**Question 3** **(25 marks)**

Scientists can estimate the age of certain ancient items by measuring the proportion of carbon−14, relative to the total carbon content in the item. The formula used is $Q = e^{-\frac{0{\cdot}693t}{5730}}$, where $Q$ is the proportion of carbon−14 remaining and $t$ is the age, in years, of the item.

**(a)** An item is 2000 years old. Use the formula to find the proportion of carbon−14 in the item.

**(b)** The proportion of carbon−14 in an item found at Lough Boora, County Offaly, was 0·3402. Estimate, correct to two significant figures, the age of the item.

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