Dif-fun-rential equations!

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Problem 1

A bacteria culture grows with a constant relative growth rate. After 2 hours there are 400 bacteria, and after 4 hours the count is 800.

(a) Find the initial population

(b) Find an expression for the population after t hours

(c) Find the number of bacteria cells after 6 hours

(d) When will the population reach 1000?

Problem 2

The half-life of Peyammonium-42 is 3 years. Suppose we have a 100 mg sample.

(a) Find the mass after t years

(b) How much of the sample will remain after 30 years?

(c) After how long will only 1 mg remain?

Problem 3

Suppose Pe-9001 has a half-life of 100 years, and that at a certain time t_0 only $\frac{1}{10}$th of the original mass remains. Find t_0.

Problem 4

The number of people who believe the moon is made of green cheese grows at a rate proportional to the number of people currently holding the belief. 2 months ago, 500 people believed it, and today 2000 people believe it. How many people will believe it 1 year from now?