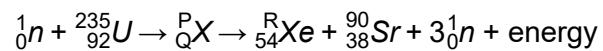


8

(a)

(i)

A slow neutron and a uranium-235 nucleus undergo a fission process, which includes the formation of strontium-90 nucleus, $^{90}_{38}\text{Sr}$, summarised by the following equation.



State the numerical values of P, Q and R.

P =

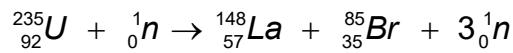
Q =

R =

[1]

(ii)

In another fission process involving uranium-235,



Given the following data, calculate the energy released in this process for one uranium nucleus.

mass of U-235 = 235.1 u

mass of neutron = 1.009 u

mass of La-148 = 148.0 u

mass of Br-85 = 84.9 u

energy = J

[2]

(b)

A strontium-90 nucleus emits a β^- particle and undergoes a *spontaneous and random* decay to yttrium (Y). The decay has a half-life of 28 years.

(i)

State what is meant by

spontaneous:

.....

random:

.....

[2]

(ii)

Write the nuclear transformation equation for the emission of the β^- particle.

[1]

(iii)

In a laboratory source of strontium-90, the number of atoms present in the year 2023 was 2.36×10^{13} .

Calculate the number of strontium atoms that will be present in the source in the year 2135 (112 years later).

number =

[2]

Section B

Answer **one** question in this Section in the spaces provided.