1 The element carbon has three common isotopes.
These are carbon-12, carbon-13 and carbon-14.

(a) Complete the table to show the number of protons and neutrons in each isotope of carbon.

(2)

Isotope	Mass number	Number of protons	Number of neutrons
carbon-12	12	6	6
carbon-13	13		
carbon-14	14		

(b) Explain, in terms of electrons, why the three isotopes have the same chemical properties.

(1)

.....

.....

(c) (i) State what is meant by the term **relative atomic mass, A_r**

(2)

.....

.....

.....

.....

(ii) A sample of carbon contained 98.90% carbon-12 and 1.10% carbon-13.

Use this information to calculate the relative atomic mass of carbon in the sample.
Give your answer to **two** decimal places.

(3)

Relative atomic mass .....

(Total for Question 1 = 8 marks)

2 Atoms contain three different types of particle.

These are electrons, neutrons and protons.

(a) Which **one** of the three particles has a negative charge?

(1)

(b) Which **one** of the three particles has the smallest mass?

(1)

(c) Use words from the box to complete the sentences below.

Each word may be used once, more than once, or not at all.

electrons	**elements**	**molecules**	**neutrons**	**protons**

(i) Atoms are neutral because they contain equal numbers of

and

(1)

(ii) Isotopes are atoms with the same number of

but different numbers of in the nucleus.

(2)

(d) An atom of magnesium can be represented by the symbol $^{24}_{12}Mg$.

Use numbers to complete these statements about this atom.

(i) The atomic number of this atom is .

(1)

(ii) The mass number of this atom is .

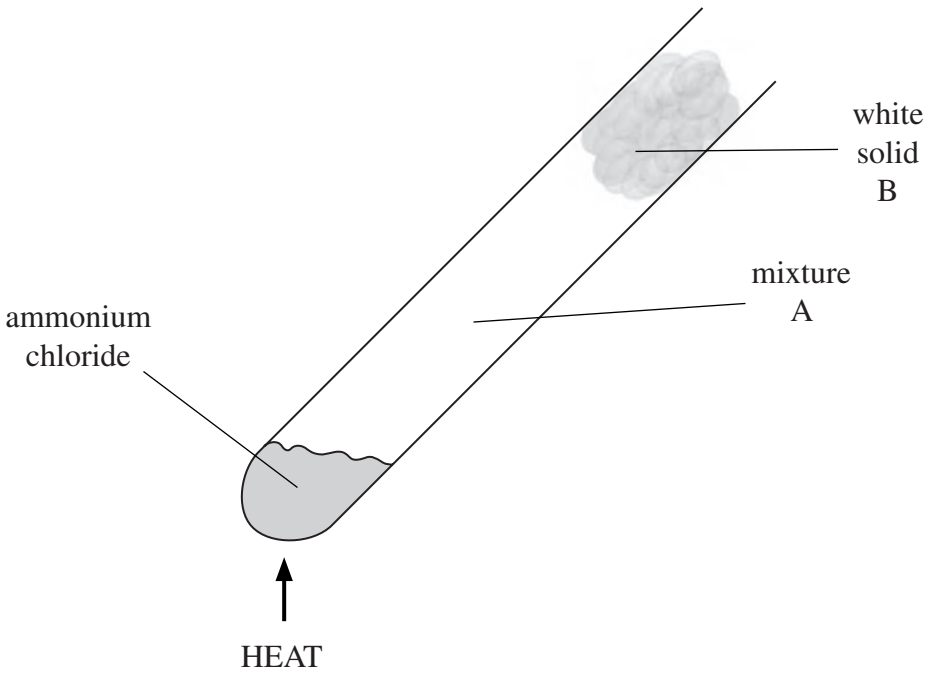
(1)

(iii) The electronic configuration of this atom is .

(1)

(Total for Question 2 = 8 marks)

3 The diagram shows ammonium chloride being heated in a test tube.



(a) The formula of ammonium chloride is NH_4Cl.

How many different elements are there in ammonium chloride?

(1)

(b) Identify the two gases in mixture A.

(2)

and

(c) Identify the white solid B.

(1)

(d) Place crosses (☒) in two boxes to identify the processes that occur in the test tube.

(2)

boiling	☒
decomposition	☒
melting	☒
neutralisation	☒

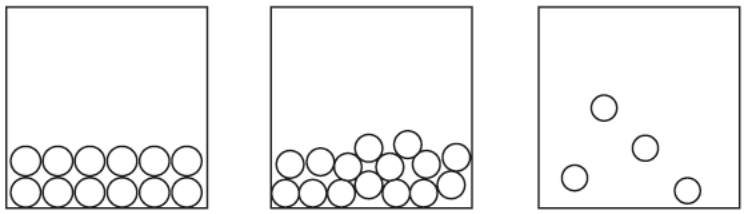
(Total for Question 3 = 6 marks)

4 This question is about the elements hydrogen and oxygen.

(a) The circles in the diagrams represent molecules of hydrogen.

Place a cross (☒) in the box under the diagram that represents hydrogen gas.

(1)



☒ ☒ ☒

(b) The diagram below shows two different atoms of hydrogen.



