Q1. Atoms contain three types of particle.

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

The particles in the nucleus of the atom are

electrons and neutrons.
electrons and protons.
neutrons and protons.

(1)

(b) Complete the table to show the relative charges of the atomic particles.

Particle	Relative charge
Electron	–1
Neutron	
Proton	

(2)

(c) (i) A neutral atom has no overall charge.

Explain this in terms of its particles.

.....

.....

.....

.....

(2)

(ii) Complete the sentence.

An atom that loses an electron is called an .....

and has an overall ..... charge.

(2)

(d) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Some substances are radioactive. They may emit alpha or beta particles.

Describe the characteristics of alpha particles and beta particles in terms of their:

- structure
- penetration through air and other materials
- deflection in an electric field.

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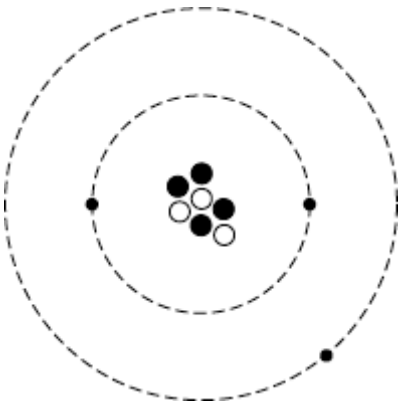
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(6)
(Total 13 marks)

Q2. The diagram represents an atom of lithium.



(a) (i) Complete the following table of information for an atom of lithium.

Number of protons	
Number of electrons	
Number of neutrons	

(2)

(ii) What is the mass number of a lithium atom?

Draw a ring around your answer.

3	**4**	**7**	**10**

Give a reason for your answer.

.....

.....

(2)

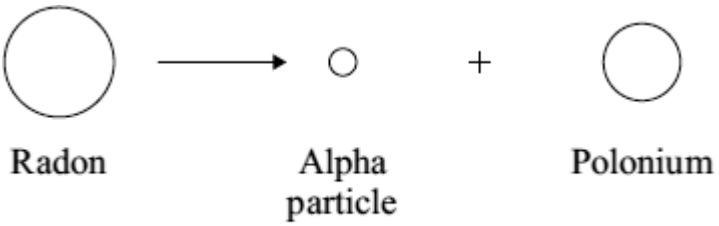
(b) Complete the following sentence by drawing a ring around the correct line in the box.

An atom that has lost an electron is called	an ion
	an isotope

a positive atom

(1)

(c) When an alpha particle is emitted from the nucleus of a radon atom, the radon changes into polonium.



Not to scale

An alpha particle consists of 2 protons and 2 neutrons.

(i) Complete the following sentence by drawing a ring around the correct line in the box.

The mass of a polonium atom is

greater than
the same as
smaller than

the mass of a radon atom.

(1)

(ii) Give a reason for your answer to part (c)(i).

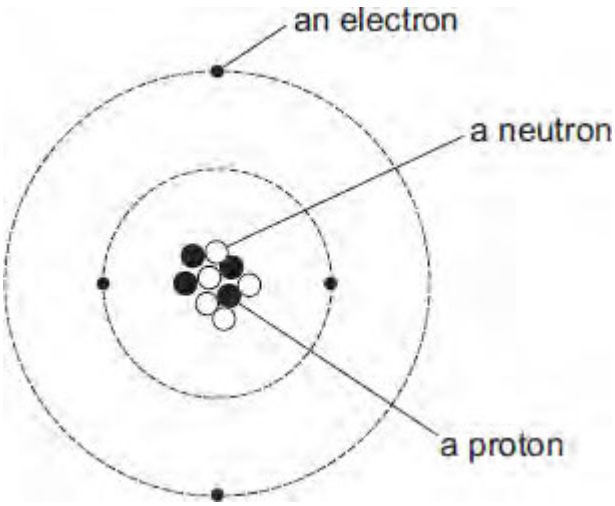
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(1)

(Total 7 marks)

Q3. The diagram represents an atom of beryllium. The three types of particle that make up the atom have been labelled.



(a) Use the labels from the diagram to complete the following statements.

Each label should be used once.

The particle with a positive charge is .....

The particle with the smallest mass is .....

