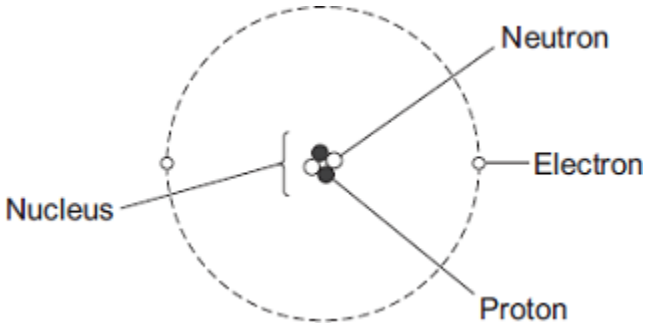
1. The diagram shows the structure of an atom.



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.

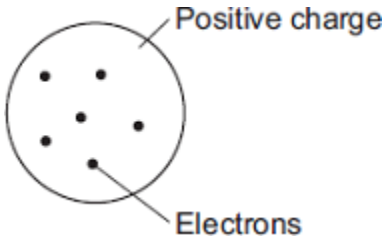
Complete the table by adding the names of the particles.

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

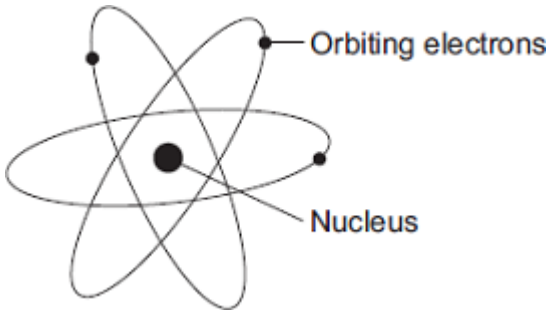
(2)

(Total 3 marks)

2. In the early part of the 20th century, scientists used the 'plum pudding' model to explain the structure of the atom.



Following work by Rutherford and Marsden, a new model of the atom, called the 'nuclear' model, was suggested.



Describe the differences between the two models of the atom.

_____

_____

_____

_____

_____

_____

_____

_____

(Total 4 marks)

3. (a) Complete the sentences about atoms.

In an atom, the number of electrons is equal to the number of _____ .

All atoms of an element have the same number of _____ .

Isotopes of the same element have different numbers of _____ .

(3)

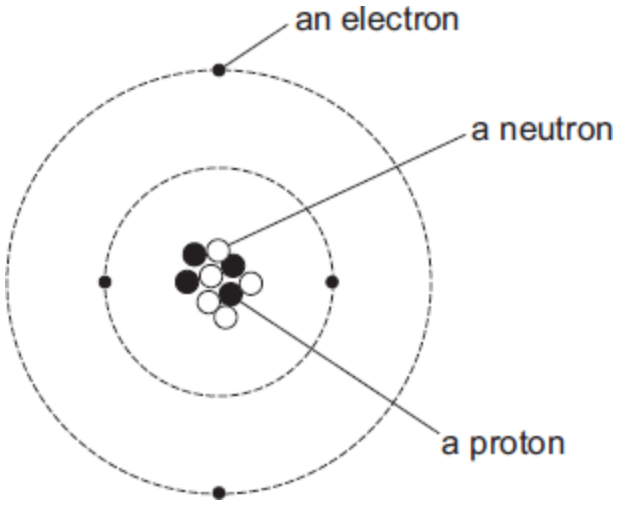
(b) Complete the sentence.

When an atom of a radioactive element emits alpha radiation, an atom of a different element is formed. A different element is formed because the radioactive element has lost _____ .

(1)

(Total 4 marks)

4. 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)

5. Scientists sometimes replace one scientific model with a different model.

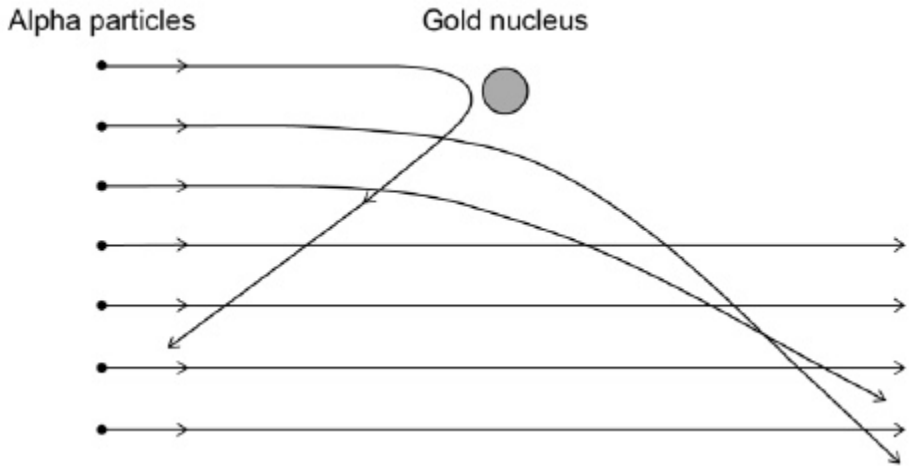
For example, in the early 20th Century the plum pudding model of the atom was replaced by the nuclear model of the atom.

Explain what led to the plum pudding model of the atom being replaced by the nuclear model of the atom.

(Total 6 marks)

6. In the early 20th century, scientists developed an alpha particle scattering experiment using gold foil.

The diagram shows the paths of some of the alpha particles in the alpha particle scattering experiment.



(a) Explain how the paths of the alpha particles were used to develop the nuclear model of the atom.

(4)

(b) Niels Bohr adapted the nuclear model by suggesting electrons orbited the nucleus at specific distances.

Explain how the distance at which an electron orbits the nucleus may be changed.

_____

_____

_____

_____

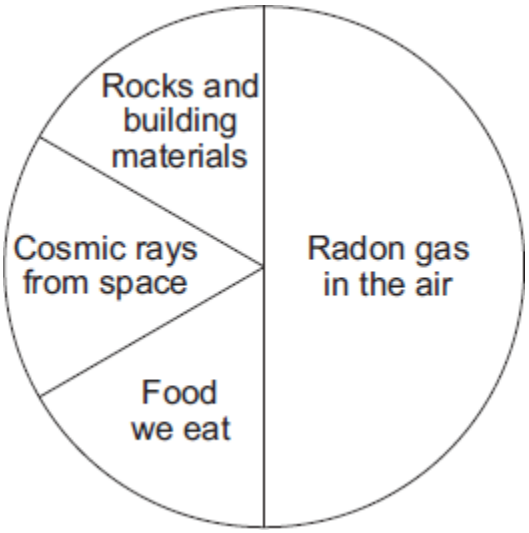
_____

_____

(3)

(Total 7 marks)

7. 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)