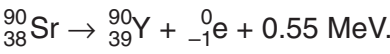6 Strontium-90 decays with the emission of a β-particle to form Yttrium-90. The reaction is represented by the equation

$$^{90}_{38}Sr \rightarrow \, ^{90}_{39}Y + \, ^{0}_{-1}e + 0.55 \text{ MeV}.$$

The decay constant is 0.025 year $^{-1}$.

(a) Suggest, with a reason, which nucleus, $^{90}_{38}Sr$ or $^{90}_{39}Y$, has the greater binding energy.

....

....

.... [2]

(b) Explain what is meant by the decay constant.

....

....

.... [2]

(c) At the time of purchase of a Strontium-90 source, the activity is 3.7×10^6 Bq.

(i) Calculate, for this sample of strontium,

1. the initial number of atoms,

number = ………………………………… [3]

2. the initial mass.

mass = ……………………………… kg [2]

(ii) Determine the activity A of the sample 5.0 years after purchase, expressing the answer as a fraction of the initial activity A_0. That is, calculate the ratio $\dfrac{A}{A_0}$.

ratio = ………………………….. [2]

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