M1. (a) neutrons and protons

1

(b) 0

1

(+)1

1

(c) (i) total positive charge = total negative charge

accept protons and electrons have an equal opposite charge

1

(because) no of protons = no of electrons

1

(ii) ion

1

positive

1

(d) Marks awarded for this answer will be determined by the quality of communication as well as the standard of the scientific response. Examiners should apply a best-fit approach to the marking.

0 marks
No relevant content

Level 1 (1 – 2 marks)
There is a basic description of at least **one** of the particles in terms of its characteristics.

Level 2 (3 – 4 marks)

There is a clear description of the characteristics of **both** particles
or
a full description of either alpha **or** beta particles in terms of their characteristics.

Level 3 (5 – 6 marks)
There is a clear and detailed description of **both** alpha and beta particles in terms of their characteristics.

examples of the physics points made in the response:

structure

- alpha particle consists of a helium nucleus
- alpha particle consists of 2 protons and 2 neutrons
- a beta particle is an electron
- a beta particle comes from the nucleus

penetration

- alpha particles are very poorly penetrating
- alpha particles can penetrate a few cm in air
- alpha particles are absorbed by skin
- alpha particles are absorbed by thin paper
- beta particles can penetrate several metres of air
- beta particles can pass through thin metal plate / foil
- beta particles can travel further than alpha particles in air
- beta particles can travel further than alpha particles in materials eg metals

deflection

- alpha particles and beta particles are deflected in opposite directions in an electric field
- beta particles are deflected more than alpha particles
- alpha particles have a greater charge than beta particles but beta particles have much less mass
  or
  beta particles have a greater specific charge than alpha particles

6

[13]

M2.(a) (i) all correct

accept presented as a tally chart

Number of protons	3
Number of electrons	3
Number of neutrons	4

*allow **1** mark for **1** correct*

2

(ii) 7

reason may score even if 7 not chosen

1

number of protons and neutrons

accept number of particles in the nucleus

accept number of nucleons

*do **not** accept number of electrons and neutrons*

1

(b) an ion

1

(c) (i) smaller than

1

(ii) radon loses an alpha (particle)
or
radon loses an (alpha) particle
or
(mass of) polonium plus an alpha = (mass) radon
or
radon loses 2 protons and 2 neutrons (to become polonium)

accept radon has less protons and neutrons

1

[7]

M3. (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]

M4. (a) (i) **L**

1

(ii) **M**

1

(b) To make a smoke detector work.

1

(c) **40**

no tolerance

1

[4]

M5. (a) electron(s)

1

(b) 3rd box ticked

The model cannot explain the results from a new experiment

1

(c) all three correct

Particle
Proton
Electron
Neutron

*allow **1** mark for 1 correct*

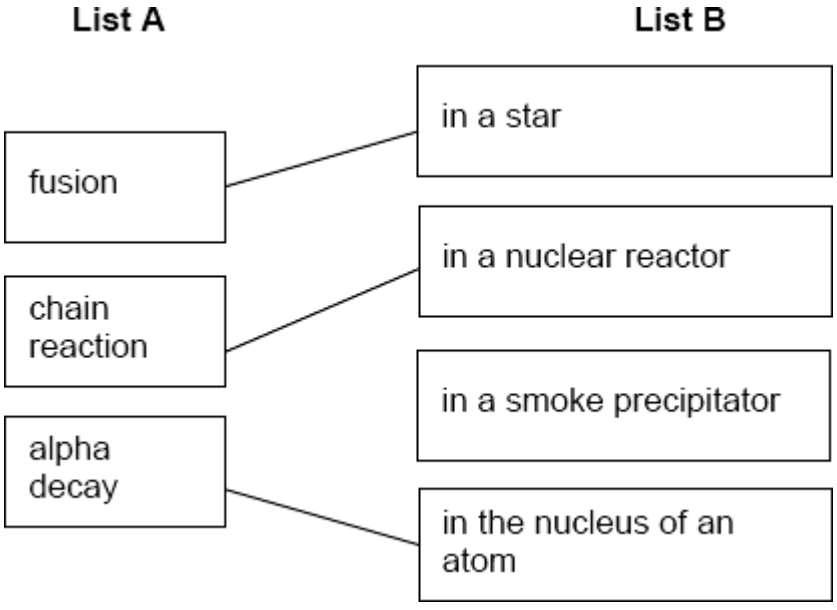
2

[4]

M6.three lines correct

*allow **1** mark for each correct line*

*if more than 1 line is drawn from a box in **List A**, mark each line incorrect*



[3]

M7. (a) (i) neutron

1

(ii) neutron
proton
both required, either order

1

(iii) 2

1

number of <u>protons</u>
do not accept number of electrons

1

(b) (i) any **one** from:

- beta
- gamma

accept correct symbols
accept positron / neutrino / neutron
cosmic rays is insufficient

1

(ii) electrons

1

(iii) are highly ionising

1

(c) (i) mutate / destroy / kill / damage / change / ionise
Harm is insufficient

1

(ii) much smaller than

1

[9]

M8. (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]

M9.(a) proton

all 3 in correct order

electron

*allow **1** mark for 1 correct do **not***

neutron

accept letters p, e, n

2

(b) 9

reason only scores if 9 is chosen

1

number of neutrons and protons

1

[4]

M10.(a) neutron discovered

1

(b) neutron

all 3 in correct order

electron

*allow **1** mark for 1 correct*

proton

2

[3]