



Mark scheme – The Particle Model (F)

Question			Answer/Indicative content	Marks	Guidance
1			C ✓	1(AO2.1)	<p>Examiner's Comments</p> <p>Candidates knew the order in which the states needed to be put. Option A is the correct answer. Option D was a common misunderstanding where candidates had not placed the states of matter '...in density order, starting with the lowest density.'</p>
			Total	1	
2			A ✓	1 (AO 2.2)	<p>Examiner's Comments</p> <p>This was the most challenging question in Section A. The most common response was distractor D, where candidates multiplied the numbers together rather than dividing wave speed by wavelength.</p>  <p>AfL</p> <p>For these type of questions candidates should be encouraged to insert the numbers into the equation. When they do this they will see that the equation needs to be rearranged. Alternatively, candidates could rearrange the equation so that the unknown quantity is on the left-hand side of the equal sign.</p>
			Total	1	
3			D	1 (AO1.1)	
			Total	1	
4			B ✓	1(AO2.1)	
			Total	1	
5			Conversion of cm to m (1) Calculation of volume: $0.2 \times 0.3 \times 1.2 = 0.072 \text{ m}^3$ (1) Re-arrangement of formula for mass (1)	6	ALLOW 12.96

			Substitution: 180×0.072 (1) Answer: 13 (1) Units: kg (1)		
			Total	6	
6		i	<p>Any two from:</p> <p>The old model has no protons / ORA ✓</p> <p>The old model has no neutrons / ORA ✓</p> <p>There is no nucleus in the old model / ORA ✓</p> <p>The electrons are in fixed positions in the old model / ORA ✓</p> <p>The positive particles are in a nucleus in the current model ✓</p> <p>The negative particles/electrons are outside / surround the nucleus in the current model ✓</p>	2 (AO2 × 1.1)	<p><u>Examiner's Comments</u></p> <p> Misconception</p> <p>It is important to be clear which model/view point/thing the candidate is writing about in these type of question. Candidates will not be credited when they expect the examiner to interpret what their answer implies. It is better to state clearly "the old model." rather than "one of the models ..."</p> <p>A number of candidates read the first statement about the old atomic model as implying that atoms had a positive charge. Several candidates did not achieve both marks because they were not clear about which model they were talking about.</p>
		ii	<p>Any two from:</p> <p>new evidence ✓</p> <p>more experiments completed ✓</p> <p>previous model couldn't explain new observations ✓</p>	2 (AO2 × 1.1)	<p>ALLOW mention of Rutherford, Geiger/Marsden</p> <p><u>Examiner's Comments</u></p> <p>Most candidates recognised the role of Rutherford/Geiger/Marsden which was expected. Several candidates mentioned Niels Bohr and/or John Dalton, which was unexpected in this context.</p>
			Total	4	
7	a		<p>Positively ✓</p> <p>Negatively ✓</p> <p>Neutrons ✓</p> <p>Nucleus ✓</p>	4 (AO1.1 × 4)	

	b	i	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 997 (kg/m³) award 2 marks $9970 \div 10 \checkmark$ $= 997 \text{ (kg/m}^3\text{)} \checkmark$	2 (AO 2.1) (AO 2.1)	
		ii	C B A	1 (AO1.1)	Correct order only
		iii	Any one from: C has more/the most particles (for the same volume) \checkmark A has fewer/the least particles (for the same volume) \checkmark	1 (AO 1.1)	ALLOW C has particles closest together/least spread out/most tightly packed ALLOW A has particles furthest apart/most spread out/least tightly packed ALLOW correct identification of C = solid, (B = liquid,) A = gas
			Total	8	