Developing Atomic structure and Isotopes 1 Mark Schemes

QUESTION 1

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)	any two pairs from: nuclear model mass is concentrated at the centre / nucleus plum pudding model mass is evenly distributed nuclear model positive charge occupies only a small part of the atom plum pudding model positive charge spread throughout the atom nuclear model electrons orbit some distance from the centre / nucleus plum pudding electrons embedded in the (mass) of positive (charge) nuclear model the atom mainly empty space plum pudding model is a 'solid' mass	to gain credit it must be clear which model is being described do not accept simple descriptions on the diagram without comparison accept the nuclear model has a nucleus/ the plum pudding model does not have a nucleus for 1 mark accept electrons in shells/ orbits provided a valid comparison is made with the plum pudding model do not accept on its own do not accept electrons at edge of plum pudding	4
b)	nucleus must be positive to deflect/ repel alpha particles	answers in terms of electrons/negative charge causing deflection negates mark	1

	nucleus (very) small so few alpha particles deflected backwards	answers in terms of reflection negates mark accept most of atom empty space so most pass through	1
c)	many/ 100 000 measurements taken findings could not be explained by plum pudding model	accept results for measurements accept data valid / reliable accept a specific finding that could not be explained eg some alpha particles were deflected backwards	1 1
Total marks			8

QUESTION 2

QUESTION	ANSWER	EXTRAA INFORMATION	MARKS
a)	<table><tr><th>Particle</th><th>Relative Mass</th><th>Relative charge</th></tr><tr><td>Proton</td><td>1</td><td></td></tr><tr><td>Neutron</td><td></td><td>0</td></tr></table>	accept one, accept +1 do not accept -1 accept zero do not accept no charge/ nothing/ neutral unless given with 0	1 1
b)	equal numbers/amounts of protons and electrons protons and electrons have equal but opposite charge	accept protons charge +1 and electron charge -1 accept (charge) on proton cancels/balances (charge) on electron accept positive (charges) cancel out the negative(charges) neutrons have no charge is neutral do not accept total charge of protons, electrons (and neutrons) is 0 unless qualified	1 1
c)i)	(3) fewer neutrons	accept lower/ smaller mass number do not accept different numbers of neutrons	1

		any mention of fewer/more protons/ electrons negates mark accept answers in terms of U-238 providing U-238 is specifically stated i.e. U-238 has (3) more neutrons	
c)ii)	neutron		1
c)iii)	(nuclear) fission	accept fision do not accept any spelling that may be taken as fusion	1
Total marks			7

QUESTION 3

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)i)	All correct Number of protons: 3 Number of electrons: 3 Number of neutrons: 4	accept presented as a tally chart allow 1 mark for 1 correct	2
a)ii)	7 number of protons and neutrons	reason may score even if 7 not chosen accept number of particles in the nucleus accept number of nucleons do not accept number of electrons and neutrons	1 1
b)	an ion		1
c)i)	smaller than		1
c)ii)	radon loses an alpha (particle) or radon loses an (alpha) particle or (mass of) polonium plus an alpha = (mass) radon or radon loses 2 protons and 2 neutrons (to become polonium)	accept radon has less protons and neutrons	1
Total marks			7

QUESTION 4

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)	electron(s)		1
b)	3rd box ticked The model cannot explain the results from a new experiment		1
c)	All correct **Particle** Proton Electron Neutron	allow 1 mark for 1 correct	2
Total marks			4

QUESTION 5

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)	proton electron neutron	all 3 in correct order allow 1 mark for 1 correct do not accept letters p, e, n	2
b)	4 number of protons	reason only scores if 4 is chosen accept number of electrons accept there are 4 protons and 4 electrons do not accept there are 4 protons and electrons	1 1
c)	The atom loses an electron.		1
Total marks			5

QUESTION 6

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)	78		1
b)	atomic		1
c)i)	131 54	correct order only	1 1

c)ii)	32 (days)	allow 1 mark for showing 4 half-lives provided no subsequent step	2
c)iii)	limits amount of iodine-131 / radioactive iodine that can be absorbed so reducing risk of cancer (of the thyroid)	accept increases level of non-radioactive iodine in thyroid do not accept cancels out iodine-131 accept stops risk of cancer (of the thyroid)	1 1
Total marks			8