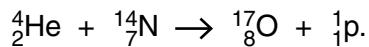


- 8 (a) Explain why the mass of an  $\alpha$ -particle is less than the total mass of two individual protons and two individual neutrons.

.....  
.....  
.....

[2]

- (b) An equation for one possible nuclear reaction is



Data for the masses of the nuclei are given in Fig. 8.1.

		mass/u
proton	${}_1^1\text{p}$	1.00728
helium-4	${}_2^4\text{He}$	4.00260
nitrogen-14	${}_7^{14}\text{N}$	14.00307
oxygen-17	${}_8^{17}\text{O}$	16.99913

**Fig. 8.1**

- (i) Calculate the mass change, in u, associated with this reaction.

$$\text{mass change} = \dots \text{u} \quad [2]$$

- (ii) Calculate the energy, in J, associated with the mass change in (i).

$$\text{energy} = \dots \text{J} \quad [2]$$

- (iii) Suggest and explain why, for this reaction to occur, the helium-4 nucleus must have a minimum speed.

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.....

.....

[2]