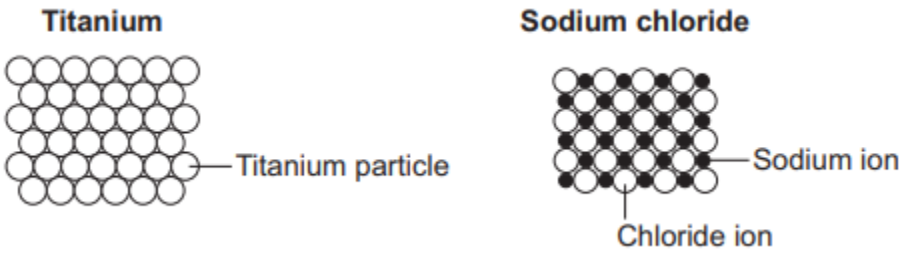
ATOMS, ELEMENTS & COMPOUNDS 1

Q1. The diagrams show sections through the lattice of titanium metal and the lattice of sodium chloride.



How do the diagrams show that:

(i) titanium is an element

_____

_____

(1 mark)

(ii) sodium chloride is a compound?

_____

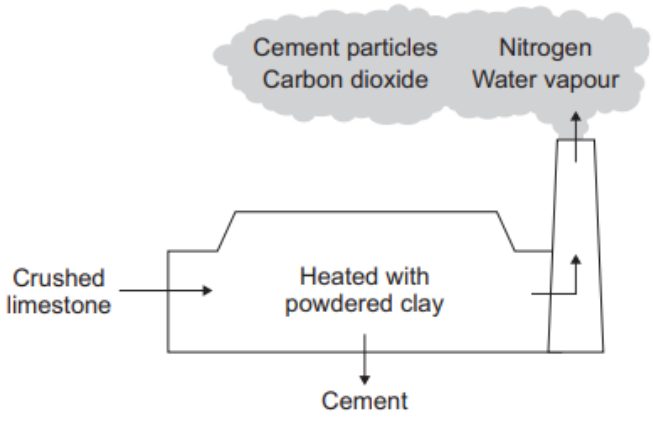
_____

_____

_____

(2 marks)

Q2. The diagram shows some of the substances used and produced at a cement works.



Limestone is mainly calcium carbonate ($CaCO_3$).

Write the correct answer in each box.

(i) The formula shows that calcium carbonate ($CaCO_3$) contains ☐ different elements.

(1 mark)

(ii) The total number of atoms in the formula $CaCO_3$ is ☐

(1 mark)

Q3. Soda-lime glass is made by heating, to above 1500 °C, a mixture of:

soda (sodium carbonate), Na_2CO_3

limestone (calcium carbonate), $CaCO_3$

sand (silicon dioxide), SiO_2

(i) Which element do all of these compounds contain?

_____

(1 mark)

(ii) Explain what the formula Na_2CO_3 shows about the compound.

_____

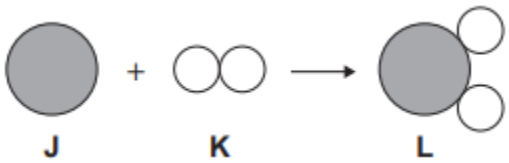
_____

_____

_____

(2 marks)

Q4. The diagram represents the reaction between substance J and substance K to create a new substance, L. In the diagram, each circle represents an atom.



(a) Which substance or substances are elements?

1 J only

2 both K and L

3 both J and K

4 L only

(b) Substance L . . .

1 is an impure substance.

2 is a mixture.

3 will have the same chemical properties as substances J and K.

4 is a compound of J and K.

(c) When substance L is formed from substances J and K . . .

1 there is an overall increase in mass.

2 there is an overall decrease in mass.

3 there is no overall change in mass.

4 the total number of atoms changes.

(d) A molecule of substance K will . . .

1 have two separate nuclei.

2 share a nucleus.

