

# Nuclear Radiations and Isotopes 3 MS

## Question 1

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)	beta alpha: would not pass through (the aluminium / foil) gamma: no change in count rate when thickness changes	must be a connection between detection / count rate / passing through and change in thickness	1 1 1
b)	foil thickness increases then decreases (then back to normal / correct thickness) gap between rollers decreases, then increases (then back to correct size) or pressure from rollers increases then decreases	a description of count rate changes is insufficient accept tightness for pressure  answers may link change in thickness and gap width for full credit ie: foil thickness increases so gap between rollers decreases (1) foil thickness decreases so gap between rollers increases (1)	1  1
c)	56(years)	accept any value between 55-57 inclusive allow 1 mark for correct calculation of mass remaining as 1.5 (micrograms) allow 1 mark for a mass of 4.5 micrograms plus correct use of graph with an answer of 12 maximum of 1 compensation mark can be awarded	2
Total marks			7

## QUESTION 2

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)	nucleus	do not accept core / centre / middle	1
b)	radiation damages our cells	accept radiation is dangerous / poisonous / harmful / toxic accept radiation can cause cancer / kills cells / change DNA / cause mutations / harm health accept so precautions can be taken accept so they know they may be exposed to / harmed by radiation it refers to radiation (source) to stop people being harmed is insufficient	1
c)	C		1
d)	gamma gamma will pass through the lead  or alpha and beta will not pass through lead	reason only scores if gamma chosen accept correct symbols for alpha, beta and gamma	1 1
e)i)	range of alpha too short or  alpha absorbed whether box is full or empty	accept alpha would not reach detector accept alpha (always) absorbed by box / card accept alpha will not pass through the box / card alphas cannot pass through objects / solids is insufficient alpha not strong enough is insufficient	1
e)ii)	M less radiation / beta (particles) absorbed or more radiation absorbed by full boxes	reason only scores if M chosen  accept more radiation / beta particles pass through accept reading is higher	1 1
Total marks			8

**QUESTION 3**

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)	(both graphs show an initial) increase in count rate	accept both show an increase	1
b)	only the right kidney is working correctly any two from: <ul style="list-style-type: none"> <li>• count-rate / level / line for right kidney decreases (rapidly)</li> <li>• count-rate / level / line for left kidney does not change</li> <li>• radiation is being passed out into urine – if referring to right kidney</li> <li>• radiation is not being passed out – if referring to the left kidney</li> <li>• left kidney does not initially absorb as much technetium-99</li> </ul>	if incorrect box chosen maximum of 1 mark can be awarded reference to named kidney can be inferred from the tick box it decreases is insufficient it does not change is insufficient	1 2
Total marks			4

**QUESTION 4**

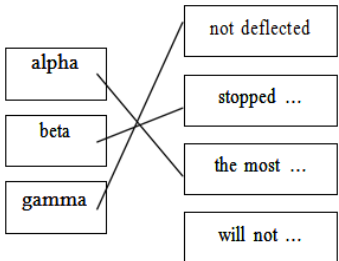
QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)	protons, electrons neutrons electron, nucleus	both required, either order  both required, this order	1 1 1
Total marks			3

**QUESTION 5**

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)i)	electromagnetic (wave / radiation)	accept em (wave / radiation)  ignore reference to frequency	1
a)ii)	gamma can penetrate the crate / box / packaging	accept converse (but must relate to both alpha and beta)	1

		ignore just gamma radiation kills bacteria accept can get through to food	
a)iii)	neutrons		1
b)i)	absorb gamma / radiation	accept it stops / reduces the radiation	1
b)ii	any one from: <ul style="list-style-type: none"> <li>slow down the conveyor belt</li> <li>food does more than one circuit</li> <li>stay on the conveyor belt longer</li> <li>food closer to the source / radiation</li> </ul>		1
c)i)	idea of testing food on humans / animals no (measured) ill effects or monitor their health	accept monitor people that have eaten the food accept a measurement / comparison for 1 mark eg measure the amount of radiation in treated food comparison plus a reason for the comparison would get 2 marks eg idea of measuring level of radiation in treated food with no measurable increase in level = 2 marks or comparing it to untreated food = 2 marks	1 1
Total marks			7

### QUESTION 6

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)	3 lines correctly drawn 	1 mark for each correct line if more than one line is drawn from a box in List A all lines from that box are wrong	3
b)	Y any two from: <input checked="" type="checkbox"/> least dangerous (inside the body)	do not accept gamma do not accept other properties of gamma do not accept not dangerous accept not as harmful as alpha	1 2

	<input type="checkbox"/> least ionising <input type="checkbox"/> penetrates through the body <input type="checkbox"/> is a gas / can be breathed in	(inside the body) do not accept can be detected externally accept it is not a solid (cannot score if Z chosen) if X chosen can score this gas mark if Z chosen can score both gamma marks	
c)	any one from: <input type="checkbox"/> longer shelf life <input type="checkbox"/> food can be supplied from around the world <input type="checkbox"/> wider market for farmers <input type="checkbox"/> cost to consumers (may be) lower <input type="checkbox"/> less likely to / will not get food poisoning	do not accept kills bacteria accept stays fresh longer / stops it going bad / mouldy  accept infection / disease / ill for food poisoning	1
Total marks			7