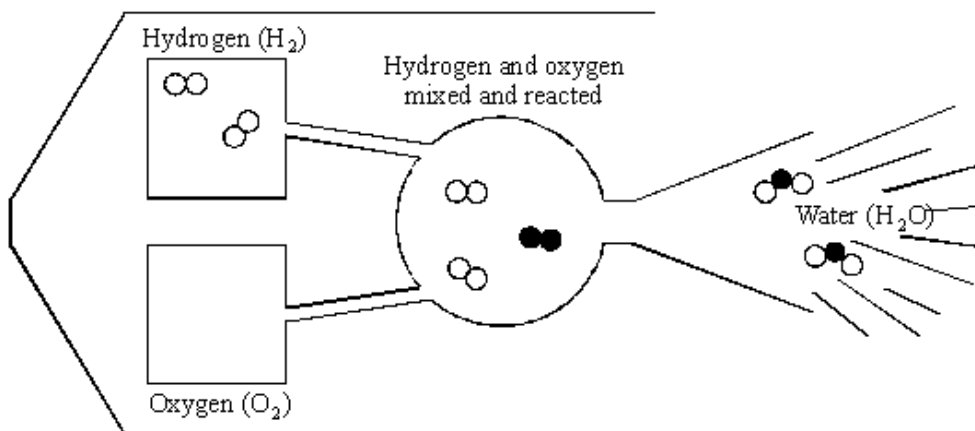
.....

.....

(3)

(Total 5 marks)

Q11. The diagram shows the reaction of hydrogen molecules with oxygen molecules to form water molecules.



(i) In the empty box draw **one** oxygen molecule.

(1)

(ii) Why are hydrogen and oxygen called elements?

.....
.....

(1)

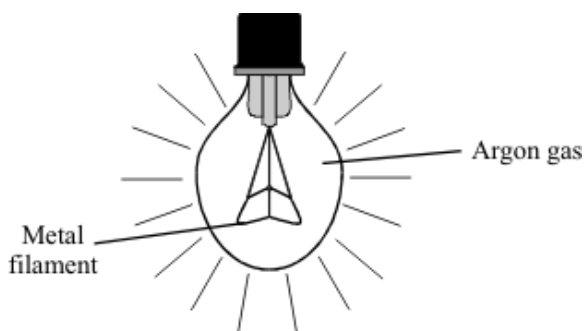
(iii) Why is water called a compound?

.....
.....

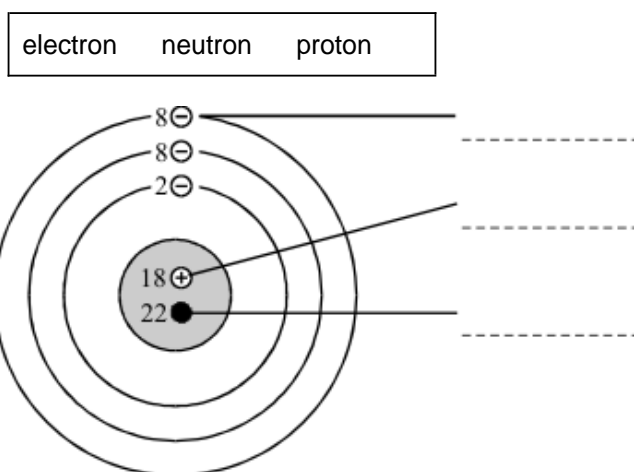
(2)

(Total 4 marks)

Q12. The diagram shows a light bulb.



(a) (i) An argon atom has the structure shown. Use the words in the box to label the particles in the atom. Each word should only be used **once**.



(2)

(ii) Argon is unreactive. Why?

.....
.....

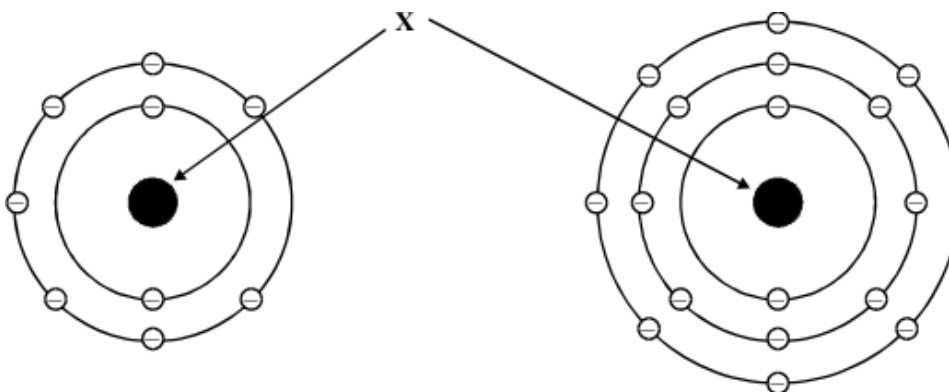
(1)

- (b) Oxygen would **not** be a suitable gas to use in a light bulb. Explain why.

.....
.....

(2)
(Total 5 marks)

- Q13.** The diagrams show the electronic arrangement of the atoms of two elements.



- (i) Name the part of the atoms labelled **X**.

.....

(1)

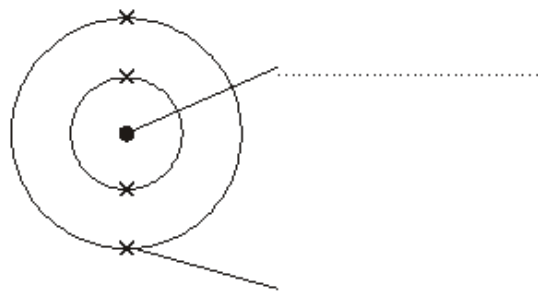
- (ii) Why are these two elements in the same group of the Periodic Table?

.....
.....

