

Question number	Answer	Notes	Marks
8 (a) (i)	B (78); A is incorrect because this is the number of protons C is incorrect because this is the number of nucleons D is incorrect because this is the number of nucleons + protons		1
(ii)	time taken; and either of for (radio)activity to halve; for half of the (radioactive) {nuclei / atoms / isotope / mass} to decay;	allow “how long it takes” reject “half the time” allow count rate for activity ignore substance	2
(iii)	one mark for each correct cross drawn (8, 8000); (16, 4000); (24, 2000);	curve from (iv) can be used to infer correct data points	3
(iv)	smooth curve of best fit drawn; correct reading of time to decrease to 5000;	can be used to infer points in (iii) ecf candidate's curve within 1 square NB - perfect curve would give answer between 13-14 days	2
(b) (i)	Geiger(-muller) tube/ GM tube / photographic film / scintillator;	allow detector or counter for tube ignore radiation detector	1
(ii)	idea that gamma is more penetrating than beta;	RA allow gamma less ionising (power) than beta	1

(c)	any three from: MP1. gamma is less ionising than beta; MP2. beta is more likely to cause cell damage than gamma; MP3. technetium decays more quickly; MP4. technetium is in the body for less time/short time;	RA allow named damage e.g. cancer, cell mutation etc. ignore half-life of technetium is less	3
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Total for Question 8 = 13 marks