6

In 1938, the physicist Hahn bombarded $^{235}_{92}U$ nuclei with slow-moving neutrons and showed that the uranium nucleus broke into two nuclei $^{141}_{56}Ba$ and $^{92}_{36}Kr$ with the release of additional neutrons. The following masses were known:

particle	Mass of particle in a.m.u.
$^{235}_{92}U$	235.1175
$^{141}_{56}Ba$	140.9577
$^{92}_{36}Kr$	91.9264
$^{1}_{0}n$	1.00898

(a)

(i) Write down an equation for the fission process.

…….. [1]

(ii) Calculate the energy liberated from 500 g of $^{235}_{92}U$ nuclei. Express your answer to 3 significant figures in joules (J).

Energy = ……J [4]

(iii) Suggest how a tremendous amount of energy can be released in a very short time.

……

……

…….. [1]

(b)

(i) State what is meant by half-life of a radioactive nuclide.

……

…….. [1]

(ii) In a uranium ore, the ratio of the number of U-238 nuclei to the number of Pb-206 nuclei is 2.8. Determine the age of the ore, assuming all the Pb-206 nuclei to be the final decay products of the uranium decay. The half-life of U-238 is 4.5×10^9 years.

Age = ……. years [3]

[Total: 10]