(1)
(Total 2 marks)

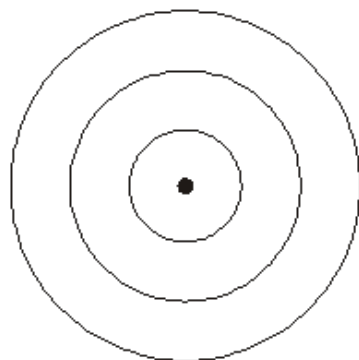
- Q14.** (a) The diagram represents an atom of beryllium. Use words from the box to label the diagram.

electron	ion	isotope	molecule	nucleus
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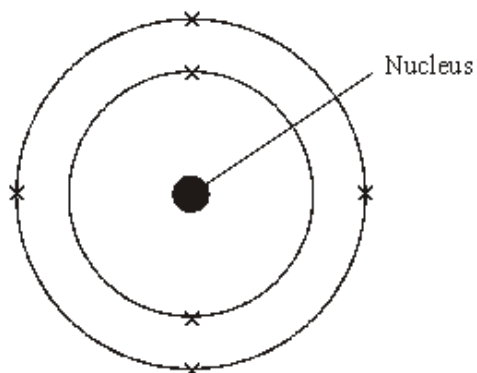
(2)

- (b) Use crosses (x) to complete the diagram to show the electronic structure of a magnesium atom. The atomic (proton) number of magnesium is 12.



(2)
(Total 4 marks)

- Q15.** The diagram represents the electronic structure of an atom of an element.



The periodic table on the Data Sheet may help you with this question.

(a) Name this element.

.....

(1)

(b) Complete this sentence.

The nucleus of an atom contains neutrons and

(1)

(Total 2 marks)

Q16. John Dalton wrote these statements in 1808.

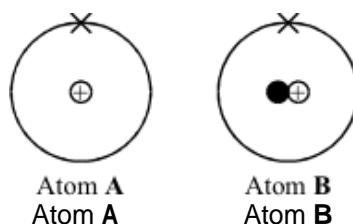
- “All substances are made of a vast number of extremely small particles called atoms.”
- “Every particle of water is like every other particle of water, every particle of hydrogen is like every other particle of hydrogen, etc.”

(a) “Every particle of water is like every other particle of water.” Use Dalton's ideas and your knowledge of water to explain why.

.....
.....
.....
.....

(2)

(b) Dalton thought that all atoms of an element are exactly the same. We now know that it is possible to have atoms of the same element but with different mass numbers. The diagrams represent two atoms of hydrogen.



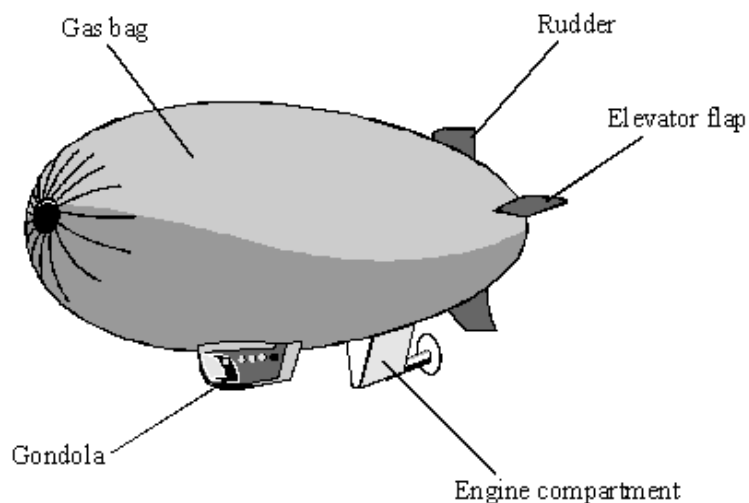
State, in terms of particles, how these two atoms are different.

.....
.....

(1)

(Total 3 marks)

Q17. The drawing shows an airship that was used about 80 years ago.



- (a) The gas bag was filled with hydrogen. A leak from the gas bag could be very dangerous. Use your knowledge of the reactions of hydrogen to explain why.

.....

.....

.....

.....

(2)

- (b) Modern airships are filled with helium.

- (i) What property makes both hydrogen and helium suitable for use in airships?

.....

.....

(1)

- (ii) Helium is safer than hydrogen for use in airships. Explain why. You should use the position of helium in the periodic table in your answer.

.....

.....

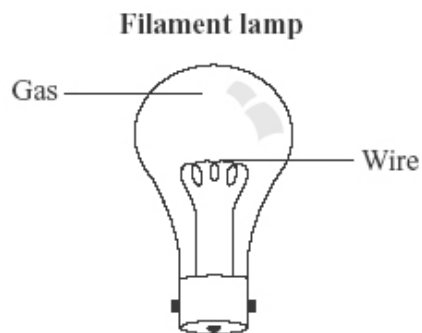
.....

.....

(2)

(Total 5 marks)

- Q18.** When electricity passes through a thin wire, the wire gets hot. If the wire gets very hot, it may glow. This idea is used in filament lamps.



- (a) The table shows some metals and their melting points.

Metal	Melting point in °C
Aluminium	660
Copper	1084
Iron	1540
Tungsten	3410

Which metal in the table should be used to make the wire in a filament lamp?

Give a reason for your answer.

.....

.....

.....

.....

(2)

- (b) The table shows some gases.

Gas
Argon
Carbon dioxide
Oxygen
Sulfur dioxide

Which gas in the table should be used in a filament lamp?

Give a reason for your answer.

.....

.....

.....

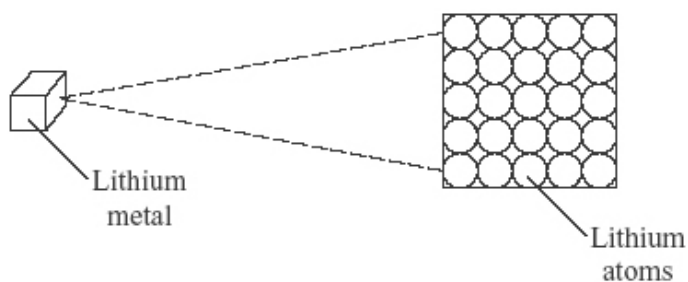
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(2)

(Total 4 marks)

Q19. Lithium metal is used in alkaline batteries.

