

Q1.

Question Number	Answer	Additional guidance	Mark
(i)	<p>one from:</p> <p>(radiation from them) (can cause) cancer / tumours (1)</p> <p>radiation sickness / radiation poisoning (1)</p> <p>(radiation from them can) mutate / alter, deform / damage / ionise / kill {cells OR DNA OR genes} (1)</p> <p>burns skin (1)</p>	<p>accept any named type of cancer</p> <p>accept birth defects OR sterilisation</p> <p>Ignore unqualified poisoning kills you skin damage</p>	(1)

Q2.

	Answer	Acceptable answers	Mark
	<p>A description including two of:</p> <ul style="list-style-type: none"> • Kill/damage cells(1) • affecting DNA (1) • (causing) mutation (1) • by ionisation (1) • make cell reproduce rapidly (1) • cause cancer (1) • (radiation) burns (1) • (radiation) sickness (1) 		(2)

Q3.

	Answer	Additional guidance	Mark
(i)	<p>One from:</p> <ul style="list-style-type: none"> cell damage (1) cancer (1) radiation sickness / poisoning (1) mutation (1) chromosomal damage (1) dna damage (1) skin damage (1) (named) organ damage (1) burns (1) releases ionising radiation (1) 	allow ionises / kills cells	(1) AO1

Q4.

Question Number	Answer	Acceptable answers	Mark
	<p>An explanation linking the following:-</p> <ul style="list-style-type: none"> (it is) ionising (1) (can cause) damage to tissue/ mutation/cancer/tumours (1) 	<ul style="list-style-type: none"> has high frequency/energy kill cells / (causes) burns 	(2)

Q5.

Question Number	Answer	Acceptable answers	Mark
(i)	<p>An explanation to include two from:</p> <p>Radiation is ionising (1)</p> <p>Radiation can cause specified damage e.g. cancer or damage/mutate DNA (1)</p> <p>if dose/exposure is too high (1)</p>	<p>(causes) ionisation/ (can) ionise/ mutate cells/tissue</p> <p>ignore radiation poisoning/death/make you ill ignore {damage/kill} cells/tissue</p> <p>if absorb(ing) too much (radiation) or so you don't absorb too much (radiation)</p> <p>Accept for both marks: Too much radiation can cause cancer (after a while)</p>	(2)
Question Number	Answer	Acceptable answers	Mark
(ii)	<p><input checked="" type="checkbox"/> C we have a better understanding of the risks from radiation (1)</p>		(1)

Q6.

	Answer	Acceptable answers	Mark
(a)	<p>A description including two of:</p> <ul style="list-style-type: none"> • Kill/damage cells(1) • affecting DNA (1) • (causing) mutation (1) • by ionisation (1) • make cell reproduce rapidly (1) • cause cancer (1) • (radiation) burns (1) • (radiation) sickness (1) 		(2)
(b)	<p>An explanation linking any suitable precaution to a sensible reason: Eg lead/shielding (1) (because it) stops/absorbs radiation (1) Use of radiation meters (1) measure/warn of radiation received (1) put up signs (1) (to)keep people away from radiation (1) increasing distance (1) (to)reduce intensity (1) to reduce dose(1) by limiting the number of X-rays taken (1)</p>	<p>source locked away for shielding (worker) leaves room inverse square law</p>	(2)

Q7.

Question number	Answer	Additional guidance	Mark
(i)	Geiger-Müller tube	accept Geiger (counter) geiger (counter) GM (tube) gm(tube) accept any recognisable (phonetic) spelling	(1)

Question number	Answer	Additional guidance	Mark
(ii)	any two from: keep a safe distance (1) point the source away from people (1) handle the source with tongs/at a distance (1) limit exposure time/return source to store (asap) (1) use shielding (1) use of gloves (1) use of mask (1) protective clothing (1) wear a film badge/monitor (1)	use of screen Do not credit goggles	(2)

Q8.

