7 A nucleus of Uranium-235 may be made to undergo fission when bombarded by a neutron. When Uranium-235 nuclei undergo fission with a slow-moving neutron, two possible reactions that may occur are

Reaction 1: $^{235}_{92}\mathrm{U} + {}^{1}_{0}\mathrm{n} \rightarrow {}^{139}_{54}\mathrm{Xe} + {}^{95}_{38}\mathrm{Sr} + 2\,{}^{1}_{0}\mathrm{n} + \text{ energy}$

Reaction 2: $^{235}_{92}\mathrm{U} + {}^{1}_{0}\mathrm{n} \rightarrow 2\,{}^{116}_{46}\mathrm{Pd} + \mathrm{xc} + \text{ energy}$

(a) For reaction 2, identify the particle c and the number x of such particle(s) produced in this reaction.

particle c = …….

x = ……. [2]

(b) The binding energy per nucleon *E* for a number of nuclides is given in Fig. 7.1.

Nuclide	*E* / MeV
$^{95}_{38}$Sr	8.74
$^{139}_{54}$Xe	8.39
$^{235}_{92}$U	7.60

Fig. 7.1

(i) Explain what is meant by *binding energy* of a nucleus.

……..……..

……. [1]

(ii) Determine the energy released in reaction 1.

energy released = ... J [2]

(iii) Hence, calculate the loss in mass in reaction 1.

loss in mass = ... kg [2]

(iv) The energy released in reaction 2 is 163 MeV. Suggest, with a reason, which of the two reactions is more likely to occur.

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……..

……. [3]

[Total: 10]