- (a) The diagram shows the atoms in lithium metal.



Why is lithium metal described as an element?

.....

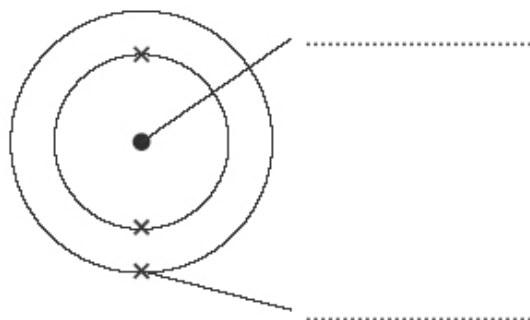
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(1)

- (b) The diagram below represents a lithium atom.

Choose words from the box to label parts of the atom.

bond	electron	molecule	nucleus
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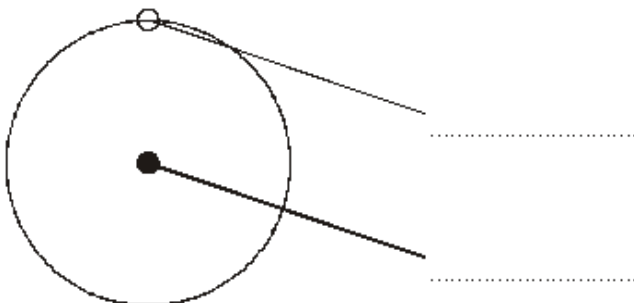
(2)
(Total 3 marks)

Q20. Hydrogen is an element.

- (a) The diagram shows the parts of a hydrogen atom.

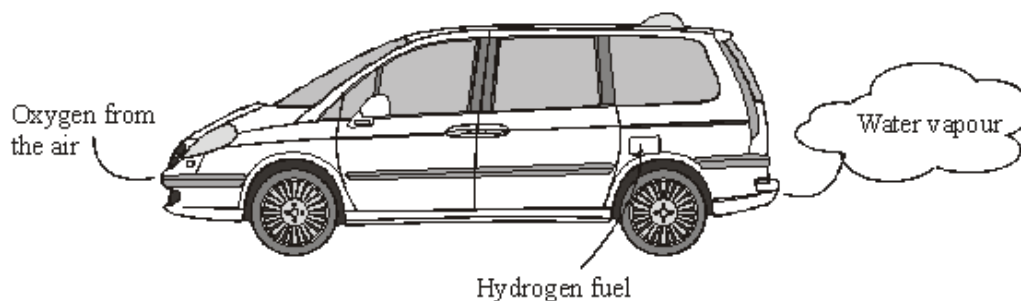
Use words from the box to label the diagram.

electron	group	nucleus	symbol
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(2)

- (b) Hydrogen can be used as a *clean fuel* for cars.



- (i) When hydrogen burns in air, it reacts with another element.

Complete the word equation for this reaction.

hydrogen + → water

(1)

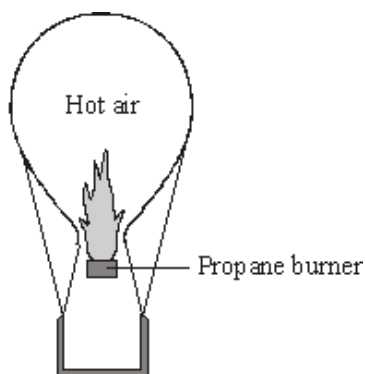
- (ii) Suggest **one** reason why hydrogen is called a *clean fuel*.

.....

(1)

(Total 4 marks)

- Q21.** Hot air balloons burn hydrocarbons to heat the air.



- (a) The hot air contains these gases: nitrogen, N₂
 oxygen, O₂
 argon, Ar
 carbon dioxide, CO₂
 water vapour, H₂O

- (i) Argon is an *element*.

What is an *element*?

.....

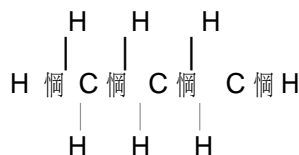
(1)

(ii) Name **one** other gas in the hot air that is also an element.

.....

(1)

(b) Propane, C_3H_8 , can be represented as:



Use the correct words from the box to complete the sentences.

bond	carbon	compound	element	mixture
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(i) Propane is a and is made up of atoms of hydrogen and

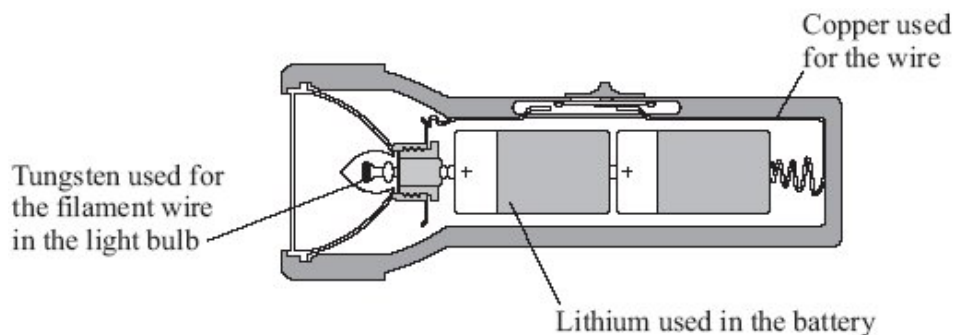
(2)

(ii) Each line between the atoms in propane represents a chemical

(1)

(Total 5 marks)

Q22. The diagram shows a circuit that is used in a torch. Electrons flow through this circuit.

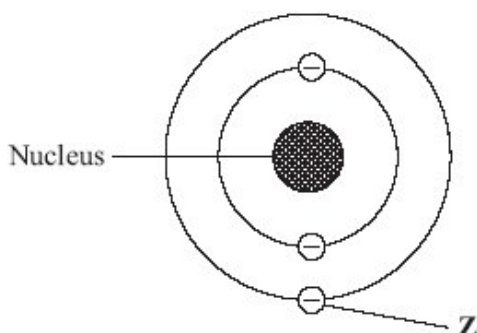


(a) Why is copper used for the wire?

