Question number	Answer	Notes	Marks
7 (a) (i)	90		1
(ii)	time; either for amount of (radioactive) isotope to halve; or for (radio)activity to halve;	Allow for amount - (number of un-decayed) nuclei/atoms/molecules (un-decayed) mass of isotope	2
(iii)	Any two of – MP1 Idea that (beta) radiation causes a stated hazard; MP2 Idea that strontium-90 has a long half-life; MP3 Idea that <u>all</u> beta emission will be absorbed by the body;	 e.g. causes cancer, kills cells, mutates DNA, ionises tissue Accept lasts a long time Accept answers in terms of range	2
(b) (i)	90 and 0; -1; $^{90}_{38}Sr \rightarrow {}^{90}_{39}Y + {}^{0}_{-1}\beta^{-}$	Must have both Minus is essential	2
(ii)	Any two ideas from – MP1 They are isotopes of different elements; MP2 Strontium-90 (nucleus/atom) has the same number of protons as other strontium (nuclei/atoms); MP3 Yttrium-90 (nucleus/atom) has the same number of protons as other yttrium (nuclei/atoms);	 Allow use of proton number data (38) Allow use of proton number data (39)	2

Total 9 marks