13 Beryllium-7 ($^{7}_{4}$Be) is produced in the upper atmosphere and then sinks down onto the Earth's surface. Nuclei of beryllium-7 decay with a half-life of 53.3 days to form stable nuclei.

The activity of a sample of beryllium-7 on a tree leaf is 39 mBq.

(a) Show that the decay constant of beryllium-7 is $1.5 \times 10^{-7}\,s^{-1}$.

[1]

(b) Determine the mass of the beryllium-7 on the leaf.

mass = ... kg [3]

(c) The leaf is covered so that no further beryllium-7 is added to the existing sample from the atmosphere.

Calculate the time that must elapse before the activity of the sample is reduced to 2.0 mBq.

time = ... s [2]

[Total: 6]

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