.....

(1)

- (b) The diagram shows the structure of an atom of lithium.



Name the particle labelled **Z**.

.....

(1)

- (c) The table shows some properties of the metals used in the electrical circuit.

Metal	Melting point in °C	Boiling point in °C	Reaction with oxygen
Copper	1083	2582	Reacts slowly to form a thin oxide layer on surface
Lithium	179	1317	Reacts rapidly to form oxide
Tungsten	3370	5930	Reacts only when very hot to form oxide

- (i) Use information from the table to suggest the order of reactivity for copper, lithium and tungsten.

most reactive

.....

least reactive

(2)

- (ii) The filament wire glows because it gets very hot.

Use information from the table to suggest **one** reason why tungsten is used for the filament wire in the light bulb.

.....

.....

(1)

- (d) The gas used in the light bulb is argon.

Draw a ring around the correct word in the box to complete the sentence.

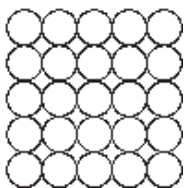
Argon is used in the light bulb because it is

dense.
solid.
unreactive.

(1)
(Total 6 marks)

Q23. Iron is the main structural metal used in the world.

- (a) The diagram represents the particles in iron, Fe.



Draw a ring around the correct word in the box to complete the sentence.

Iron is described as an element because all the

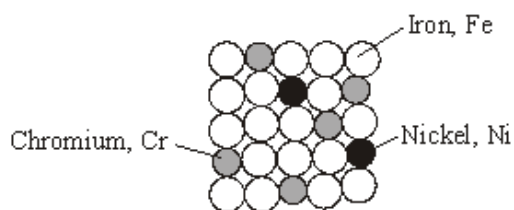
atoms
compounds
metals

are the same.

(1)

- (b) Stainless steel is mostly iron.

The diagram represents the particles in stainless steel.



Use the correct words from the box to complete the sentences about alloys.

metal	mixture	molecule	polymer	smart	structure
-------	---------	----------	---------	-------	-----------

Stainless steel is an alloy because it is a of iron, chromium and nickel.

An alloy is made up of more than one type of

Stainless steel alloys are harder than iron because the different sized atoms added change

the

An alloy that can return to its original shape after being deformed is called a

..... alloy.

(4)

- (c) In the UK, we use about 1.8 billion steel cans every year but only 25% are recycled. Used steel cans are worth about £100 per tonne.

Recycling saves raw materials and reduces waste that would end up in landfill. Producing steel by recycling used cans saves 75% of the energy that would be needed to produce steel from iron ore. This also reduces carbon dioxide emissions.

- (i) Give **two** reasons, from the information above, to explain why recycling used steel cans is a good idea.

1

.....

2

.....

(2)

- (ii) Suggest how the local council could increase the percentage of used steel cans that are recycled.

.....

.....

(1)

(Total 8 marks)

Q24. A substance made of only one type of atom is called an element.

The chemical symbols and positions of six elements in the periodic table are shown.

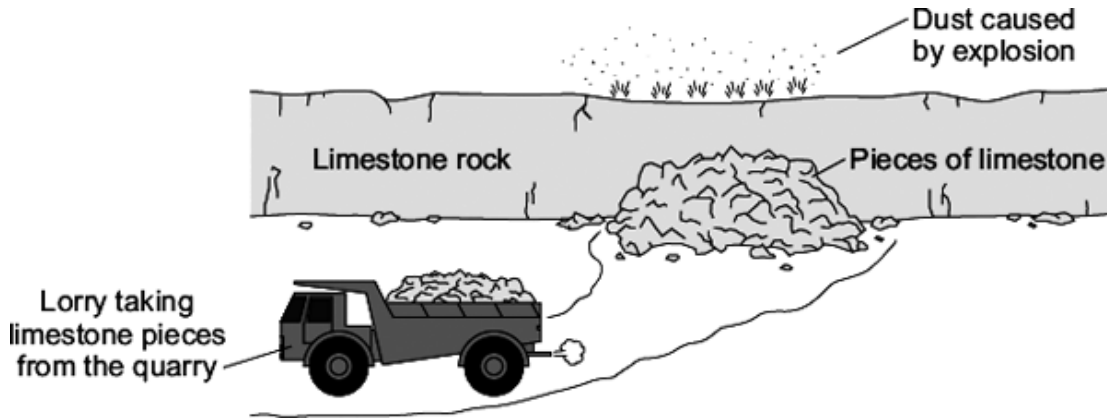
[illegible]

Draw a straight line from each description to its correct symbol.

Description	Symbol
A metal with a low density that does not corrode easily	Al
It has properties similar to those of sodium, Na	Fe
It is a transition metal	He
It is a noble gas	Li
	O

(Total 4 marks)

- Q25.** In a quarry, limestone is blasted into pieces by explosives.
The pieces of limestone are taken from the quarry by lorries.



- (a) Draw a ring around the correct word in the box to complete the sentence.

Limestone can be used as a

building
plastic
smart

 material.

(1)

- (b) Tick (✓) **one** possible advantage for people who live near to the limestone quarry.

Advantage	Tick (✓)
causes more traffic	
provides jobs	
attracts tourists to the area	

(1)

- (c) Give **two** types of pollution that would be caused by the limestone quarry.

1

2

(2)

- (d) Limestone contains calcium carbonate (CaCO_3).

Complete the **two** empty boxes in the table about the formula of calcium carbonate.

Name of element	Symbol for the element	Number of atoms in the formula
calcium	Ca	1
carbon	C	1
oxygen

(2)

- (e) Lorries take some of the limestone to be heated in a lime-kiln.
Calcium carbonate, in the limestone, decomposes when heated.

Use the balanced chemical equation to help you complete the word equation for the decomposition of calcium carbonate.



(1)

(Total 7 marks)

Q26. Natural gas is mainly a hydrocarbon called methane.

- (a) Use **one** word from the box to complete the sentence.

