



How Often Should You Take DayQuil™?



Cold medication like VICKS® DayQuil™ often includes the chemical Dextromethorphan, which is a cough suppressant. Although these medications are available over-the-counter and are generally low-risk, taking too large of quantities can cause serious side effects.

- Dextromethorphan has a half-life of 3 hours. This means that every 3 hours, your body will eliminate $\frac{1}{2}$ of the current amount. In a 30 mL dosage of liquid DayQuil™, there are 20 milligrams of Dextromethorphan, and after 3 hours, 10 mg would still be in your system.
 - How many mg of the drug will be in your system after 6 hours? After 9 hours?
 - How many mg of the drug will be in your system after 10 hours? How do you know?
- Write a formula for $D(t)$, that gives the amount of Dextromethorphan in your system after t hours.
- What percent of the drug remains in your body after 1 hour? What percent is eliminated?
- Write an alternate formula for $D(t)$ of the form $D(t) = ab^t$ that can also be used to model the amount of Dextromethorphan in your system after t hours. Clearly explain what your a and b values represent in this context.
- Customers are instructed to use the medicine “as directed”. For adults and children 12 years and over, this means taking 30 mL every 4 hours. Suppose you take your first 30 mL at 8 AM. Using the recommended dose, calculate how many mg of Dextromethorphan will be in your system at various times throughout the day.

8 AM	10 AM	12 PM	2 PM	4 PM	6 PM	8 PM
20 mg						

Lesson 4.7 – Constructing Exponential Models

QuickNotes

Check Your Understanding

1. An element is known to decay by 25% every 5 days. After 10 days there are 45 grams of the element remaining.
 - a. How much of the element must there have been on day 0?
 - b. Write an equation for $E(t)$, the number of grams remaining of the element after t days.
 - c. Find $\frac{E(7)}{E(6)}$ and interpret the meaning of this value in the context of this problem.
2. On the Great British Baking Show, a contestant takes their cake out of an 180°C oven and puts it in a refrigerator whose temperature is set at 3°C . After 10 minutes, the cake has cooled to 150°C . The temperature of the cake, in $^\circ\text{C}$, t minutes after it is removed from the oven can be modeled by the equation $C(t) = ab^t + 3$ for some parameters a and b .
 - a. Find the values of a and b .
 - b. What will be the temperature after 45 minutes?