	Answer	Additional guidance	Mark
(iii)	Two from: shielding (1) time limiting exposure (1) distance limiting exposure (1) wear PPE / protective clothing (1)	accept stand behind barriers / store (source) in lead box radiation monitoring badges leave the room / go outside / stay away from the patient / use tongs lead aprons / gloves ignore goggles / masks	(2) AO1

Q9.

Question Number	Answer	Acceptable answers	Mark
	<p>Any three from:</p> <ul style="list-style-type: none"> keep distant from sources / (stand) in a separate room (behind leaded window etc.) limit time exposed to the radioactivity use lead shielding for the sources / handle sources with tongs etc. / dispose radioactive material(s) safely wear lead aprons / used lead-lined clothing / lead-lined gloves monitor exposure with some detector / badge / use of (radiation) meters 	<p>(distance also involved if you) use computer controlled equipment</p> <p>the time aspect must be clear here.</p> <p>ignore goggles / (special) gloves without detail. Similarly ignore 'radiation resistant' (clothes)</p>	(3)

Q10.

	Answer	Acceptable answers	Mark
	<p>An explanation linking any suitable precaution to a sensible reason: Eg lead/shielding (1) (because it) stops/absorbs radiation (1) Use of radiation meters (1) measure/warn of radiation received (1) put up signs (1) (to)keep people away from radiation (1) increasing distance (1) (to)reduce intensity (1) to reduce dose(1) by limiting the number of X-rays taken (1)</p>	<p>source locked away for shielding (worker) leaves room inverse square law</p>	(2)

Q11.

Question number	Indicative content	Mark
*	<p>Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme.</p> <p>The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant.</p> <p>Dangers of exposing people to radioactive sources/radiation.</p> <ul style="list-style-type: none">• it is ionising• may cause cancer• may destroy /kill cells• can mutate DNA• can burn the skin <p>Protection of hospital staff using radioactive sources/radiation.</p> <ul style="list-style-type: none">• use tongs to carry radioactive sources• use lead containers to store sources• stay at a distance from radioactive sources• use sources for as short a time as possible• wear (lead lined) protective clothing (PPE)• give treatments from behind a shield /wall• wear a radiation badge (dosimeter)	(6) AO1

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1-2	<p>Demonstrates elements of physics understanding, some of which is inaccurate. Understanding of scientific, enquiry, techniques and procedures lacks detail. (AO1)</p> <p>Presents a description which is not logically ordered and with significant gaps. (AO1)</p>
Level 2	3-4	<p>Demonstrates physics understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas, enquiry, techniques and procedures is not fully detailed and/or developed. (AO1)</p> <p>Presents a description of the procedure that has a structure which is mostly clear, coherent and logical with minor steps missing. (AO1)</p>
Level 3	5-6	<p>Demonstrates accurate and relevant physics understanding throughout. Understanding of the scientific ideas, enquiry, techniques and procedures is detailed and fully developed. (AO1)</p> <p>Presents a description that has a well-developed structure which is clear, coherent and logical. (AO1)</p>

Level	Mark	Additional Guidance	General additional guidance - the decision within levels
	0	No rewardable material.	e.g. - At each level, as well as content, the scientific coherency of what is stated will help place the answer at the top, or the bottom, of that level.
Level 1	1-2	<u>Additional guidance</u> At least one isolated fact about the dangers of radiation and/or protection from radiation	<u>Possible candidate responses</u> it's ionising causes cancer burns you kills cells mutates DNA wear a radiation badge use tongs work from behind a shield use protective clothing
Level 2	3-4	<u>Additional guidance</u> simple explanation of the dangers of radiation and a fact about protection or reverse OR detailed explanation of the dangers of radiation or protection from radiation	<u>Possible candidate responses</u> radiation is ionising and can kill cells so wear a radiation badge or use tongs and stay at a distance from radiation source as it can cause cancer or use tongs to stay at a distance from radiation sources and wear a radiation badge
Level 3	5-6	<u>Additional guidance</u> detailed explanation of the dangers of radiation and protection from radiation	<u>Possible candidate responses</u> radiation is ionising and can kill cells and use tongs and stay at a distance from the radiation source