

Growth and Decay Take Home Quiz

Use a calculator to evaluate answers for #1-5. Include units on answers when applicable.

1. The radioactive element carbon 14 has a half-life of 5750 years. If 100 grams of this element are present initially, how much will be left after 1000 years?

2. According to United Nations data, the world population at the beginning of 1975 was approximately 4 billion people and was growing at the rate of 2% per year.

- A. Estimate the world population at the beginning of the year 2000.

- B. In how many years would the population have been doubled?

3. The rate of change of the number of bacteria in a culture is proportional to the number present. In a certain lab experiment, a culture had 10,000 bacteria initially, 20,000 bacteria at time t_1 minutes, and 100,000 bacteria at time (t_1+10) minutes.

- A. In terms of t only, find the number of bacteria in the culture at any time t .

- B. How many bacteria were there after 20 minutes?

- C. How many minutes had elapsed when the 20,000 bacteria were observed?

4. **MULTIPLE CHOICE:** The amount of a certain bacteria y in a petri dish grows according to the equation $\frac{dy}{dt} = ky$, where k is a constant and t is measured in hours. If the amount of bacteria triples in 10 hours, then what is k ?
- A) -1.204
 - B) -.110
 - C) .110
 - D) 1.204
 - E) .3
5. **MULTIPLE CHOICE:** Let y represent the population in a town. If y decreases according the equation $\frac{dy}{dt} = ky$, with t measured in years, and the population decreases by 25% in 6 years, then k =?
- A) -8.318
 - B) -1.726
 - C) -.231
 - D) -.120
 - E) -.048
6. **MULTIPLE CHOICE:** The weight of a yeast population is given by a differentiable function y , where $y(t)$ is measured in grams and t is measured in days. The weight of the yeast population increases according to the equation $\frac{dy}{dt} = ky$, where k is a constant. The initial yeast population weighs 120 grams and is increasing at the rate of 24 grams per day. Which of the following is an expression for $y(t)$?
- A) $120e^{24t}$
 - B) $120e^{t/5}$
 - C) $e^{t/5} + 119$
 - D) $24t + 120$