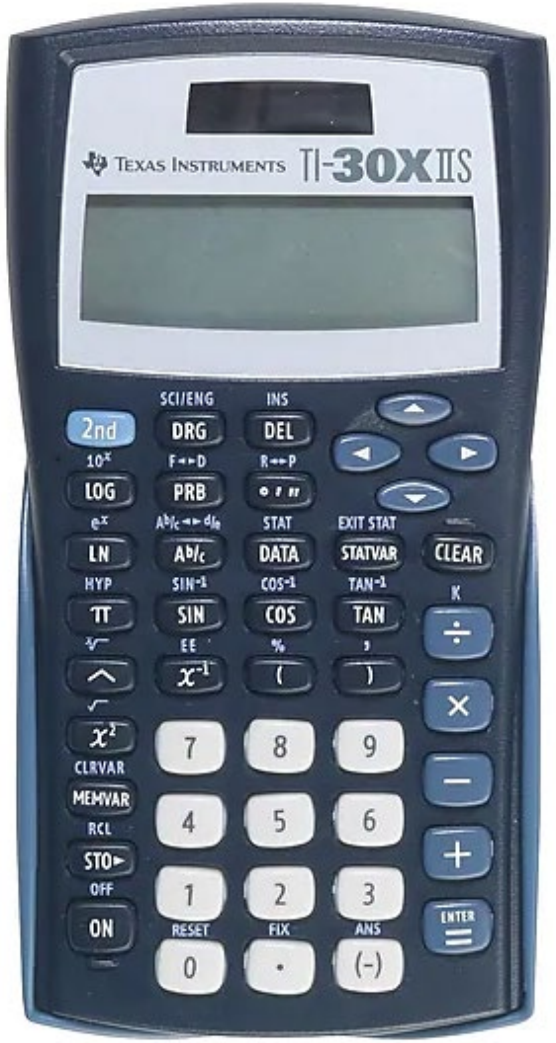
Radioactive Decay

Decay Equation

$$A_t = A_o\, e^{-\lambda t}$$

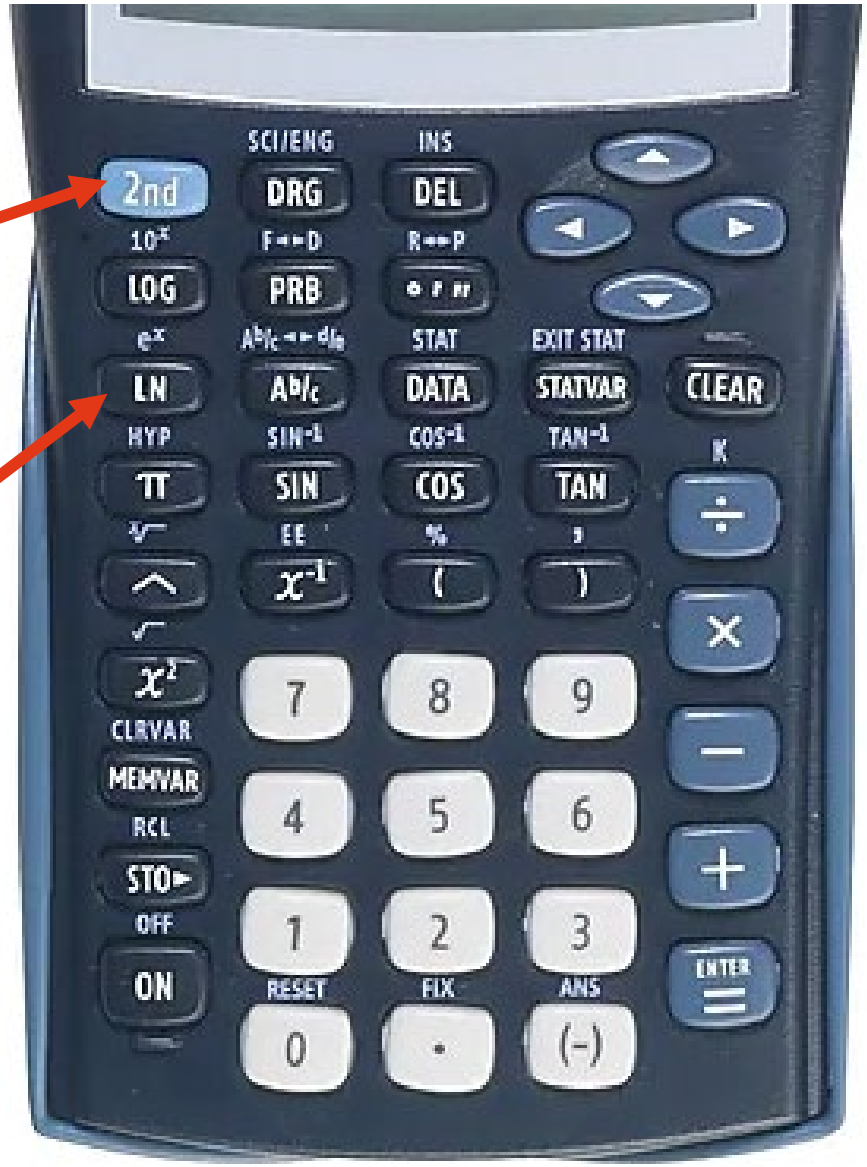
- A_t = Activity at some time
- A_o = Original Activity
- e = euler's number
- λ = lambda = $\dfrac{0.693}{T^{1/2}}$
- t = time



