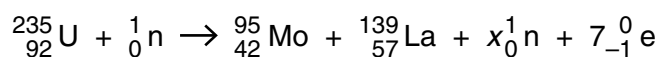


- 8 When a neutron is captured by a uranium-235 nucleus, the outcome may be represented by the nuclear equation shown below.

For  
Examiner's  
Use



- (a) (i) Use the equation to determine the value of  $x$ .

$x = \dots\dots\dots$  [1]

- (ii) State the name of the particle represented by the symbol  ${}_{-1}^0\text{e}$ .

$\dots\dots\dots$  [1]

- (b) Some data for the nuclei in the reaction are given in Fig. 8.1.

|  | mass/u  | binding energy per nucleon /MeV |
|--|---------|---------------------------------|
| uranium-235 ( ${}_{92}^{235}\text{U}$ )    | 235.123 |                                 |
| molybdenum-95 ( ${}_{42}^{95}\text{Mo}$ )  | 94.945  | 8.09                            |
| lanthanum-139 ( ${}_{57}^{139}\text{La}$ ) | 138.955 | 7.92                            |
| proton ( ${}_1^1\text{p}$ )                | 1.007   |                                 |
| neutron ( ${}_0^1\text{n}$ )               | 1.009   |                                 |

**Fig. 8.1**

Use data from Fig. 8.1 to

- (i) determine the binding energy, in u, of a nucleus of uranium-235,

binding energy =  $\dots\dots\dots$  u [3]

- (ii) show that the binding energy per nucleon of a nucleus of uranium-235 is 7.18 MeV.

For  
Examiner's  
Use

[3]

- (c) The kinetic energy of the neutron before the reaction is negligible.  
Use data from (b) to calculate the total energy, in MeV, released in this reaction.

energy = ..... MeV [2]

**BLANK PAGE**

**Please turn over for Section B.**