

Mark schemes

- 1.** (a) neutron discovered 1
- (b) neutron
all 3 in correct order
- electron
allow 1 mark for 1 correct
- proton 2
- [3]**
- 2.** any **two** pairs from:
- to gain credit it must be clear which model is being described*
*do **not** accept simple descriptions of the diagram without comparison*
- nuclear model mass is concentrated at the centre / nucleus (1)
accept the nuclear model has a nucleus / the plum pudding model does not have a nucleus for 1 mark
 - plum pudding model mass is evenly distributed (1)
 - nuclear model positive charge occupies only a small part of the atom (1)
plum pudding model positive charge spread throughout the atom (1)
 - nuclear model electrons orbit some distance from the centre (1)
accept electrons in shells / orbits provided a valid comparison is made with the plum pudding model
 - plum pudding electrons embedded in the (mass) of positive (charge) (1)
*do **not** accept electrons at edge of plum pudding*
 - nuclear model the atom mainly empty space (1)
plum pudding model is a 'solid' mass (1)
- [4]**
- 3.** (a) protons 1
- protons
accept electrons 1
- neutrons 1

(b) protons

reject mass

1

[4]

4.

(a) proton

electron

neutron

all 3 in correct order

allow 1 mark for 1 correct

*do **not** accept letters p, e, n*

2

(b) 4

reason only scores if 4 is chosen

1

number of protons

accept number of electrons

accept there are 4 protons and 4 electrons

*do **not** accept there are 4 protons and electrons*

1

(c) The atom loses an electron.

1

[5]

5.

Level 3 (5–6 marks):

A detailed and coherent explanation is provided. The student gives examples that argue a strong case and demonstrate deep knowledge. The student makes logical links between clearly identified, relevant points.

Level 2 (3–4 marks):

An attempt to link the description of the experiment and the results with differences between the two models. The student gives examples of where the plum pudding model does not explain observations. The logic used may not be clear.

Level 1 (1–2 marks):

Simple statements are made that the nuclear model is a better model. The response may fail to make logical links between the points raised.

0 marks:

No relevant content.

Indicative content

- alpha particle scattering experiment
- alpha particles directed at gold foil
- most alpha particles pass straight through
- (so) most of atom is empty space
- a few alpha particles deflected through large angles
- (so) mass is concentrated at centre of atom
- (and) nucleus is (positively) charged
- plum pudding model has mass spread throughout atom
- plum pudding model has charge spread throughout atom

[6]

6.

(a) most alpha particles pass straight through the atom

1

which shows that the atom is mostly empty space

1

very few alpha particles are deflected through a large angle

1

which shows the atom contains a nucleus where the mass / charge of the atom is concentrated

1

(b) electron may absorb electromagnetic radiation

full credit may be scored for a description of an electron emitting electromagnetic radiation

1

(and) move further from the nucleus

1

to a higher energy level

1

[7]

7.

(a) (i) half / 50 %

1

(ii) Measure the radon gas level in more homes in this area

1

(b) (i) 86

1

(ii) 222

1

[4]