6 **(a)** State what is meant by *binding energy* of a nucleus.

……

…… [1]

(b) The data for iron-56 $\left({}^{56}_{26}\mathrm{Fe}\right)$ nucleus is given below.

Mass of proton = 1.00728 *u*

Mass of neutron = 1.00866 *u*

Mass of iron-56 nucleus = 55.92132 *u*

(i) Show that the binding energy per nucleon of iron-56 nucleus is 8.8 MeV.

[2]

(ii) On Fig. 6.1, sketch the variation of binding energy per nucleon with nucleon number.
On your sketch, mark the position of iron-56 and label it with appropriate values.

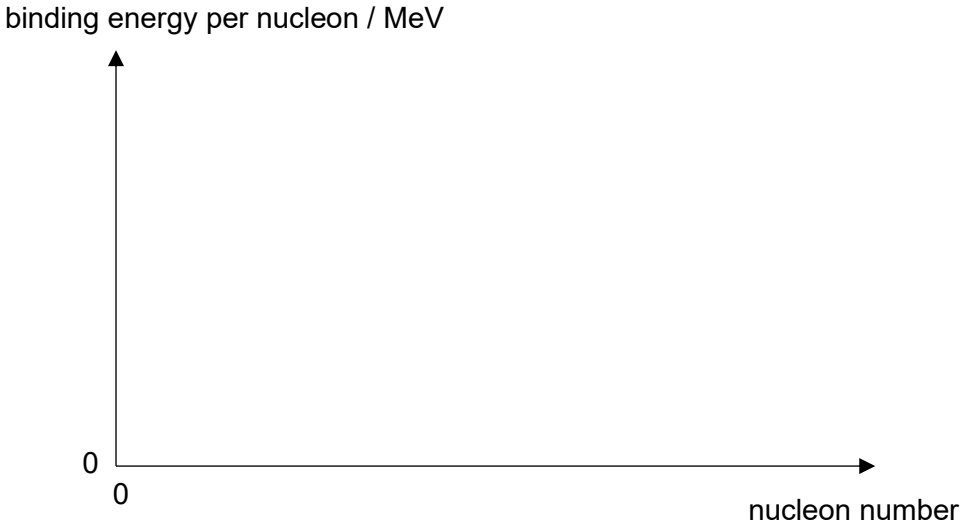

Fig. 6.1

(c) A nuclear fission reaction may be represented by the equation

$$^{235}_{92}\mathrm{U} + {}^{1}_{0}\mathrm{n} \rightarrow {}^{141}_{56}\mathrm{Ba} + {}^{92}_{36}\mathrm{Kr} + 3\,{}^{1}_{0}\mathrm{n}$$

(i) On Fig. 6.1, mark approximate positions for the nuclei of

1. uranium–235 (label the position U)

2. barium–141 (label the position Ba)

3. krypton–92 (label the position Kr)

[1]

(ii) Explain, by reference to Fig. 6.1, why energy is released in this fission reaction.

..……..……..……

..……..……..……

..……..……..……

..……..……..…….. [2]

(iii) The binding energy per nucleon of the respective nuclei are as follows:

Nucleus	Binding energy per nucleon / MeV
Uranium–235	7.6
Barium–141	8.3
Krypton–92	8.5

Calculate the energy released in this nuclear fission.

energy released = …….. MeV [2]