

Exponential Growth and Decay – Worksheet

1. A bacteria culture grows according to the formula: $N = 12000 \times 2^{\frac{t}{4}}$, where t is in hours. How many bacteria are present
 - (a) at the beginning of the experiment? (answer 12 000)
 - (b) after 12 hours? (answer 96 000)
 - (c) after 1 day? (answer 768 000)
 - (d) after 19 hours? (answer 323 000)
2. A bacteria culture doubles every 0.25 hours. At time 1.25 hours, there are 40 000 bacteria present. How many bacteria were present initially? (answer 1250)
3. A bacteria culture starts with 3000 bacteria. After 3 hours there are 48 000 bacteria present. What is the length of the doubling period? (answer D=0.75h)
4. A bacteria culture starts with 6500 bacteria. After 2.5 hours, there are 208 000 bacteria present. What is the length of the doubling period? (answer D=0.5h)
5. A bacteria culture triples every 4 hours and starts with 10 000 bacteria. Find the number of bacteria in the culture after 30 hours. (answer 37 880 000)
6. The world population doubles every 35 years. In 1980 the population was 4.5 billion. Assuming that the doubling period remains at 35 years, estimate the population in the year 2120. (answer 72 000 000 000)
7. A sodium isotope, Na^{24} , has a half-life of 15 hours. Determine the amount of sodium that remains from a 4 g sample after
 - (a) 45 hours (answer 0.5g)
 - (b) 100 hours (answer 0.04g)
 - (c) 5 days (answer 0.015625g)

8. The half-life of Palladium-100 is 4 days. After 16 days an initial sample has been reduced to a mass of 0.75 g. Determine the starting mass. (answer 12g)
9. Strontium-90 has a half-life of 25 years. How long would it take for 40 mg of it to decay to
- (a) 20 mg (answer 25 years)
 - (b) 1.25 mg (answer 125 years)
10. A colony of insects doubles every 10 days. If the colony has 850 insects today, how many are/were present
- (a) in 30 days? (answer 6800)
 - (b) 10 days ago? (answer 425)
 - (c) in 55 days? (answer 38 500)
 - (d) 14 days ago? (answer 322)
11. A cup of coffee contains approximately 96 mg of caffeine. When you drink the coffee, the caffeine is absorbed into the bloodstream and is eventually metabolized by the body. Every 5 hours the amount of caffeine present in the body is reduced by one-half. How many hours does it take for the amount of caffeine to be reduced to 12 mg? (answer 15 hours)
12. The 50 cent Bluenose is one of Canada's most famous postage stamps. In 1930 it could be bought at the post office for \$0.50. In 2000, a stamp in excellent condition was sold at an auction for \$512. Determine the doubling time for the stamp's value. (answer 7 years)