Name of the Student:_____
Max. Marks : 19 Marks **Time : 19 Minutes**

Mark Schemes

Q1.

answers must be comparative
accept converse answers throughout

alpha: the count rate is (greatly) reduced by the card **or** the card absorbs alphas <u>but not betas</u>
accept paper for the card
1

beta: the count rate is (greatly) reduced by the metal **or** the thin metal absorbs alphas <u>and</u> betas **or** the thin metal absorbs all of the radiation (from the source)
accept aluminium for the metal
1

gamma: would pass through the thin
accept aluminium for the metal

metal but count rate is background **or** no radiation passing through **or** a higher reading would be recorded **or** to reduce the count to 2 would require <u>much more</u> than 3 mm of metal
accept lead / aluminium for the metal
1

[3]

Q2.

(i) 50 ± 5
1

(ii) 50 ± 5
accept their (b)(i)
1

(iii) less
accept any way of indicating the correct answer
1

[3]

Q3.

(a) **Y** and **Z**
1

they have the same number of protons **or** same atomic number

*accept they have the same number of electrons **or** same number of protons **and** electrons*
allow only different in number of neutrons N.B. independent marks

1

(b) **Quality of written communication**

*for correct use of terms underlined in B **or** C*

Q ✓ Q ✗

1

A – alpha particle passes straight through the empty space of the atom
or it is a long way from the nucleus

*describes 3 tracks correctly for **2** marks*
*describes 2 or 1 track correctly for **1** mark*

B – alpha particle deflected / repelled / repulsed by the (positive) nucleus

C – alpha particle heading straight for the nucleus is deflected / repelled / repulsed backwards

*do **not** accept hits the nucleus*
*do **not** accept answers referring to refraction*
*do **not** accept answers in terms of reflected backwards unless qualified in terms of repulsion*

mention of difference in charge on nucleus negates that track

max 2

[5]

Q4.

(a) suitable arrangement of source and GM tube ie fixed distance apart

accept 'detector' for GM tube and counter

1

suitable test

*eg introduce absorbing material **or** increase distance between source and GM tube*

1

suitable conclusion

*alpha that which gives a greatly reduced count with a paper absorber **or** alpha if count decreases rapidly when distance between source and GM tube exceeds 5 cm (approx)*

the first two marks could be scored from a labelled diagram

1

(b) (i) (changes to) background radiation

*do **not** accept the source is decaying if it is their only answer*

or

(beta) decay is random

accept decay is not constant

1

(ii) thickness decreasing

accept it is thin

1

increased count rate

1

(means) less (beta) radiation absorbed

accept more (beta) radiation passes through

1

(iii) changing thickness will not change count rate (significantly)

accept insufficient absorption of gamma radiation irrespective of thickness

*do **not** accept gamma rays too penetrating*

*do **not** accept answers in terms of speed*

1

[8]