

Answer on Question #67196 - Chemistry - Physical Chemistry

Question:

The reaction: $A \rightarrow B$ follows first-order kinetics. The time taken for 0.8 mol of A to produce 0.6 mol of B is 1 hour. What is the time taken for conversion of 0.9 mol of A to produce 0.675 mol of B?

Solution:

The kinetic equation for the first-order reaction has the form: $k = \frac{1}{t} \cdot \ln \frac{[X]_0}{[X]}$.

$$k = \ln \frac{0.8}{(0.8 - 0.6)} = 1.386 \text{ hour}^{-1}$$

$$t = \frac{\ln \frac{[X]_0}{[X]}}{k} = \frac{\ln \frac{0.9}{(0.9 - 0.675)}}{1.386} = 1 \text{ hour}$$

Answer: 1 hour.