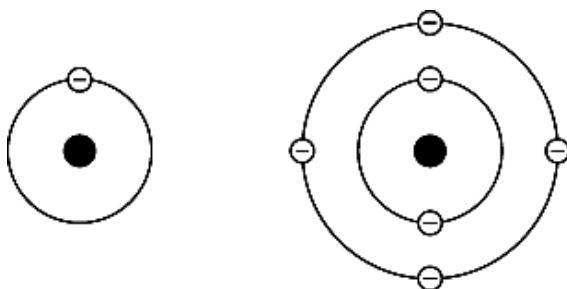
compounds	elements	molecules
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Hydrocarbons contain hydrogen and carbon only.

Hydrogen and carbon are

(1)

- (b) The diagrams represent atoms of hydrogen and carbon.



Hydrogen

Carbon

Draw a ring around the correct answer to complete the sentences.

- (i) The centre of each atom is called the

bond.
nucleus.
symbol.

(1)

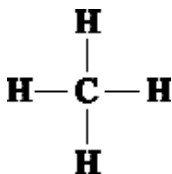
- (ii) The hydrogen atom has one electron and the carbon atom has

three
four
six

electrons.

(1)

- (c) A molecule of methane can be represented as



Draw a ring around the correct answer to complete the sentences.

- (i) The formula of methane is

CH
CH₄
C H₄

(1)

- (ii) The line between C—H is called a

bond.
molecule.
nucleus.

(1)

(d) Methane burns to produce carbon dioxide (CO_2) and water (H_2O).

(i) Draw a ring around the correct answer to complete the sentence.

When methane burns it reacts with

carbon.
nitrogen.
oxygen.

(1)

(ii) Hydrogen (H_2) can be used as a fuel.

Suggest why burning hydrogen would be less harmful to the environment than burning methane.

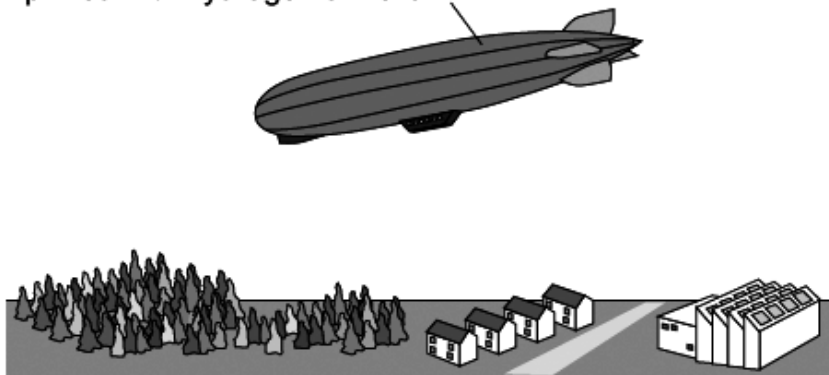
.....
.....

(1)

(Total 7 marks)

Q27. Hydrogen and helium have both been used in airships.

Airship filled with hydrogen or helium



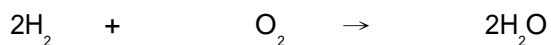
(a) Tick (✓) the property which both hydrogen and helium have that makes an airship float in air.

Property	Tick (✓)
Colourless	
Less dense than air	
More dense than air	

(1)

- (b) (i) Hydrogen is no longer used in airships because it burns in oxygen.

The chemical equation for this reaction is shown.



Complete the word equation for this reaction

hydrogen + oxygen →

(1)

- (ii) Helium is safer than hydrogen because it does **not** burn in oxygen.

Draw a ring around the correct answer to complete the sentence.

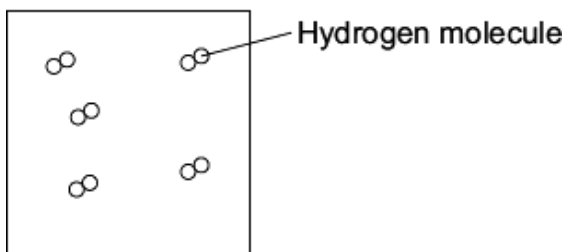
Helium is now used in airships because it is

a fuel.
already in the air.
unreactive.

(1)

- (c) **Diagram 1** represents hydrogen molecules.

Diagram 1



Draw a ring around the correct answer to complete the sentence.

Each hydrogen molecule is made up of two hydrogen

atoms.
compounds.
elements.

(1)

(d) **Diagram 2** shows the parts of a helium atom.

Use words from the box to label **diagram 2**.

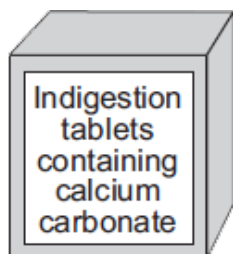
bond	electron	nucleus
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Diagram 2

