1. Suppose \$16000 is invested at 6% with interest compounded semiannually. How long will it take for this investment to double its value? Round your answer to the nearest tenth.

A. The investment will double in approximately $t = 12.01$ years.

B. The investment will double in approximately $t = 11.61$ years.

C. The investment will double in approximately $t = 10.95$ years.

D. The investment will double in approximately $t = 12.46$ years.

E. The investment will double in approximately $t = 11.88$ years.

F. The investment will double in approximately $t = 11.79$ years.

G. The investment will double in approximately $t = 11.72$ years.

H. The investment will double in approximately $t = 11.44$ years.

2. The formula
$$\mathrm{pH} = -\log \mathrm{H}^+$$
expresses the pH of a solution in terms of its hydrogen ion concentration H^+. A certain brand of shampoo has a pH of 9.1. What is the H^+ concentration in moles per liter?

A. The concentration is 8×10^{-11} moles per liter.

B. The concentration is 0 moles per liter.

C. The concentration is 9×10^{-10} moles per liter.

D. The concentration is 3.4×10^{-10} moles per liter.

E. The concentration is 1.75×10^{-9} moles per liter.

F. The concentration is 7.9×10^{-10} moles per liter.

G. The concentration is 1.5×10^{-10} moles per liter.

H. The concentration is 6.6×10^{-10} moles per liter.

3. Seismologists use the Richter scale to measure the magnitude of earthquakes. The equation

$$R = \log \frac{A}{a}$$

compares the amplitude A of the shock wave of an earthquake to the amplitude a of a reference shock wave of minimal intensity. The amplitude of the September 19th, 1985, earthquake in Mexico City was 63100000 times the reference amplitude. Calculate the magnitude of this earthquake on the Richter scale. Round your answer to the nearest hundredth.

A. The magnitude of the earthquake was 7.19 on the Richter scale.

B. The magnitude of the earthquake was 7.69 on the Richter scale.

C. The magnitude of the earthquake was 8.08 on the Richter scale.

D. The magnitude of the earthquake was 7.8 on the Richter scale.

E. The magnitude of the earthquake was 7.92 on the Richter scale.

F. The magnitude of the earthquake was 7.94 on the Richter scale.

G. The magnitude of the earthquake was 7.11 on the Richter scale.

H. The magnitude of the earthquake was 8.57 on the Richter scale.

4. The population of a species of whales is estimated to be decreasing at a rate of 9% per year. The current population is approximately 16000. First estimate the population 10 years from now, and then determine how many years from now the population will have declined to 8000. Round your first answer to the nearest individual and your time answer to the nearest hundredth.

A. Ten years from now, the population will be approximately 6505 individuals. It will take approximately 10.8 years for the population to decline to 8000 individuals.

B. Ten years from now, the population will be approximately 6518 individuals. It will take approximately 6.3 years for the population to decline to 8000 individuals.

C. Ten years from now, the population will be approximately 6518 individuals. It will take approximately −0.8 years for the population to decline to 8000 individuals.

D. Ten years from now, the population will be approximately 6505 individuals. It will take approximately 9 years for the population to decline to 8000 individuals.

E. Ten years from now, the population will be approximately 6505 individuals. It will take approximately 13.5 years for the population to decline to 8000 individuals.

F. Ten years from now, the population will be approximately 6505 individuals. It will take approximately 7.7 years for the population to decline to 8000 individuals.

G. Ten years from now, the population will be approximately 6518 individuals. It will take approximately 4.1 years for the population to decline to 8000 individuals.

5. If the number of white owls in Illinois has decreased from 1900 to 100 in 5 years, approximate the annual rate of decrease. Round your answer to the nearest hundredth of a percent.

A. The annual rate of decrease is about 59.86% per year.

B. The annual rate of decrease is about 58.55% per year.

C. The annual rate of decrease is about 59.07% per year.

D. The annual rate of decrease is about 58.32% per year.

E. The annual rate of decrease is about 58.74% per year.

F. The annual rate of decrease is about 59.71% per year.

G. The annual rate of decrease is about 58.89% per year.

H. The annual rate of decrease is about 59.18% per year.

6. The safe level of psychrotrophic bacteria in a gallon of milk is 100 units. In a refrigerator set at 38F, the number of units of these bacteria in a gallon of skim milk is approximated by the exponential function

$$B(t) = 4.0e^{0.24t},$$

where t is the time in days. How long will it take the bacterial colony to grow to 60 units? Round your answer to the nearest hundredth.

A. It will take about 11.87 days to reach 60 units.

B. It will take about 10.56 days to reach 60 units.

C. It will take about 11.49 days to reach 60 units.

D. It will take about 11.83 days to reach 60 units.

E. It will take about 11.28 days to reach 60 units.

F. It will take about 11.69 days to reach 60 units.

G. It will take about 10.8 days to reach 60 units.

H. It will take about 10.35 days to reach 60 units.

7. Seismologists use the Richter scale to measure the magnitude of

A. acidity of a chemical solution

B. earthquakes

C. sound

8. Newtons cooling law is a formula for calculating how much time it takes a hot object to cool when surrounded by a medium at some constant temperature. This formula can be applied to a hot steel ingot at a steel factory, to a heat source used to warm air, or to a murder victim at the scene of a crime. The formula is

$$t = k \ln \frac{b - r}{b_0 - r} \text{ where:}$$

$k =$ a constant which depends on the object
$t =$ time
$r =$ room temperature
$b =$ object temperature at the end of the time period
$b_0 =$ original object temperature at the beginning of the time period

A coroner at a murder scene found the room temperature to be 24C and the temperature of the victim to be 30C. Assume that normal body temperature is 37C and that the constant k for a body of the nature of the victim is -3.8065. Determine the number of hours the victim had been dead when these temperatures were taken. Round your answer to the nearest hundredth.

A. The victim had been dead for 2.61 hours.

B. The victim had been dead for 2.94 hours.

C. The victim had been dead for 2.26 hours.

D. The victim had been dead for 2.95 hours.

E. The victim had been dead for 2.87 hours.

F. The victim had been dead for 2.73 hours.

G. The victim had been dead for 2.45 hours.

H. The victim had been dead for 3.67 hours.