

MARK SCHEME

GCSE

PHYSICS

AQA - COMBINED SCIENCE

P4 - TEST 2

ATOMIC STRUCTURE

Beginner

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.** (a) presence of a radioactive source
*accept radioactivity **or** radioactive or radiation*
accept a named source
accept a named type of radiation ignore reference to relative levels
*do **not** accept thermal **or** heat radiation*
*do **not** accept nuclear waste* 1
- (b) (i) gamma 1
accept correct symbol
- (ii) alpha 1
accept correct symbol
- [3]**
- 3.** (a) bigger 1
accept any word which means bigger
- (b) **Z** 1
if Z is not given, the reason does not score
- alpha will not pass through aluminium or lead
accept alpha cannot go through metals / dense material
accept there is nothing to stop the radiation
accept alpha will not pass through aluminium
*do **not** accept alpha will not pass through lead*
*do **not** accept alpha stopped by air* 1
- [3]**

4.

(a) (i) **L**

1

(ii) **M**

1

(b) To make a smoke detector work.

1

(c) **40**

no tolerance

1

[4]

5.

(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]

6.

(a) 95

1

(b) alpha

1

accept correct symbol

(c) any **two** from:

- radiation is outside the body
accept detector is on ceiling or high up the wall
- radiation will not reach (living) cells
accept radiation cannot pass through the body / skin
- radiation absorbed by the air
accept cannot pass through the plastic casing
*do **not** accept because it is alpha radiation – unless qualified*
*do **not** accept does not give off harmful substance*
*do **not** accept cannot pass through building materials etc*

2

(d) less (than)

1

[5]

7.

(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

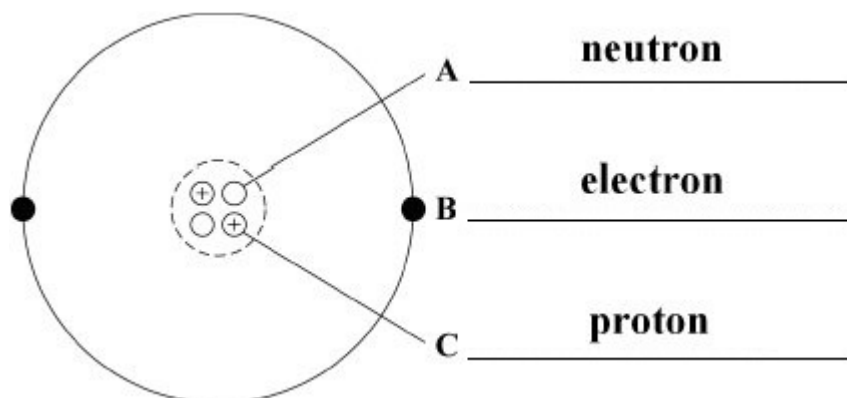
- (ii) radon loses an alpha (particle)
or
 radon loses an (alpha) particle
or
 (mass of) polonium plus an alpha = (mass) radon
or
 radon loses 2 protons and 2 neutrons (to become polonium)
accept radon has less protons and neutrons

1

[7]

8.

(a) (i)



all 3 labels correct
allow 1 mark for 1 correct label

2

- (ii) has no electrons
it = alpha
allow alpha has a positive(charge)
allow a helium (atom) has no (charge)
*do **not** accept general properties of alpha*
*do **not** accept general answers in terms of size / density / mass etc*

1

- (b) (i) 15 (hours)
accept any answer between 14.8 and 15.2 inclusive

1

- (ii) 15 (hours) or their (b) (i)

1

- (c) (i) americium-241 has a long half life

1

(ii) any **one** from:

- alpha (particles) are harmful to ...
accept radiation / radioactive material is harmful to ...
accept specific example of harm
eg can cause cancer
accept radiation is poisonous if ingested / inhaled
*do **not** accept it is poisonous / in case of leakage*
- so they dispose of it safely / appropriately
- so they don't break it open / open it
*accept do **not** touch the radioactive source*
- so they can make a choice about having a radioactive source (in the house)
it = radioactive material

1

[7]

9.

(a) C

1

(b) beta

accept gamma

if answer alpha can still gain marks for saying why not beta or gamma

1

any **two** from:

must have at least one quantitative statement to get 2 marks

- range in air for beta is (at least) 50cm
- count-rate does not drop (much) in first 40cm
- count-rate does not fall much until distance is 60cm
- alphas cannot travel more than 5cm in air / alphas could not travel 100cm in air
accept alphas cannot travel that far
- alphas would not be detected
- gammas not absorbed by 100cm of air
accept gammas not stopped by air
accept gammas travel further than alphas and betas
strength of source is neutral
references to penetrating power is neutral

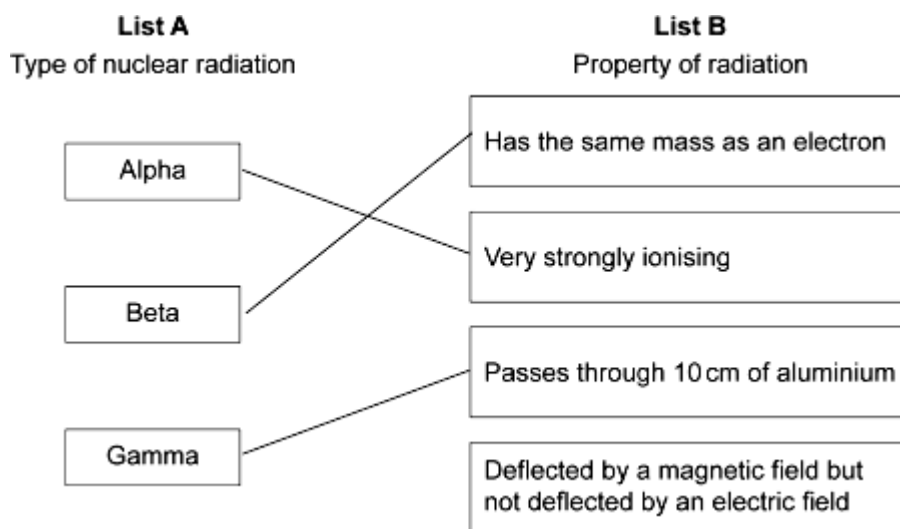
2

- (c) (i) increases 1
- (ii) Group **A** think that (even a very small level of exposure) gives some risk
accept there is always a risk, no matter how small the level of exposure 1
- Group **B** think that there is no risk (from a very low level of exposure)
accept below a certain level of exposure there is no risk
no marks for a simple graph description 1

[7]

10.

- (a) 1 mark for each correct line



if more than 1 line is drawn from any box in List A, none of those lines gain any credit

3

- (b) (i) (the detector) reading had gone down
'it' equals detector reading
accept the reading in the table is the smallest
accept 101 is (much) lower than other readings / a specific value eg 150
*do **not** accept this answer if it indicates the readings are the thickness*

1

more beta (particles / radiation) is being absorbed / stopped
accept radiation for beta particles / radiation
accept fewer particles being detected

1

- (ii) six years 1

- (iii) alpha would not penetrate the cardboard
accept the basic property – alpha (particles) cannot pass through paper / card
accept alpha (particles) are less penetrating (than beta)
range in air is neutral

1

[7]

11.

- (a) (i) neutron

1

- (ii) neutron
 proton

both required, either order

1

- (iii) 2

1

number of protons

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]