

Question number	Answer	Notes	Marks
9 (a)	Geiger-muller tube;	allow GM tube spark counter geiger counter	1
(b) (i)	any two from: MP1. rocks / buildings / radon gas; MP2. cosmic rays / (radiation from) the Sun; MP3. medical sources; MP4. nuclear waste / accidents; MP5. some foods e.g. coffee, bananas etc.;		2
(ii)	any three from: MP1. remove the radioactive source; MP2. measure background count; MP3. repeat the measurement and calculate average; MP4. idea of scaling background count to same time as count measurement; MP5. subtract background count from the non-corrected measurement;	allow background count taken for 20 minute period	3
(c)	number of neutrons decreases by one; number of protons increases by one;	condone atomic number for protons  'neutron becomes a proton' gains both marks 'atomic number increases by 1, mass number stays the same' gains both marks allow for one mark if no other scored for the idea that the nucleus becomes a different element	2
(d)	any two from: MP1. reduce exposure time;  MP2. handle with tongs / at a distance;	allow keeping in lead container when not in use	2

	MP3. use shielding;  MP4. wear a film badge / monitor; MP5. not pointing source at anyone;	allow use of gloves, mask etc.	
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**Total for question 9 = 10 marks**