BACKGROUND RADIATIONS AND HAZARDS 2 MS

QUESTION 1

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)	any one from: • nuclear power (stations) • nuclear weapons (testing) • nuclear accidents	accept nuclear waste accept coal power stations accept nuclear bombs / fallout accept named accident, eg Chernobyl or Fukushima accept named medical procedure which involves a radioactive source accept radiotherapy accept X-rays accept specific industrial examples that involve a radioactive source nuclear activity / radiation is insufficient smoke detectors is insufficient	1
a)ii)	(radioactive decay) is a random process	accept an answer in terms of background / radiation varies (from one point in time to another)	1
b)	any one from: •(maybe) other factors involved •evidence may not be valid •may not have (a complete) understanding of the process (involved)	accept a named 'sensible' factor, eg smoking accept not enough data	1
Total marks			3

QUESTION 2

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)i)	1.25 (mSv)		1
a)ii)	any two from: (frequent) flying living at altitude • living in areas with high radon concentrations • living in a building made from granite (blocks) • having more than the average number of X-rays or	accept stated occupation that involves flying accept a specific area, eg Cornwall accept more medical treatments accept any suggestion that could reasonably increase the level from a specific source	2

	having a CT scan • working in a nuclear power station		
b)i)	to be able to see the effect of exposure (to radon gas) or as a control	accept to compare (the effect of) exposure (with no exposure)	1
b)ii)	increased levels of exposure increases the risk (of developing cancer) smoking increases the (harmful) effect of radon	accept exposure (to radon gas) increases the risk answers that simply reproduce statistics are insufficient	
c)	LNT model – risk increases with increasing radiation (dose) level Radiation hormesis – low radiation (dose) levels reduce the risk	accept in (direct) proportion accept low doses increase the risk	2
Total marks			8

QUESTION 3

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)	cosmic rays radon gas		1 1
b)i)	Radioactive decay is a random process		1
b)ii)	19		1
b)iii)	140	accept 159 – their (b)(i) correctly calculated	1
b)iv)	gamma the count stayed the same or gamma does not have a charge (so) gamma is not deflected / affected by the magnetic field	accept gamma is an electromagnetic wave accept magnet for magnetic field do not accept is not attracted to the magnet last two marks may be scored for an answer in terms of why it cannot be alpha or beta only answer simply in terms of general properties of gamma are insufficient	1 1 1
c)	lead absorbs (some of the) radiation	accept radiation cannot pass through (the lead)	1

	or less radiation emitted into the (storage) room		
d)	Should radioactive waste be dumped in the oceans		1
Total marks			10

QUESTION 3

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)i)	on average, cosmic rays produce less background radiation than rocks. having no X-rays reduces a person's radiation dose.		1 1
a)ii)	4	allow 1 mark for 350 / 4 allow 1 mark for an answer 3.5	2
b)i)	(risk) increases		1
b)ii)	C shows a lower risk for low doses (than for zero exposure)	reason only scores if C chosen accept risk reduces when you go from low to moderate (doses)	1 1
c)i)	YES fewer mice exposed first to a low dose get cancer (than those only exposed to a high dose) NO the results are for mice (1) and may not be applicable to people (1)	no mark for YES or NO, marks are for the explanation only scores if first marking point scores	1 1
c)ii)	ethical		1
Total marks			10