Euler's number e^x

2^{nd} key

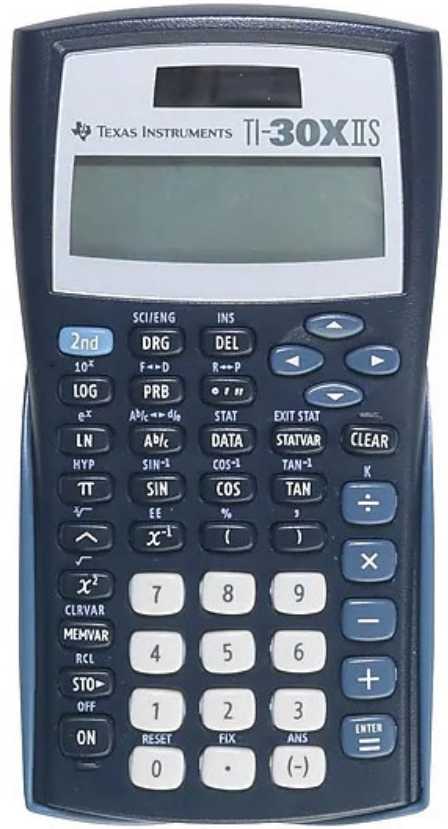
LN key



You have 30 mCi of Tc-99m at 1:00 PM. How much will there be at 3:00PM?

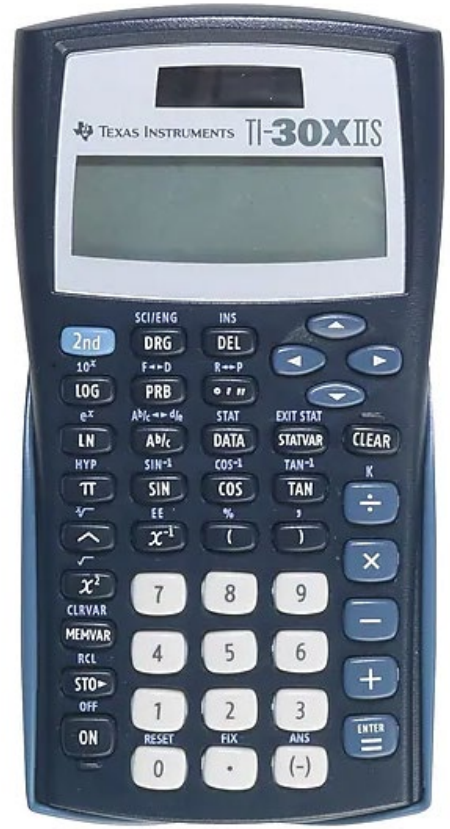
- $A_t = A_o e^{-\lambda t}$
- $A_t = 30\ mCi\ e^{-(0.693/\ 6\ hours\ *\ 2\ hours)}$
- $A_t = 23.8\ mCi$

- *Order of buttons to push: 30, 2nd, LN, -, 0.693, ÷, 6, *, 2, enter*



You have a 200 uCi I-123 pill (T ½ = 13.2 hours). How much will you have at the same time tomorrow?

- $A_t = A_o e^{-\lambda t}$
- $A_t = 200 \text{ uCi } e^{-(0.693/ 13.2 \text{ hours} * 24 \text{ hours})}$
- $A_t = 56.7 \text{ uCi}$



A vial of Xe-133 gas (T1/2 = 5.24 days) is calibrated at 22 mCi at 6 am on March 1. What is its activity at 6:00 pm on March 8th?

- $A_t = A_o\, e^{-\lambda t}$
- $A_t = 22\ mCi\ e^{-(0.693/\ 5.24\ days\ *\ 7.5\ days)}$
- $A_t = 8.2\ mCi$

A dose of Tc-DTPA has 10 mCi in it at 1:00 PM. Your patient has arrived early. If you do the scan at 11:00 AM, how much activity is in your dose?

- $A_t = A_o\, e^{-\lambda t}$
- $10\ mCi = A_o\, e^{-(0.693/\ 6\ hours\ *\ 2\ hours)}$
- $10\ mCi = A_o\,(0.794)$
- $A_o = 12.6\ mCi$

A multi-dose vial of Tc-MDP is being prepared by the pharmacy at 6 AM. How much activity needs to be added so there is 140 mCi at 10:00 AM?

- $A_t = A_o\, e^{-\lambda t}$
- $140\ mCi = A_o\, e^{-(0.693/\ 6\ hours\ *\ 4\ hours)}$
- $140\ mCi = A_o\, (0.630)$
- $A_o = 222\ mCi$