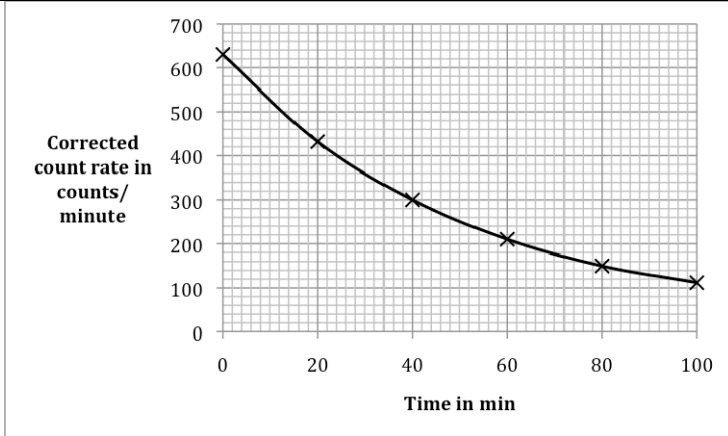


Question number			Answer	Notes	Marks
12	(a)	(i)	<p>Any two sources:</p> <p>MP1. radiation from rocks/buildings/radon gas;</p> <p>MP2. cosmic radiation / radiation from the Sun / stars;</p> <p>MP3. radiation from medical sources;</p> <p>MP4. nuclear waste / accidents;</p> <p>MP5. some foods e.g. coffee, bananas;</p>	<p>Ignore : cosmic <u>microwave</u> (background) radiation / <u>cmb</u></p> <p>allow named radioactive isotopes</p> <p>accept fire / smoke detector</p>	2
		(ii)	<p>Any three of</p> <p>MP1. Remove the radioactive source;</p> <p>MP2. Measure the (background) count rate;</p> <p>MP3. Repeat the measurement / measure for a long time;</p> <p>MP4. Background radiation is 30 (counts per minute);</p> <p>MP5. Subtract this value from (each) reading(s);</p>	<p>Accept standard abbreviations e.g. cpm</p> <p>Allow for 2 marks: measure the count rate without the source</p>	3

Question number			Answer	Notes	Marks														
12	(a)	(iii)	scale; at least half the paper axes labelled including units; Plotting to nearest sm sq; ; Best fit line to include at least 5 points;	-1 each plotting error, minimum 0 for plotting <table><tr><td>Time in min</td><td>Corrected count rate in counts/minute</td></tr><tr><td>0</td><td>630</td></tr><tr><td>20</td><td>432</td></tr><tr><td>40</td><td>300</td></tr><tr><td>60</td><td>210</td></tr><tr><td>80</td><td>150</td></tr><tr><td>100</td><td>112</td></tr></table>	Time in min	Corrected count rate in counts/minute	0	630	20	432	40	300	60	210	80	150	100	112	5
Time in min	Corrected count rate in counts/minute																		
0	630																		
20	432																		
40	300																		
60	210																		
80	150																		
100	112																		
																			
		(iv)	Evidence of correct graph use; Correct value;	Allowed range is 35-42	2														

Question number		Answer	Notes	Marks
12	(b)	<p>correct statement about a neutron; e.g. neutron changes neutron number decreases by 1</p> <p>correct statement about a proton/ atomic/number of positive charges in nucleus; e.g. (neutron changes) into a proton proton number increases by 1 number of positive charges increases by 1</p>	<p>ignore : 'it becomes unstable'</p> <p>Accept answers in terms of quarks (down to up) or anti-neutrinos</p> <p>allow for 1 mark if no other mark gained: nucleus becomes another/new element it loses energy nucleus recoils</p> <p>reject: all implication that nucleus becomes ionised</p>	2
	(c)	(i)	<p>MP1. (they emit) ionising radiation; plus any one of -</p> <p>MP2. Cannot be seen; MP3. Can damage/harm cells; MP4. Can cause tumours / cancer;</p>	2
		(ii)	<p>Any three suitable, e.g.</p> <p>MP1. Reduce exposure time; MP2. Handle with tongs/use robotic handling/keep at distance /eq; MP3. Use shielding / work in fume cupboard /eq MP4. Wear film badge / monitor;</p>	3

Total 19 marks