3 not have any chemical bonds.

4 not contain any electrons.

(4 marks)

Q5. A mixture of iron oxide and aluminium reacts when heated.

This is the balanced equation for the reaction:

$$Fe_2O_3 + 2Al \longrightarrow Al_2O_3 + 2Fe$$

Symbols	
Fe	Iron
O	Oxygen
Al	Aluminium

Match words, A, B, C and D, with the numbers 1– 4 in the sentences.

A electrons

B bonds

C products

D elements

Iron oxide and aluminium are the reactants. Aluminium oxide and iron are the . . . 1 . . . .

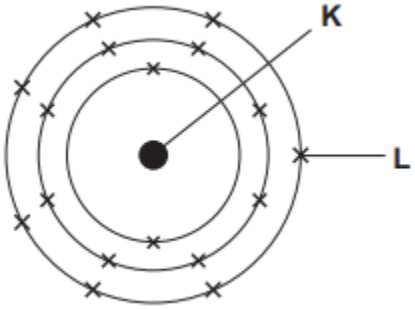
Aluminium atoms and oxygen atoms combine by transferring . . . 2 . . . .

The particles (ions) in aluminium oxide are held together by . . . 3 . . . .

The equation is balanced because, in the reaction, there is no change in the total number of atoms of each of the . . . 4 . . . .

(4 marks)

Q6. The diagram shows a chlorine atom.



Match words, A, B, C and D, with the numbers 1– 4 in the sentences.

A the nucleus

B a bond

C an electron

D an element

Chlorine is . . . 1 . . . .

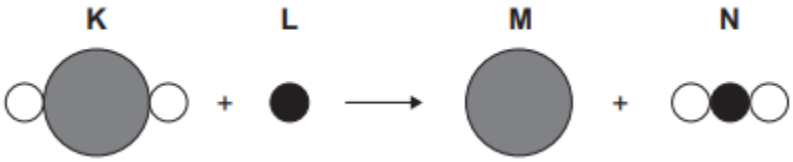
K is . . . 2 . . . .

L is . . . 3 . . . .

In a molecule of chlorine, two atoms are held together by . . . 4 . . . .

(4 marks)

Q7. The diagram represents a reaction between substances K and L to produce two substances, M and N. Each circle represents an atom.



(a) Substance N is . . .

1 an element.

2 a mixture of elements.

3 a compound.

4 a mixture of compounds.

(1 mark)

(b) Which substances will be in the periodic table?

1 K and N

2 K and L

3 M and N

4 L and M

(1 mark)

(c) A molecule of substance K . . .

1 contains three different elements.

2 will have three separate nuclei.

3 will not have any chemical bonds.

4 will not contain any electrons.

(1 mark)

(d) In the formation of substances M and N from substances K and L . . .

1 no new chemical bonds are formed.

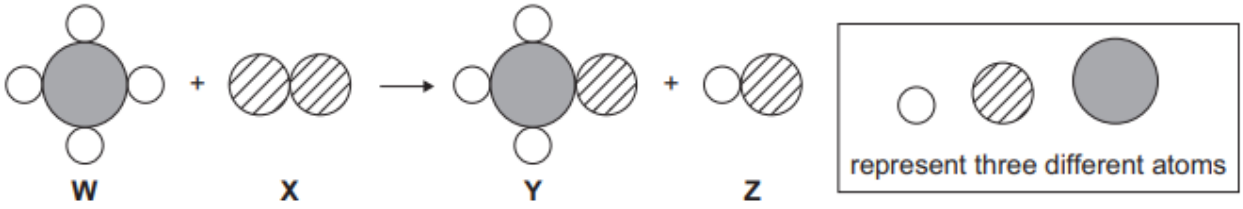
2 different atoms are formed.

3 there is no change in total mass.

4 there is an increase in the number of atoms.

(1 mark)

Q8. The diagram shows the reaction between substances W and X to produce two new substances Y and Z.