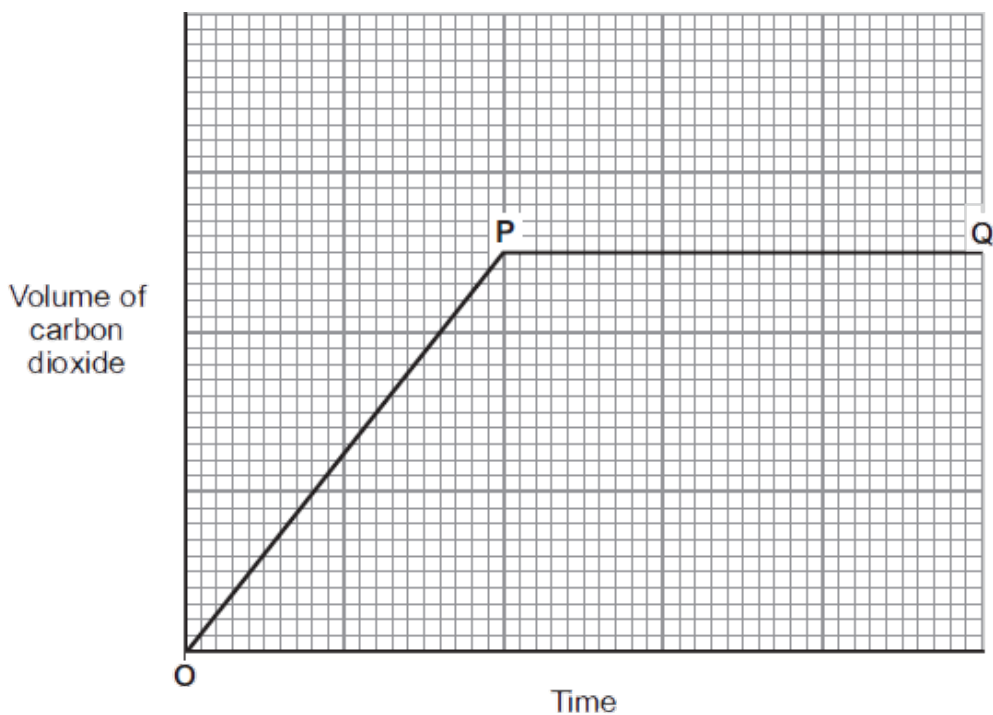


(2)
(Total 6 marks)

- Q28.** Human stomachs contain hydrochloric acid.
 Stomach ache can be caused by too much acid in the stomach.
 Indigestion tablets can be used to reduce the amount of acid in the stomach.



- (a) The graph shows how the volume of carbon dioxide produced changes with time, after some calcium carbonate is added to hydrochloric acid.



- (i) Complete the sentence to explain what happens between **O** and **P**.

Between **O** and **P** the calcium carbonate and hydrochloric acid

(1)

- (ii) Complete the sentence to explain what happens at **P**.

At **P** the calcium carbonate and hydrochloric acid

because

(2)

- (iii) Describe the test for carbon dioxide gas.

Test

Result of the test

(2)

- (b) Calcium carbonate is found in limestone.
Limestone is removed from the ground by quarrying.



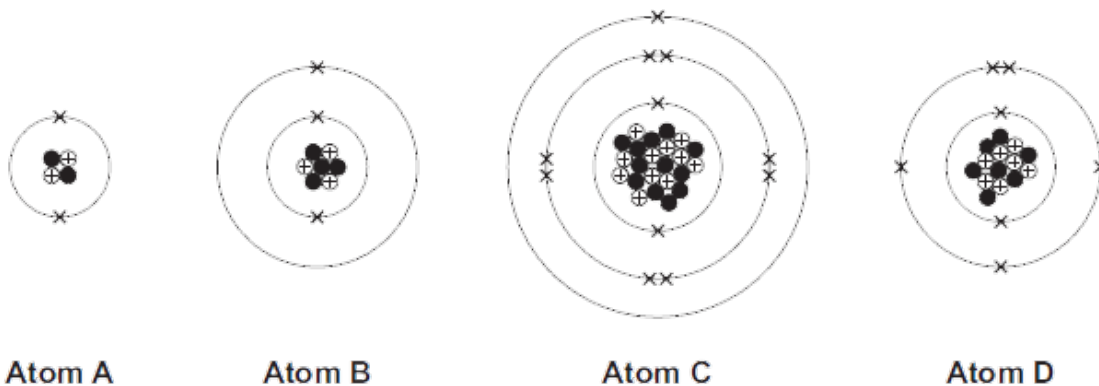
Photograph supplied by Stockbyte/Thinkstock

Tick (✓) **one** advantage and tick (✓) **one** disadvantage of quarrying limestone.

Statement	Advantage Tick (✓)	Disadvantage Tick (✓)
Quarrying limestone destroys the shells and skeletons of marine organisms that formed the limestone.		
Quarrying limestone releases dust, and lorries release carbon dioxide from burning diesel fuel.		
Quarrying limestone provides building materials, employment and new road links.		
Quarrying limestone removes ores from the ground.		

(2)
(Total 7 marks)

Q29. The diagrams show the sub-atomic particles in four different atoms.



Use the Chemistry Data Sheet to help you to answer these questions.

(a) Draw a ring around the correct answer to complete each sentence.

(i) The centre of each atom is called the

energy level.
molecule.
nucleus.

(1)

(ii) The centre of each atom contains neutrons and

bonds.
electrons.
protons.

(1)

(b) Complete the sentence.

There is no overall electrical charge on each atom because the
number of is equal to the number of

(1)

(c) What is the name of the element represented by atom **D**?

(1)

(d) Which **two** of the atoms, **A**, **B**, **C** and **D**, are in the same group of the periodic table?

Give a reason for your answer.

Atom and atom

Reason

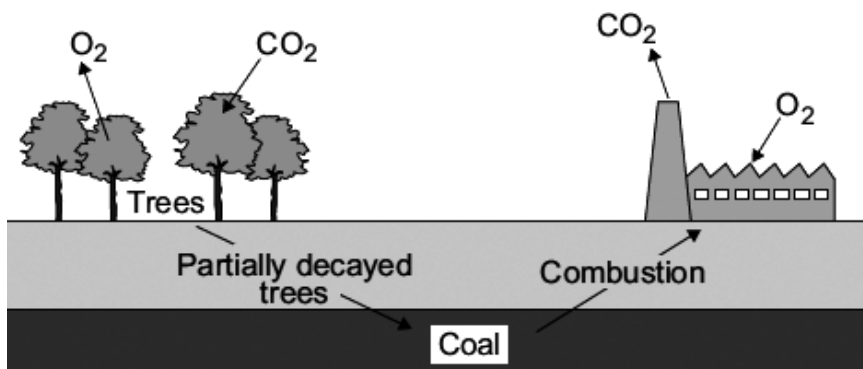
.....

