

## Growth and Decay Word Problems

1. A bacteria culture starts with 100 000 bacteria and the doubling period is 40 minutes. How much bacteria will there be in 7 hours?
2. The bacteria count is 125 000 after 10 hours. How much bacteria was there to begin with, using the same doubling time of 40 minutes?
3. Strontium-90 is a radioactive material that has a half-life of 25 years. If the original sample is 20 mg , how much will be left after
  - (a) 40 years?
  - (b) 18 years?
  - (c) 5 years?
4. Radium-221 is a radioactive material that has a half-life of 30 seconds. How much will be left of a 10 mg sample after 5 minutes?
5. The half-life of radium-226 is 1620 years. If you start with a sample of 120 mg, how much will be left after 500 years?
6. Caffeine stays in your bloodstream for extended periods of time. The half-life of caffeine for adults is averaged at 6 hours. In other words, it takes 6 hours for your body to metabolize *half* the amount of caffeine in your bloodstream! The half-life of caffeine for a pregnant woman can be as high as 18 hours! If there are 80 mg of caffeine in a standard cup of coffee, after 14 hours how much caffeine would still be in the bloodstream of:
  - (a) an average adult ?
  - (b) a pregnant woman ?
7. An investment grows 6.5% annually. How long will it take for an investment of \$5000 to reach a value of \$8000?
8. A population of a bacteria culture doubles after 1.5 hours. An experiment begins with 620 bacteria. Determine the number of bacteria after
  - (a) 10 hours
  - (b) 3 days
9. After tracking the same type of bacteria culture from question #8 for 11 hours, the final bacteria count was 95,000. Determine the initial number of bacteria in the culture.
10. A radioactive material diminishes by 40% every 2 years. How much of a 5.0 kg sample of this material will remain after (a) 4 years (b) 18 months
11. A population is 35,000. In 10 years, the population has grown to 44,400.
  - (a) determine the growth rate
  - (b) determine the population in 25 years
12. A sports car was purchased for \$38,900 but the value will depreciate by 20% each year. Determine the value of the car 6 years after it was purchased.

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Answers :

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| 1. 144,815,469 | 2. 3.815                | 3. a) 6.598     | b) 12.142             | c) 17.411  | 4. 0.009766 mg |
| 5. 96.89 mg    | 6. a) 15.87 mg          | b) 46.66 mg     | 7. approx.. 7.5 years |            |                |
| 8. a) 62,988   | b) $1.7 \times 10^{17}$ | 9. 589          | 10. a) 1.8 kg         | b) 3.41 kg |                |
| 11. a) 2%      | b) 57,421               | 12. \$10,197.40 |                       |            |                |