

- 12 One nuclear reaction that can take place in a nuclear reactor may be represented, in part, by the equation



Data for a nucleus and some particles are given in Fig. 12.1.

nucleus or particle	mass/u
${}^{139}_{57}\text{La}$	138.955
${}^1_0\text{n}$	1.00863
${}^1_1\text{p}$	1.00728
${}^0_{-1}\text{e}$	5.49×10^{-4}

Fig. 12.1

- (a) Complete the nuclear reaction shown above. [1]
- (b) (i) Show that the energy equivalent to 1.00 u is 934 MeV.

[3]

- (ii) Calculate the binding energy per nucleon, in MeV, of lanthanum-139 (${}^{139}_{57}\text{La}$).

$$\text{binding energy per nucleon} = \dots \text{ MeV} \quad [3]$$

Question 12 continues on the next page.

- (c) State and explain whether the binding energy per nucleon of uranium-235 ($^{235}_{92}\text{U}$) will be greater, equal to or less than your answer in (b)(ii).

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[3]

[Total: 10]

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