Name _____ $Q=Ce^{kt}$ Date _____

Practice 5.5B: Exponential Growth/Decay Apps

1. Byrdite 451 (^{451}NB) has a half-life of 657 years.

a. Find its rate of decay (k)

$\frac{\frac{1}{2}\cancel{C}}{\cancel{C}} = \frac{\cancel{C}e^{k\cdot 657}}{\cancel{C}}$ $\frac{\ln\frac{1}{2}}{657} = \frac{\cancel{657}k}{\cancel{657}}$

$\ln\frac{1}{2} = \cancel{\ln e}^{657k}$

If you started with 10*g* of ^{451}NB, how much would you have after:

b. 500 years * c

$Q=10e^{k\cdot 500}$

* we know k!

c. 1000 years

If I have 25*g* now, how much did I have:

d. 100 years ago *

$\frac{25}{e^{100k}} = \frac{\cancel{Ce^{k\cdot 100}}}{\cancel{e^{100k}}}$

e. 500 years ago

f. If I have a sample that weighs 40*g*, how long until it weighs 15*g*? * c t? Q

$\frac{15}{40} = \frac{\cancel{40}e^{kt}}{\cancel{40}}$ $\frac{\ln .375}{k} = \frac{\cancel{k}t}{\cancel{k}}$

$\ln .375 = \cancel{\ln e}^{kt}$

2. Complete the table for the following elements.

	Isotope	*Half Life Years*	*Initial Quantity*	*Amount after 1000 years*	*Amount after 10,000 years*
a.	^{226}Ra	1620	10*g*		
b.	^{24}C	5730		5*g*	
c.	^{230}Pu	24,360			4*g*

$k=\frac{\ln .5}{5730}$ $\frac{5=Ce^{k\cdot 1000}}{e^{1000k}}$ $\frac{}{\cancel{e^{1000k}}}$ *

3. The population of Corvallis was 49,434 in 2000. In 2012 it rose to 52,950.
   a. Use the two populations to calculate the growth factor (k).

   Use the model to predict Corvallis's population in:

   b. 2022 **c.** 2062

   Use the model to predict when Corvallis's population will reach the amounts:

   b. 55,000 **c.** 75,000

4. The population of Eugene was 138,509 in 2000. In 2012 it rose to 143,910.
   a. Use the two populations to calculate the growth factor (k).

   Use the model to predict Eugene's population in:

   b. 2022 **c.** 2062

   Use the model to predict when Corvallis's population will reach the amounts:

   b. 150,000 **c.** 200,000

5. When a bacteria culture is placed in Mr. Downey's room, the population increases from1.2 billion, to 32.7 billion in 42 seconds. Calculate the rate of growth and predict what the population will be after 5 minutes.

6. When a bacteria culture is placed in a refrigerator, the population decreases from 8.2 million, to 6.3 million in 24 minutes. Calculate the rate of decay and predict when the population will drop below 1 million.