

Problem of the Day 21 CHEM 1252

1. The first-order rate constant for the decomposition of a certain antibiotic in water at 20.0°C is 1.65 yr^{-1} .

a) If a $6.0 \times 10^{-3} \text{ M}$ solution of the antibiotic is stored at 20.0°C, what will its concentration be after 3.00 months? After 1.00 year?

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b) How long will it take for the concentration of the solution to drop to $1.0 \times 10^{-3} \text{ M}$?

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c) What is the half-life of the antibiotic solution?

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2. Hydrogen reacts explosively with oxygen. However, a mixture of H_2 and O_2 can exist indefinitely at room temperature. Explain why H_2 and O_2 do not react under these conditions.

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3. The rate constant for the rearrangement of methyl isonitrile at 230.3°C is $6.30 \times 10^{-4} \text{ s}^{-1}$. What is the value of the rate constant at 156.9°C if the activation energy equals 160 kJ/mol?

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4. Explain, on the molecular level, why reaction rates are typically faster at higher temperatures.

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5. Explain, on the molecular level, why reaction rates are typically faster when the concentration of reactants is larger.

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