NUCLEAR RADIATIONS AND ISOTOPES MARK SCHEMES 1

Question 1

Question	**answers**	**extra information**	**mark**
a)i)	protons neutrons	answers may be in either order	1
a)ii)	86	do not accept two fewer protons and neutrons do not accept 218 protons and neutrons	1
a)iii)	two fewer protons and two fewer neutrons or 84 protons 134 neutrons	do not accept two fewer protons and neutrons do not accept 218 protons and neutrons	1
b)i)	0.4	accept 2/5 / accept 40 % for 2 marks allow 1 mark for correct totalling = 1.8 allow 1 mark for a clearly correct method with a clearly incorrect total	2

b)ii)	any one from: nuclear weapon testing nuclear power (stations) nuclear accidents medical	do not accept nuclear accept nuclear/ radioactive waste accept X-rays	1
c)i)	2	accept 2:1 accept twice as big ignore units	1
c)ii)	No with a reasonable reason explained only going for two weeks so or even staying for a year total exposure well under lowest limit for causing cancer or Yes with a reasonable reason explained all levels of radiation are (potentially) hazardous (1) harm caused by lower doses may not have been recorded(1) or evidence may not be complete or insufficient research into effect of small doses	1 mark is for a time frame 1 mark is for correctly relating to a dose accept low doses could still cause cancer accept all levels affect you do not accept radiation dose is high(er) do not accept level of background radiation is higher in Germany	1 1

Question 2

Question	answers	extra information	mark
a)	146		1
b)	atomic number		1
c)i)	alpha		1
c)ii)	number of protons changes	accept atomic number changes accept loses or gains protons do not accept protons with any other particle e.g. number of protons and neutrons changes incorrect do not accept any reference to mass number	1

Question 3

Question	answers	extra information	mark
a)i)	K and L	both answers required either order	1
a)ii)	(1) same number of protons	accept same number	1

	(2) different numbers of neutrons	of electrons accept same atomic number	1
b)i)	90		1
b)ii)	140		1
c)	alpha (particle) mass number goes down by 4 or number of protons and neutrons goes down by 4 or number of neutrons goes down by 2 atomic / proton number goes down by 2 or number of protons goes down by 2	reason may score even if beta or gamma is chosen candidates that answer correctly in terms of why gamma and beta decay are not possible gain full credit accept an alpha particle consists of 2 neutrons and 2 protons for 1 mark accept alpha equals 42He or 42α for 1 mark an alpha particle is a helium nucleus is insufficient for this mark	1 1 1

Question 4

Question	answers	extra information	mark
a)	isotopes		1
b)	231 90 Th	correct order only	1 1
c)i)	(nuclear) fission	accept fision do not accept any spelling that may be confused with fusion	1
c)ii)	neutron / neutrons		1
d)	plutonium (239)	accept MOX (mixed oxide) accept Pu do not accept uranium 238 / hydrogen	1