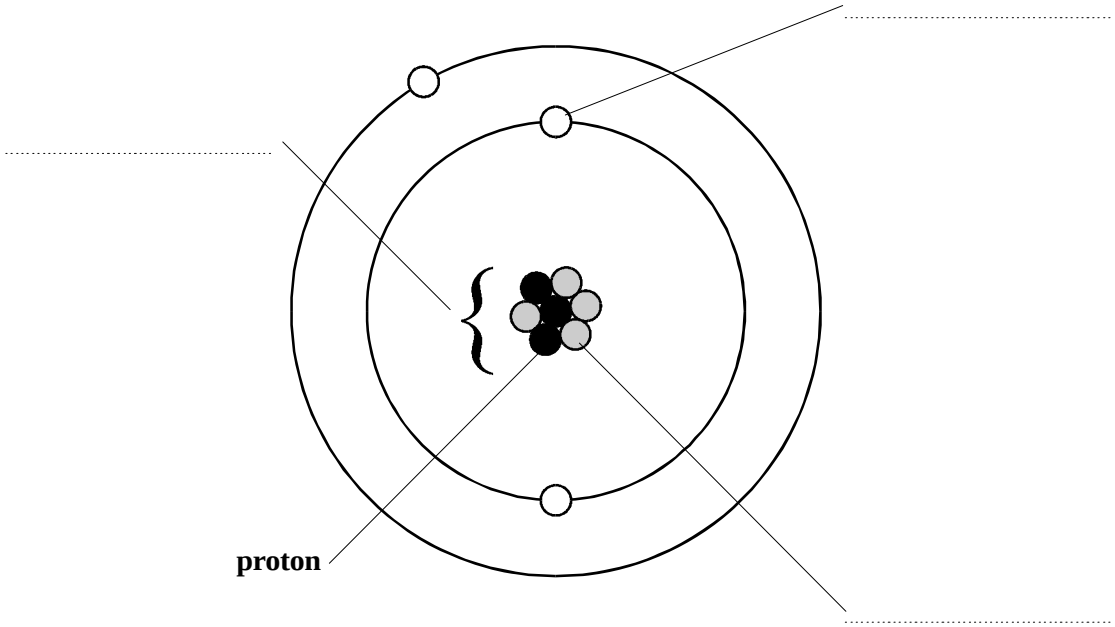
The fundamental ideas in chemistry

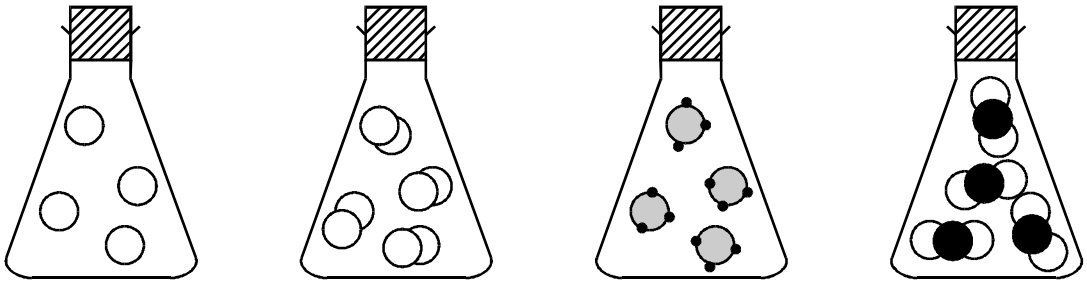
1. The diagram represents an atom. Choose words from the list to label the diagram.

electron **ion** **neutron** **nucleus**



(Total 3 marks)

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



A **B** **C** **D**

(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.

.....

.....

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.....

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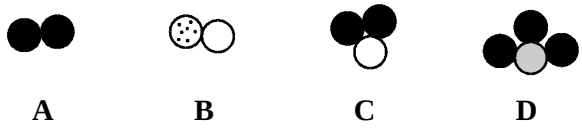
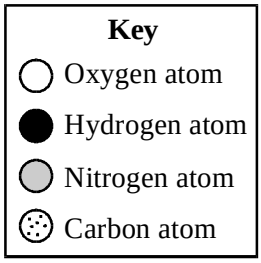
(3)
(Total 5 marks)

3. 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)

4. 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).

..... + ... + ...

(3)
(Total 3 marks)

5. Here is the word equation for a chemical reaction.

magnesium + zinc oxide → magnesium oxide + zinc

Write down everything that the word equation tells you about the reaction.

.....

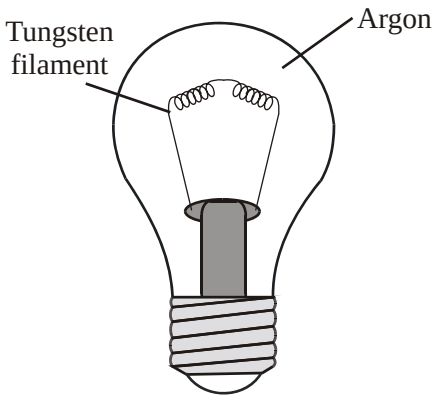
.....

