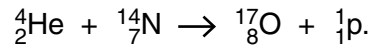


- 8 (a) Explain why the mass of an  $\alpha$ -particle is less than the total mass of two individual protons and two individual neutrons.

.....  
 .....  
 ..... [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	${}^4_2\text{He}$	4.00260
nitrogen-14	${}^{14}_7\text{N}$	14.00307
oxygen-17	${}^{17}_8\text{O}$	16.99913

**Fig. 8.1**

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

mass change = ..... u [2]

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

energy = ..... J [2]

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

*For  
Examiner's  
Use*

.....

.....

..... [2]