

Q1. (2019)

a)

06.2	gamma radiation is only weakly ionising or most gamma radiation will pass through any detector	allow gamma radiation is very penetrating	1	AO1.1 6.4.2.1	E
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b)

06.3		allow 2 marks for only some of the radiation passing into the GM tube is detected because gamma is weakly ionising		AO1.1 6.4.2.4	E
	any two from		2		
	<ul style="list-style-type: none"> the radiation spreads out in all directions only some of the radiation goes into the G-M tube only some of the radiation passing into the GM tube is detected 				

c)

06.4	to reduce the amount of radiation received	allow to reduce irradiation (of the teacher)	1	AO1.1	E
	because radiation increases the risk of cancer or (genetic) mutation	allow causes cancer or (genetic) mutation	1	6.4.2.1 WS 1.4	
		ignore references to contamination			

d)

06.5	a calculation of the product of thickness and count rate	examples of calculations $0.5 \times 110 = 55$ $1.0 \times 60 = 60$ $1.5 \times 33 = 50$ $2.0 \times 18 = 36$ $2.5 \times 10 = 25$	1	AO3.1b	E
	a second calculation of the product of thickness and count rate		1	6.4.2.1	
	a comparison of the calculated values and a recognition that they are different		1		
	OR				
	A calculation of half the count rate (1)	e.g. $\frac{110}{2} = 55$			
	A comparison with the count rate for double that thickness (1)	the first two marks may be scored for a count rate divided by 3, 4 or 5 compared with the corresponding count rate for 3, 4 or 5 times the thickness			
	A recognition that the values are different (1)	e.g. $55 \neq 60$			

Q2. (2022)

06.1	beta radiation is more penetrating (than alpha radiation)	allow beta radiation can pass through the case (but alpha radiation cannot)	1	AO1 6.4.2.1 6.4.2.4
		allow beta radiation can travel further (in air than alpha radiation)		
		do not allow beta radiation is more ionising		
	so beta radiation could irradiate people passing near the smoke detector	allow beta radiation can pass through skin	1	

Q3. (2023)

a)

04.1	<u>peer review</u>		1	AO1 6.4.2.4
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b)

04.2	it is ionising	ignore references to penetrating ability	1	AO1 6.4.2.4 6.4.2.1
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Q4. (2024)

05.1		allow risk for hazard throughout		AO1 6.4.2.4
	Irradiating			
	EITHER			
	radiation enters the water	allow alpha / beta / gamma enters the water	1	
		allow the water does not become radioactive		
	(which) does not affect the hazard	dependent on MP1	1	
	OR			
	because radiation can kill pathogens (1)	allow named pathogens e.g. bacteria, viruses		
	(irradiating) decreases the hazard (1)	dependent on MP1		
	contaminating			
	because radioactive isotopes will enter the water / body		1	
	(contaminating) increases the hazard	dependent on MP3	1	