(a) Which statement about substance Y is correct?

1 It is a mixture of W and X.

2 It will have the same chemical properties as W.

3 It is a compound.

4 It has a total of 3 atoms.

(1 mark)

(b) In the formation of substances Y and Z from substances W and X, which statement is correct?

1 There is a decrease in mass.

2 There is an increase in mass.

3 No new chemical bonds are formed.

4 There is sharing or transfer of electrons.

(1 mark)

(c) Which substance would be found in the periodic table?

1 substance W

2 substance X

3 substance Y

4 substance Z

(1 mark)

(d) Which of the following statements is correct?

1 The total number of atoms stays the same during the reaction.

2 The reaction is an example of thermal decomposition.

3 Only atoms in substance X contain a nucleus.

4 Substance W contains five different elements.

(1 mark)

Q9. This question is about the substances involved in the thermal decomposition of calcium carbonate, $CaCO_3$

Match words, A, B, C and D, with the numbers 1– 4 in the sentences.

A atoms

B compounds

C non-metal elements

D elements

Calcium carbonate contains three . . . 1 . . . .

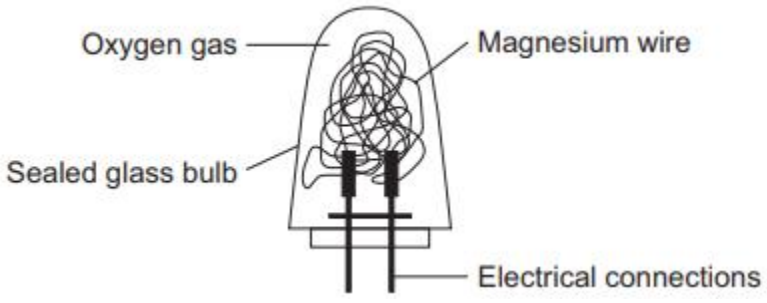
The formula for calcium carbonate contains a total of five . . . 2 . . . .

Calcium carbonate contains two . . . 3 . . . .

On heating, calcium carbonate decomposes into two new . . . 4 . . . .

(4 marks)

Q10. The diagram shows a flash bulb that was used in photography.



When a photograph is taken, an electric current flows through the magnesium. The magnesium burns very brightly and very quickly. A white powder called magnesium oxide (MgO) is formed. A student wanted to find out if the mass of the flash bulb changed when it was used.

- The mass of a new flash bulb was measured.
- It was made to flash and then allowed to cool.
- The glass bulb was unbroken.
- The mass of the used flash bulb was then measured.

(a) Which of the following statements is correct?

The mass of the flash bulb . . .

1 did not change.

2 changed because a chemical reaction had taken place.

3 increased because a new substance had been made.

4 decreased because the magnesium and oxygen had been used up.

(1 mark)

(b) Which statement correctly describes what happens inside the flash bulb?

1 Magnesium and oxygen atoms make magnesium oxide when they mix together.

2 Magnesium and oxygen atoms combine and are held together by chemical bonds.

3 Many new magnesium and oxygen atoms are formed when there is a flash inside the flash bulb.

4 Magnesium and oxygen atoms combine to make atoms of magnesium oxide.

(1 mark)

(c) Which row in the table gives a correct description of each substance involved in the reaction in the flash bulb?

	Substance		
	Magnesium	**Oxygen**	**Magnesium oxide**
1	element	element	compound
2	element	compound	element
3	compound	compound	element
4	element	compound	compound

(1 mark)

(d) The magnesium oxide made in this reaction can be used to produce magnesium nitrate.

The formula for magnesium nitrate is $Mg(NO_3)_2$. Which row in the table below shows the numbers of each type of atom in the formula $Mg(NO_3)_2$?

	Magnesium	Nitrogen	Oxygen
1	1	1	3
2	2	1	6
3	1	2	3
4	1	2	6

(1 mark)

Total marks (36)