(2)
(Total 6 marks)

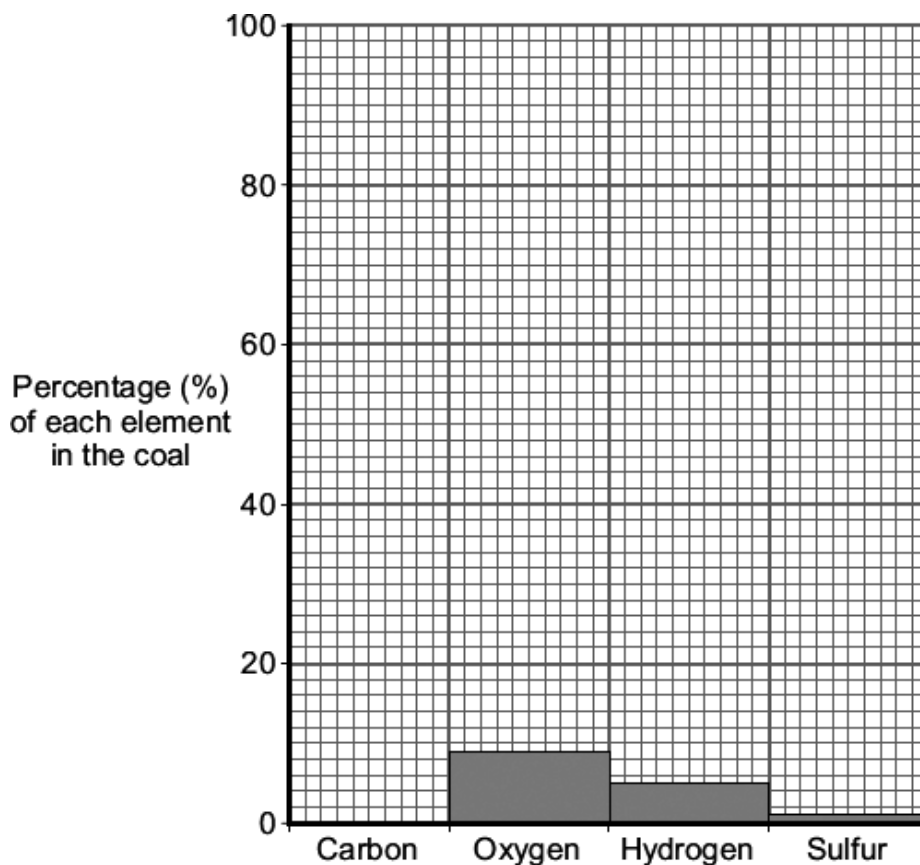
Q30. About 3000 million years ago carbon dioxide was one of the main gases in the Earth's early atmosphere.

About 400 million years ago plants and trees grew on most of the land. When the plants and trees died they were covered by sand and slowly decayed to form coal.

Today coal is burned in power stations to release the energy needed by industry.



(a) The bar chart shows the percentage of some of the elements in this coal.



(i) This coal contains 85 % carbon. Draw the bar for carbon on the chart.

(1)

- (ii) Coal is burned in the atmosphere to release energy.
Two of the products of burning coal are shown.

Draw **one** line from each product to its environmental impact.

Product	Environmental impact
	Acid rain
Sulfur dioxide	
	Global dimming
Carbon particles	
	Global warming

(2)

- (b) Use the information above and your knowledge and understanding to answer these questions.

- (i) How did the formation of coal decrease the amount of carbon dioxide in the Earth's early atmosphere?

.....
.....

(1)

- (ii) How does burning coal affect the amount of carbon dioxide in the Earth's atmosphere?
Explain your answer.

.....
.....
.....
.....

(2)

(Total 6 marks)

Q31. This question is about atoms and molecules.

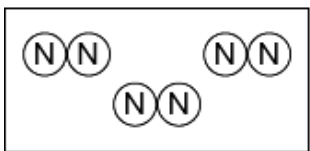
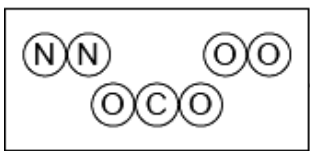
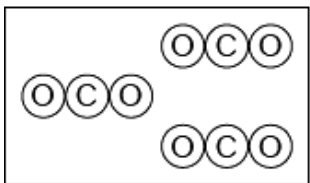
(a) In the diagrams below:

(N) is a nitrogen atom

(O) is an oxygen atom

(C) is a carbon atom.

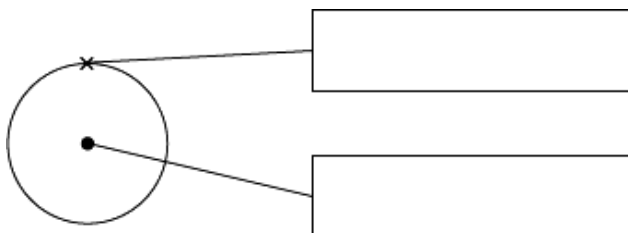
Draw **one** line from each diagram to its correct description.
One line has been done for you.

Diagram	Description
	<div>Compound</div>
	<div>Element</div>
	<div>Mixture</div>
	<div>Polymer</div>

(2)

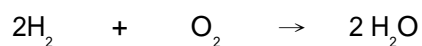
- (b) The diagram below shows a hydrogen atom.
Use words from the box to write the correct labels on the diagram.

alloy	electron	group	nucleus
-------	----------	-------	---------



(2)

- (c) This chemical equation represents the reaction of hydrogen burning.



Complete the sentence to describe what is happening in this chemical reaction.

Hydrogen reacts with

.....
.....
.....

(2)

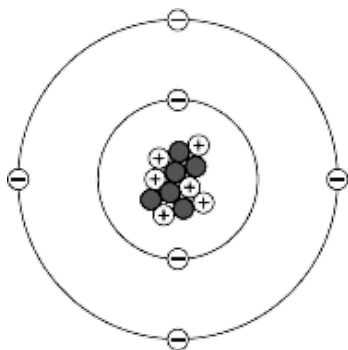
(Total 6 marks)

Q32. The picture shows a diamond ring.



Photograph supplied by Comstock/Thinkstock

(a) Diamond is a form of carbon. The diagram represents a carbon atom.



Complete the table to show the name and charge of each type of particle in the carbon atom.

Name of particle	Charge
proton	
neutron	0
	-1

(2)

(b) Use the Chemistry Data Sheet to help you to answer these questions.

