Name of the Student:_____
Max. Marks : 18 Marks **Time : 18 Minutes**

Mark Schemes

Q1.

(a) beta radiation is more penetrating (than alpha radiation)

allow beta radiation can pass through the case (but alpha radiation cannot)

allow beta radiation can travel further (in air than alpha radiation)

*do **not** allow beta radiation is more ionising*

1

so beta could irradiate people passing near the smoke detector

allow beta radiation can pass through skin

1

(b) A = 227

1

Z = 89

1

(c) (some) radiation is stopped by paper

1

so the source emits alpha radiation

MP2 dependent on MP1

1

and (some) radiation passes through paper but is stopped by aluminium

1

so the source emits beta radiation (but does not emit gamma)

MP4 dependent on MP3

1

(d) D B A C

all four letters must be in the correct order

explanation only scores if correct order given

1

explanation

a substance with a longer half-life has more stable nuclei

allow the more stable a nucleus, the less likely it is to decay (in a given time)

1

so answers are in order of increasing half-life

1

[11]

Q2.

(a) both are random processes

allow rolling dice is a random process

allow radioactive decay is a random process

1

(b) 144 →72 → 36 →18 → 9

allow the probability of not getting a 6 is 5/6

1

4 half lives

allow $144 \times (5/6)^4 = 69$

1

$\frac{20}{4}$ = 5 (rolls of the dice)

allow 69 is closest to 72 so 4 (rolls of the dice) some credible working must be shown to gain this mark

1

(c) a dice with 8 sides will have a smaller chance of decay (in one roll)

allow answers in terms of the 6-sided dice or in terms of more or fewer sides.

allow the 8 sided dice has a 1/8 chance of decay, whereas the 6 sided dice has a 1/6 chance of decay

1

so dice with 8 sides have a greater half-life

1

(d) nuclei in source **A** are more stable than nuclei in source **B**

allow nuclei in source A are less likely to decay (in a given time period)

1

[7]