Mark scheme

Question			Answer/Indicative content	Marks	Guidance
1			A	1 (AO 2.1)	
			Total	**1**	
2		i	Arrow with direction vertically upwards ✓ Arrow from lowest energy level to highest energy level ✓	2 (2 × AO 2.1)	**ALLOW** to above the highest energy level
		ii	Excited **and** absorbed ✓ Higher than ✓	2 (2 × AO 1.1)	**BOTH** required for first mark **Examiner's Comments** The topic of energy levels (P6.1) was not well understood by candidates, with approximately half of candidates not gaining any credit in part (a). A number of candidates did not attempt part (a) (i) and, of those who did, many had the arrow pointing downwards. In part (a) (ii), few scored both marks, with various combinations of words from the list used to complete the sentences.
			Total	**4**	
3	a	i	2 2 0 ✓✓	2 (2 ×AO 1.1)	All 3 correct = 2 marks 2 correct = 1 mark **Examiner's Comments** Most candidates scored at least 1 mark for this question. Some candidates thought that there were also electrons in an alpha particle.
		ii	Alpha cannot penetrate body/skin **OR** alpha is absorbed by the body/skin ✓	1 (AO 1.2)	**ALLOW** skin blocks alpha **IGNORE** alpha is highly ionising / not very penetrating **Examiner's Comments**

					This question was of standard demand but many candidates struggled to express themselves clearly enough to gain credit, referring to general properties of alpha particles but not linking these properties directly to the question asked.
	b	i	Isotopes ✓	1 (AO 1.1)	
		ii	e ✓ $^{0}_{-1}$ ✓	2 (2 × AO 2.2)	**ALLOW** β for e Both 0 as mass number **and** -1 as proton number required for the mark
	c	i	69, 13 ✓	1 (AO 2.2)	**BOTH** needed for 1 mark **ALLOW** tolerance of +/− 1
		ii	Calculates any one correct ratio from the table ✓ **BUT** Calculates at least two correct ratios **and** states the values are approximately the same / the teacher is correct ✓ ✓	2 (2 ×AO 2.2)	**ALLOW ECF** from **(d)(i)** e.g.: $M_0 \div M_{200}$ or 160 ÷ 69 = 2.32 $M_{200} \div M_{400}$ or 69 ÷ 30 = 2.30 $M_{400} \div M_{600}$ or 30 ÷ 13 = 2.31 **ALLOW** ratios calculated over 400 days, e.g., $M_0 \div M_{400}$ or 160 ÷ 30 = 5.3 and $M_{200} \div M_{600}$ or 69 ÷ 13 = 5.3 **Examiner's Comments** This question required candidates to calculate two ratios from the table and state that they were close enough to be considered constant. The majority of candidates correctly calculated two ratios, although some candidates left the ratio as a fraction. Some candidates did not gain the second mark as, even though the ratios rounded to 2.3, they stated they were not constant. **Assessment for learning** In Science, candidates should usually fully calculate their final answer and write it as a decimal number, not as the fraction which is usually shown on

					their calculator (unless asked for otherwise).
			Total	**9**	
4			B ✓	1 (AO2.1)	**Examiner's Comments** Most candidates were able to use the data in the question to correctly calculate the count-rate after 20 minutes. Exemplar 1 A 8 cpm B 16 cpm C 32 cpm D 48 cpm Your answer B $\frac{64}{2} = 32$ $\frac{32}{2} = 16$ Exemplar 1 shows how the candidate writes down calculations to help them to determine the correct count-rate.
			Total	**1**	