(i) Draw a ring around the correct answer to complete the sentence.

Gold and carbon are

compounds.
elements.
mixtures.

(1)

(ii) Complete the sentence.

Gold and carbon have different properties because gold is a metal
and carbon is a

(1)

- (c) Draw a ring around the correct answer to complete each sentence.

Pure gold is not used to make the ring because pure gold is too

hard.
reactive.
soft.

The gold ring is made by mixing pure gold with other metals to form

a compound.
an atom.
an alloy.

(2)

- (d) The data in the table shows some information about the three metals in the gold ring.

Name of metal	Atomic number	Percentage (%) of metal
gold	79	
silver	47	16
copper	29	9

Draw **one** line from each question to its correct answer.

Question

Answer

What is the percentage of gold in this ring?

29

How many electrons are there in a copper atom?

61

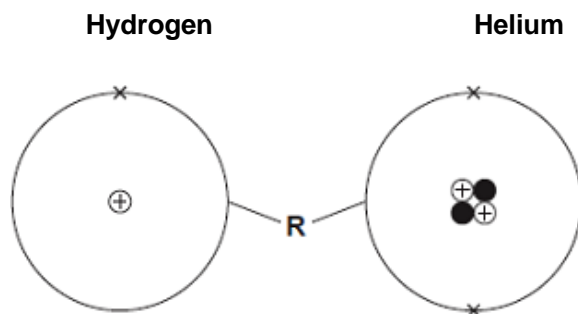
How many neutrons are in an atom of silver with a mass number of 108?

75

79

(3)
(Total 9 marks)

- Q33.** The Sun is mainly hydrogen and helium.
The diagrams show an atom of hydrogen and an atom of helium.



- (a) Draw a ring around the correct answer to complete each sentence.

- (i) The centre of each atom is called the

molecule.
nucleus.
shell.

(1)

- (ii) The circle (labelled **R**) around the centre of each atom is called

a bond.
an electrical charge.
an energy level (shell).

(1)

- (b) Use the diagrams in part (a) to help you to answer these questions.

Draw **one** line from each question to its correct answer.

Question	Answer
How many protons are there in the hydrogen atom?	1
How many electrons are there in the helium atom?	2
What is the mass number of the helium atom?	3
	4

(3)

- (c) The Sun is 73% hydrogen and 25% helium. The rest is other elements.

What is the percentage of other elements in the Sun?

..... %

(1)

- (d) One of the other elements in the Sun is neon.
Neon is in the same group of the periodic table as helium.

Use the Chemistry Data Sheet to help you to answer these questions.

- (i) How many protons are there in a neon atom?

.....

(1)

- (ii) Which group of the periodic table are helium and neon in?

.....

(1)

(Total 8 marks)

Q34. Barbecues are heated by burning charcoal or burning hydrocarbons.



- (a) Use the Chemistry Data Sheet to help you to answer this question.

The chemical equation for charcoal burning is:



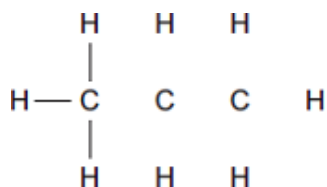
Complete the word equation for this reaction.

carbon + \longrightarrow carbon dioxide

(1)

(b) Propane is a hydrocarbon.

(i) Complete the displayed structure of propane. Draw in the missing bonds.



(1)

(ii) Write the chemical formula of propane.

(1)

(iii) Draw a ring around the correct answer to complete the sentence.

Propane burns in air to produce carbon dioxide and

hydrogen.

hydroxide.

water.

(1)

(c) The table shows information about six hydrocarbons.

Hydrocarbon	State at room temperature (20°C)	Boiling point in °C
Ethane (C ₂ H ₆)	gas	-89
Ethene (C ₂ H ₄)	gas	-104
Butane (C ₄ H ₁₀)	gas	-1
Butene (C ₄ H ₈)	gas	-6
Hexane (C ₆ H ₁₄)	liquid	+69
Hexene (C ₆ H ₁₂)	liquid	+64

Tick (✓) **two** correct statements about the six hydrocarbons.

Statement	Tick (✓)
Ethane and butane boil at temperatures less than 20°C.	
Hexene and butene are alkanes.	
Butane and hexane are liquid at 0°C.	
Ethene and hexene each have a carbon-carbon double bond.	

(2)

(Total 6 marks)

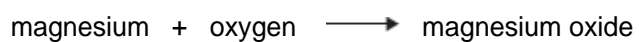
Q35. Magnesium burns in oxygen.



By Kingsway School [CC BY 2.0],
via Flickr

- (a) Use the Chemistry Data Sheet to help you to answer this question.

The word equation for magnesium burning is:

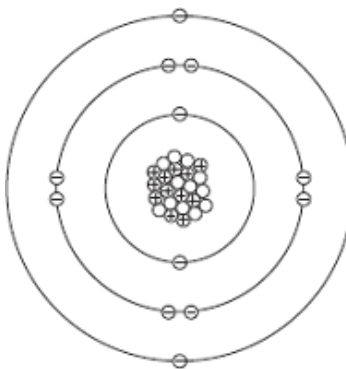


Draw **one** line from each substance to its correct description.

Substance	Description
magnesium	compound
magnesium oxide	metal
oxygen	mixture
	non-metal

(3)

- (b) The diagram represents a magnesium atom.



Complete the table to show the name of each particle and the charge of each particle in the magnesium atom.

Name of particle	Charge
proton	+1
neutron
.....	-1

(2)

- (c) Use the Chemistry Data Sheet to help you to answer these questions.

Draw a ring around the correct answer to complete each sentence.

- (i) In a magnesium atom, the protons and neutrons are in the

core.
nucleus.
shell.

(1)

- (ii) The number of protons in a magnesium atom is the

atomic number
mass number.
group number.

(1)

- (iii) The sum of the protons and neutrons in a magnesium atom is the

atomic number.
mass number.
group number.

(1)

(Total 8 marks)