The particle with no charge is .....

(2)

(b) What is the atomic number of a beryllium atom?

Draw a ring around your answer.

4	**5**	**9**	**13**

Give a reason for your answer.

.....

.....

(2)

(c) Which **one** of the following statements describes what can happen to an atom to change it into an ion?

Tick (✓) **one** box.

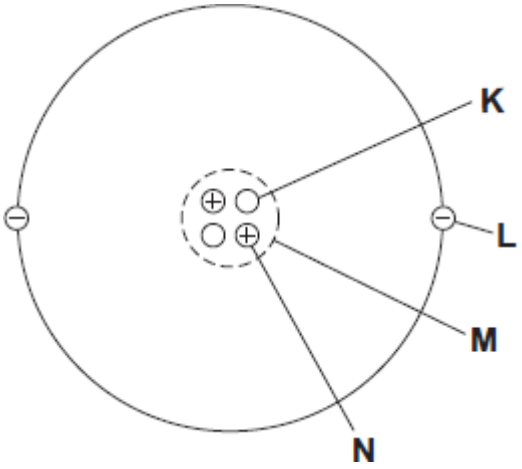
The atom loses a neutron. ☐

The atom loses an electron. ☐

The atom loses a proton. ☐

(1)
(Total 5 marks)

Q4. (a) The diagram represents a helium atom.



(i) Which part of the atom, **K**, **L**, **M** or **N**, is an electron?

Part ☐

(1)

(ii) Which part of the atom, **K**, **L**, **M** or **N**, is the same as an alpha particle?

Part ☐

(1)

(b) A radioactive source emits alpha particles.

What might this source be used for?

Put a tick (✓) in the box next to your answer.

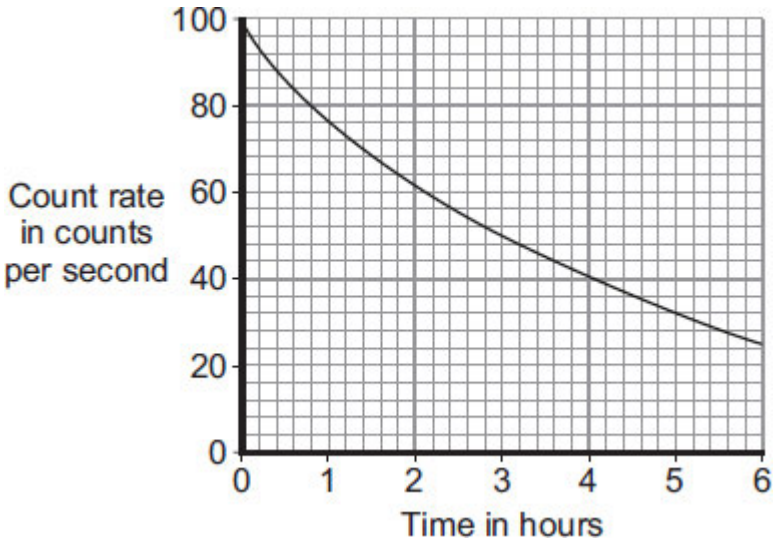
to monitor the thickness of aluminium foil as it is made in a factory ☐

to make a smoke detector work ☐

to inject into a person as a medical tracer

(1)

(c) The graph shows how the count rate from a source of alpha radiation changes with time.



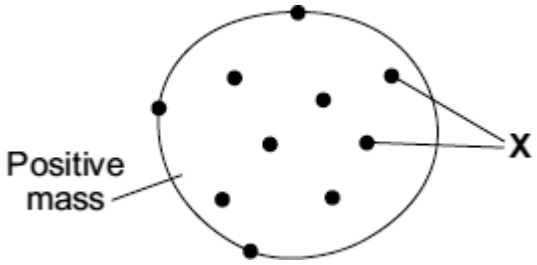
What is the count rate after 4 hours?