(i) The particle furthest from the centre of each atom is

(1)

☒ **A** an electron

☒ **B** a neutron

☒ **C** a nucleus

☒ **D** a proton

(ii) The particle present in atom Y but not in atom X is

(1)

☒ **A** an electron

☒ **B** a neutron

☒ **C** a nucleus

☒ **D** a proton

(iii) Both atoms are neutral because they have the same number of

(1)

☒ **A** electrons and neutrons

☒ **B** electrons and protons

☒ **C** electrons, neutrons and protons

☒ **D** neutrons and protons

(c) Different atoms of oxygen can be represented as

$$^{16}_{8}O \text{ and } ^{18}_{8}O$$

Select words or phrases from the box to complete the sentence about these atoms of oxygen.

You may use each word or phrase once, more than once or not at all.

atomic numbers	isotopes	mass numbers	numbers of electrons

(3)

These atoms of oxygen are called .....

because their ..... are the same

but their ..... are different.

(Total for Question 4 = 7 marks)

5 Distress flares are used to attract attention in an emergency. The flares contain magnesium, which burns with a bright, white flame to form magnesium oxide.

(a) The reaction between magnesium and oxygen is exothermic.

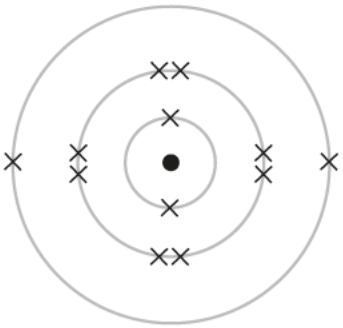
What is meant by the term **exothermic**?

(1)

.....

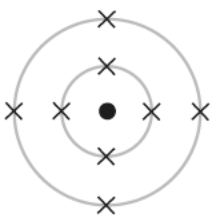
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(b) The diagram shows the electronic configuration of a magnesium atom.

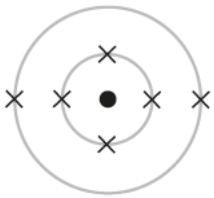


Put a cross in a box to indicate the diagram that shows the electronic configuration of an oxygen atom.

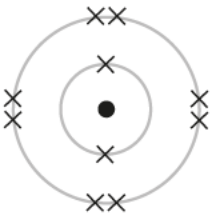
(1)



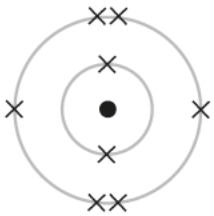
A ☐



B ☐



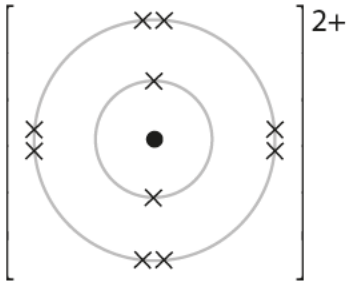
C ☐



D ☐

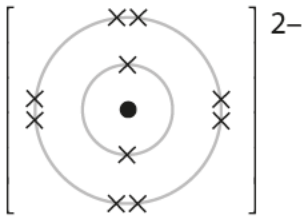
(c) Magnesium ions and oxide ions are formed when magnesium reacts with oxygen.

The diagram shows the electronic configuration and charge of a magnesium ion.

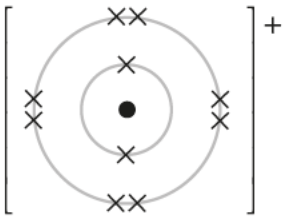


Put a cross in a box to indicate the diagram that shows the electronic configuration and charge of an oxide ion.

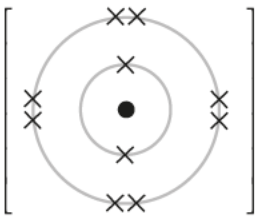
(1)



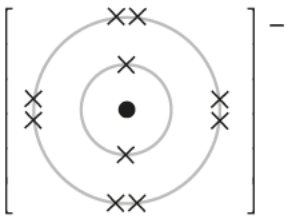
A ☒



B ☒



C ☒



D ☒

(d) A major use of magnesium oxide is as a refractory material, which is a material that can withstand very high temperatures.

Explain, in terms of its structure and bonding, why magnesium oxide has a very high melting point.

(4)

(e) Magnesium oxide is also used as an antacid. It helps relieve indigestion by neutralising hydrochloric acid in the stomach.

Give the name and formula of the salt produced when magnesium oxide reacts with hydrochloric acid.

(2)

Name .....

Formula .....

(Total for Question 5 = 9 marks)

6 This question is about the element beryllium.

(a) Use words from the box to complete the sentences about beryllium.

Each word may be used once, more than once or not at all.

(7)

electrons	**negative**	**neutral**	**neutrons**
nucleus	**positive**	**protons**	**shells**

An atom of beryllium has a central ..... that contains particles called ..... and ..... . Around these particles there are ..... orbiting in ..... .

An atom of beryllium has no charge because it contains equal numbers of ..... and ..... .

The particles with the lowest mass in an atom of beryllium are called ..... .

(b) Beryllium forms a compound with the formula $Be(OH)_2$

(i) How many different elements are there in $Be(OH)_2$?

(1)

.....

(ii) What is the total number of atoms in the formula $Be(OH)_2$?

(1)

.....

(Total for Question 6 = 9 marks)