.....

.....

(Total 4 marks)

6. The diagram shows an electric light bulb.



When electricity is passed through the tungsten filament it gets very hot and gives out light.

(a) What reaction would take place if the hot tungsten was surrounded by air?

.....

.....

.....

(1)

(b) State why argon is used in the light bulb. Explain your answer in terms of the electronic structure of an argon atom.

.....

.....

.....

.....

(3)
(Total 4 marks)

7. Many foods contain chemical additives.

(a) A tin of creamed rice contains sodium carbonate as an acidity regulator.

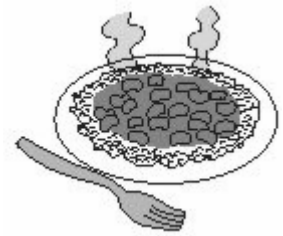
Sodium carbonate is an ionic compound which contains sodium ions (Na+) and carbonate ions (CO_3^{2-}).

Draw a ring around the formula of sodium carbonate.

$NaCO_3$ **Na_2CO_3** **$Na(CO_3)_2$** **$Na(CO_3)_3$**

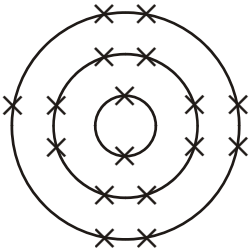
(1)

(b) A tin of red kidney beans contains calcium chloride as a firming agent.



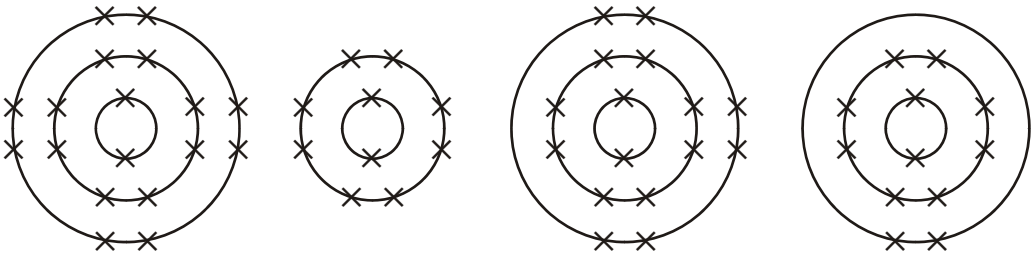
Calcium chloride contains calcium ions (Ca^{2+}) and chloride ions (Cl^-).

(i) The diagram represents the electronic structure of a chlorine atom.



Four electronic structures are shown in the box.

A **B** **C** **D**



Which electronic structure, **A**, **B**, **C** or **D**, represents a chloride ion (Cl^-)?

(1)

(ii) Complete the following sentence by crossing out the **two** words that are incorrect in each box.

A calcium ion (Ca^{2+}) is formed when a calcium atom

gains loses shares	two	electrons neutrons protons	.

(2)
(Total 4 marks)

8. (a) Balance the symbol equation.

$$H_2 + O_2 \rightarrow H_2O$$

(2)

(b) What atoms does each molecule of H_2O contain?

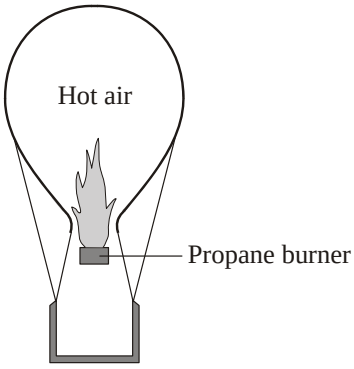
.....

(2)
(Total 4 marks)

9. Hot air balloons burn hydrocarbons to heat the air.

(a) The hot air contains these gases:

nitrogen, N_2
oxygen, O_2
argon, Ar
carbon dioxide, CO_2
water vapour, H_2O



(i) Argon is an *element*.

What is an *element*?

.....

.....

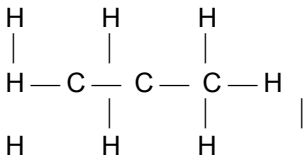
(1)

(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

(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)

10. Calcium oxide (quicklime) is made by heating calcium carbonate (limestone).

calcium carbonate	→	calcium oxide	+	carbon dioxide
100g		?		44g

(a) 44 grams of carbon dioxide is produced when 100 grams of calcium carbonate is heated.

Calculate the mass of calcium oxide produced when 100 grams of calcium carbonate is heated.

.....

mass ..... g

(1)

(b) What mass of carbon dioxide could be made from 100 tonnes of calcium carbonate?

mass ..... tonnes

(1)

(Total 2 marks)