..... counts per second

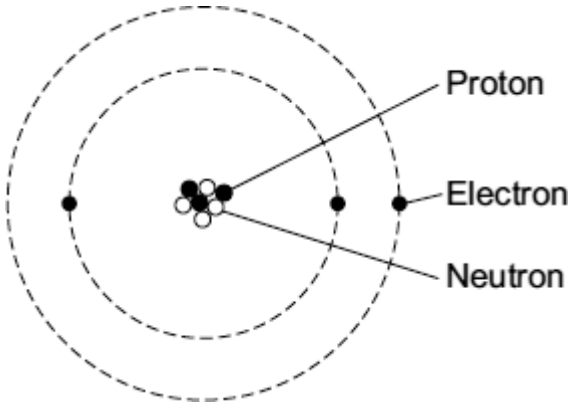
(1)

(Total 4 marks)

Q5. The diagrams show two different models of an atom.



'Plum pudding' model



Model used today

(a) The particles labelled '**X**' in the plum pudding model are also included in the model of the atom used today.

What are the particles labelled '**X**' ?

.....

(1)

(b) Scientists decided that the 'plum pudding' model was wrong and needed replacing.

Which **one** of the following statements gives a reason for deciding that a scientific model needs replacing?

Tick (✓) **one** box.

The model is too simple. ☐

The model has been used by scientists for a long time. ☐

The model cannot explain the results from a new experiment. ☐

(1)

(c) The table gives information about the three types of particle that are in the model of the atom used today.

Particle	Relative mass	Relative charge
	1	+1
	very small	–1
	1	0

Complete the table by adding the names of the particles.

(2)
(Total 4 marks)

Q6. The names of three different processes are given in **List A**.
Where these processes happen is given in **List B**.

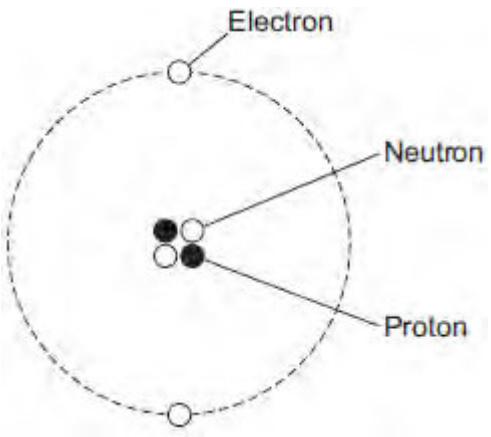
Draw a line to link each process in **List A** to where the process happens in **List B**.

Draw only **three** lines.

List A		**List B**
style='height:1.1pt'>**Process**		**Where it happens**
		in a star
fusion		
		in a nuclear reactor
chain reaction		
		in a smoke precipitator
alpha decay		
		in the nucleus of an atom

(Total 3 marks)

Q7.(a) The figure below shows a helium atom.



(i) Which **one** of the particles in the atom is **not** charged?

Draw a ring around the correct answer.

electron **neutron** **proton**

(1)

(ii) Which **two** types of particle in the atom have the same mass?

..... and .....

(1)

(iii) What is the atomic number of a helium atom?

Draw a ring around the correct answer.

2 **4** **6**

Give a reason for your answer.

.....

.....

(2)

(b) Alpha particles are one type of nuclear radiation.

(i) Name **one** other type of nuclear radiation.

.....

(1)

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

electrons	**neutrons**	**protons**

The difference between an alpha particle and a helium atom is that the alpha particle does **not** have any ..... .

(1)

(iii) Which **one** of the following is a property of alpha particles?

Tick (✓) **one** box.

Have a long range in air ☐

Are highly ionising ☐

Will pass through metals ☐

(1)

(c) Doctors may use nuclear radiation to treat certain types of illness.

Treating an illness with radiation may also harm a patient.

(i) Complete the following sentence.

The risk from treating a patient with radiation is that the radiation may

..... healthy body cells.

(1)

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

Radiation may be used to treat a patient if the risk from the

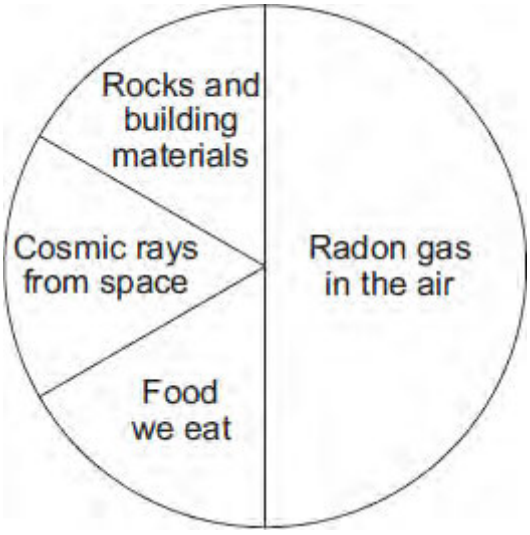
radiation is

much bigger than
about the same as
much smaller than

the possible benefit of having the treatment.

