2016 **13** A radioactive isotope of Curium has a half-life of 163 days.

   c Initially there are 10 mg of Curium in a container.
The mass $M(t)$ in milligrams of Curium, after t days, is given by $M(t) = Ae^{-kt}$, where A and k are constants.
   (i)   State the value of A.   **1**
   (ii)   Given that after 163 days only 5 mg of Curium remain, find the value of k.   **3**

(i)   Consider $M = Ae^{-kt}$

   Let $t = 0$, $M = 10$:

   $\therefore\ 10\ = Ae^{-k(0)}$

   $\therefore A\ = 10$

State Mean:
0.89

(ii) $M = 10e^{-kt}$

   Let $t = 163$, $M = 5$:

   $\therefore\ 5\ = 10e^{-k(163)}$

   $e^{-163k} = 0.5$

   $-163k = \ln 0.5$

   $k\ =\ -\dfrac{\ln 0.5}{163}\ \ (\text{or } k = \dfrac{\ln 2}{163}\ )$

State Mean:
1.67

* These solutions have been provided by *projectmaths* and are not supplied or endorsed by BOSTES.

BOSTES: Notes from the Marking Centre

This information is released by BOSTES in late Term 1 2017.