8 **(a)** State what is meant by *nuclear binding energy*.

.....

.....

.....[2]

(b) The variation with nucleon number A of the binding energy per nucleon B_E is shown in Fig. 8.1.

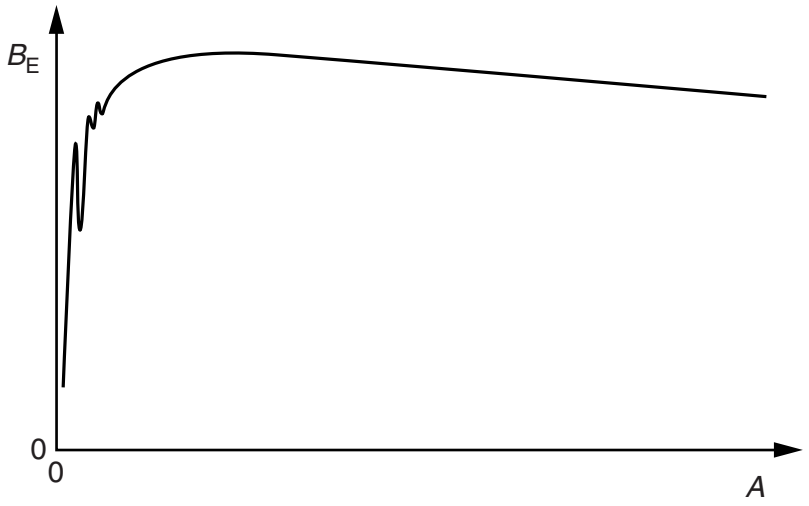

Fig. 8.1

When uranium-235 ($^{235}_{92}U$) absorbs a slow-moving neutron, one possible nuclear reaction is

$$^{235}_{92}U + {}^{1}_{0}n \rightarrow {}^{95}_{42}Mo + {}^{139}_{57}La + 2{}^{1}_{0}n + 7{}^{0}_{-1}\beta + \text{energy.}$$

(i) State the name of this type of nuclear reaction.

.....[1]

(ii) On Fig. 8.1, mark the position of

1. the uranium-235 nucleus (label this position U), [1]

2. the molybdenum-95 ($^{95}_{42}Mo$) nucleus (label this position Mo), [1]

3. the lanthanum-139 ($^{139}_{57}La$) nucleus (label this position La). [1]

(iii) The masses of some particles and nuclei are given in Fig. 8.2.

For Examiner's Use

	mass/u
β-particle	5.5×10^{-4}
neutron	1.009
proton	1.007
uranium-235	235.123
molybdenum-95	94.945
lanthanum-139	138.955

Fig. 8.2

Calculate, for this reaction,

1. the change, in u, of the rest mass,

change in mass = ... u [2]

2. the energy released, in MeV, to three significant figures.

energy = ... MeV [3]