(1)
(Total 9 marks)

Q8. The pie chart shows the average proportions of natural background radiation from various sources in the UK.



(a) (i) Complete the following sentence.

On average, ... of the natural background radiation in the UK comes from radon gas.

(1)

(ii) Radon gas is found inside homes.

The table shows the results from measuring the level of radon gas inside four homes in one area of the UK.

Home	Level of radon gas in Bq per m^3 of air
1	25
2	75
3	210
4	46
Mean	89

One of the homes has a much higher level of radon gas than the other three homes.

What should be done to give a more reliable mean for the homes in this area of the UK?

Put a tick (✓) in the box next to your answer.

ignore the data for home number 3 ☐

measure the radon gas level in more homes in this area ☐

include data for homes from different areas of the UK ☐

(1)

(b) Each atom of radon has 86 protons and 136 neutrons.

(i) How many electrons does each atom of radon have?

Draw a ring around your answer.

50 **86** **136** **222**

(1)

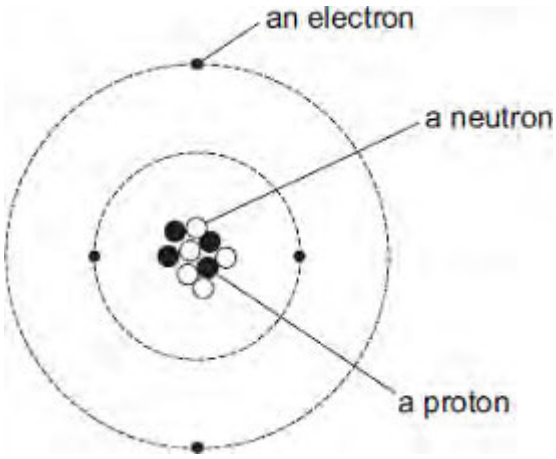
(ii) How many particles are there in the nucleus of a radon atom?

Draw a ring around your answer.

50 **86** **136** **222**

(1)
(Total 4 marks)

Q9. The diagram represents an atom of beryllium. The three types of particle that make up the atom have been labelled.



(a) Use the labels from the diagram to complete the following statements.

Each label should be used once.

The particle with a positive charge is ..... .

The particle with the smallest mass is ..... .

The particle with no charge is ..... .

(2)

(b) What is the mass number of a beryllium atom?

Draw a ring around your answer.

4	**5**	**9**	**13**

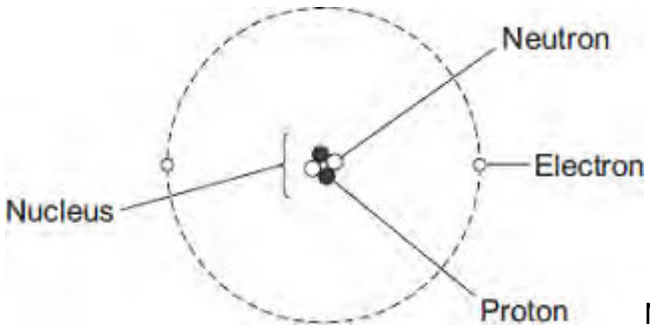
Give a reason for your answer.

.....

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(2)
(Total 4 marks)

Q10. The diagram shows the structure of an atom.



Not drawn to scale

(a) In 1931 scientists thought that atoms contained **only** protons and electrons.

Suggest what happened in 1932 to change the idea that atoms contained only protons and electrons.

.....

.....

(1)

(b) The table gives information about the particles in an atom.

Complete the table by adding the names of the particles.

Particle	Relative Mass	Relative Charge
	1	0
	very small	–1
	1	+1

(2)
(Total 3 marks)