**18*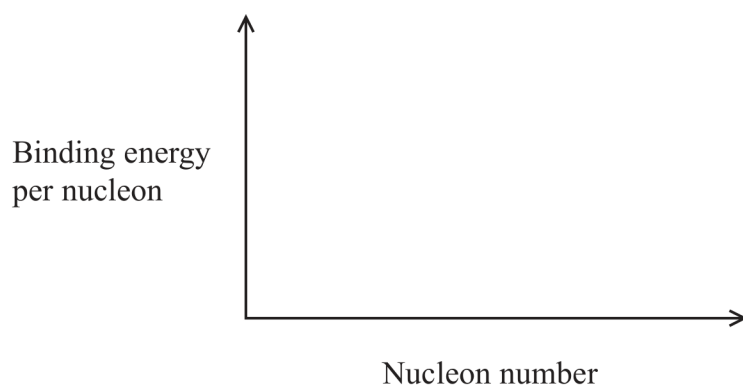* Many countries use nuclear power stations to provide electrical power. Energy is released when nuclei undergo fission in the core of the reactor.

(a) State what is meant by nuclear fission.

(1)

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(b) (i) Sketch a graph to show how the binding energy per nucleon varies with nucleon number, for a wide range of isotopes.

(2)

Binding energy
per nucleon

Nucleon number

(ii) Mark the position of iron-56 on your graph.

(1)

(c) Complete the nuclear equation below.

$$^{236}_{92}U \rightarrow \ ^{\ \ \ }_{38}Sr \ + \ ^{141}_{\ \ \ }Xe \ + \ 2 \times \ _{\ \ \ }n$$
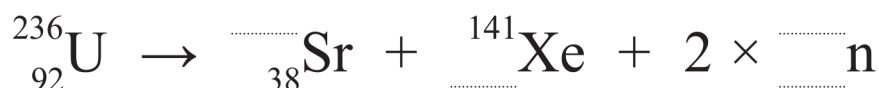
(2)

(d) Calculate, in MeV, the binding energy per nucleon for a nucleus of $^{236}_{92}U$.

	Mass/GeV/c²
$^{236}_{92}U$	219.8750
n	0.93956
p	0.93827

(2)

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Binding energy per nucleon = ... MeV

*(e) Ultraviolet radiation (UV) is produced when alpha particles interact with air.
This can be used to detect alpha particles when a nuclear reactor is decommissioned.

Explain how UV is produced by alpha particles in the air, and why detecting UV has advantages compared with detecting alpha particles directly.

(6)

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(Total for Question 18 = 14 marks)