Question number	Answer	Notes	Marks
4 (a)	A helium **nucleus** / 2 protons and 2 neutrons/ 4 nucleons, 2 protons;	Ignore chemical symbol	1
(b) (i)	Arrow labelled Y, through X away from nucleus; Line of action of force would pass through centre of nucleus by eye;		2
(ii)	Arrow labelled Z, opposite direction to their answer from b) (i) by eye; Same size as their answer from b) (i) by eye;	If no arrow Y, condone correct direction for arrow Z, i.e. force arrow pointing away from point X.	2
(iii)	MP1 Force on alpha is repulsive; MP2 Alpha and nucleus must be same (type of) charge; MP3 Alpha is positive **therefore** nucleus is positive;	Allow 'like charges repel' for MP1 and MP2	3
4 (c)	Selection of F = ma; Substitution or re-arrangement; Evaluation; e.g. a = 3.6 / 6.6 x 10^{-27} = 5.5 x 10^{26} m/s^2	Can be implied from working -1 for PoT error Allow 5.45 x 10^{26}, 5.454 x 10^{26}, 5.4545... x 10^{26} etc Condone 5.4 x 10^{26}	3

Question number	Answer	Notes	Marks
9 (a) (i)	Selection of P=F/A; Conversion of g to kg; Evaluation of weight; Evaluation of pressure; Correct answer: 140 (Pa) i.e. $W = 3.7 \times 10^{-3} \times 10 = 3.7 \times 10^{-2}$ N; $P = 3.7 \times 10^{-2} / (2.6 \times 10^{-4})$; P = 140 (Pa);	 0.0037 seen anywhere Accept any value that rounds to 140. i.e 142, 142.3, Accept use of 9.8(1) for 'g', giving 139(.46)	4
(ii)	Same weight (and larger cross-sectional area); P=F/A so smaller pressure;	Allow 'force' for weight	2
(b)	Increases continuously from -10 °C to 0 °C; Remains constant at 0 °C; Increases continuously from 0 °C to 20 °C;	Responses with no period of time at 0 °C score max 1 mark. Accept • Any gradient • Straight lines or curves for the increasing temperature parts • Any non-zero amount of time at 0 °C by eye Ignore any numbers on the time axis.	3
(c)	Any TWO from: Bonds between particles are weakened or broken; Particles go from regular to irregularly packed/EQ; Particles go from vibrating (about a fixed position) to sliding past each other/EQ;	 Allow particles get (slightly) further apart/EQ; ignore references to KE	2