

How Often Should You Take DayQuil™?

Name: _____



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.

1. 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.
 - a. How many mg of the drug will be in your system after 6 hours? After 9 hours?

 - b. How many mg of the drug will be in your system after 10 hours? How do you know?

2. Write a formula, $D(t)$, that gives the amount of Dextromethorphan in your system after t hours.

3. What percent of the drug remains in your body after 1 hour? What percent is eliminated?

4. Customers are instructed to use the medicine “as directed”. For the average adult, Dextromethorphan is effective in quantities over 8 mg. What should the directions say about how often an adult should take the recommended serving?

Directions • take only as directed - see Overdose warning
 • use dose cup or tablespoon (TBSP) • do not exceed 4 doses per 24 hrs

adults & children 12 yrs & over	30 mL (2 TBSP) every
children 6 to under 12 yrs	15 mL (1 TBSP) every
children 4 to under 6 yrs	ask a doctor
children under 4 yrs	do not use

• when using other DayQuil or NyQuil® products, carefully read each label to insure correct dosing

5. Suppose you take your first 30 mL at 8 AM. Using the recommended dose you calculated in question 4, 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						

Section 3.8—Exponential and Logarithmic Modeling

Important Ideas:

Check Your Understanding!

- Estimates of the numbers (in millions) of US households with digital televisions is given by $D = 30.92e^{0.1171t}$ where t represents years after 2000.
 - Is the number of households with digital televisions increasing or decreasing between 2003 and 2007? Justify your answer.
 - What does the 30.92 represent? What does the 0.1171 represent?
 - When will the number of U.S. households reach 100 million?
- An investor invests \$1000 into an account that has continuously compounded interest. If after 3 years he has \$1,450, what is the interest rate of the account?
- 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 $C(t) = Ae^{kt} + 3$.
 - Find the values of A and k .
 - What will be the temperature after 45 minutes?