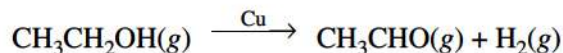


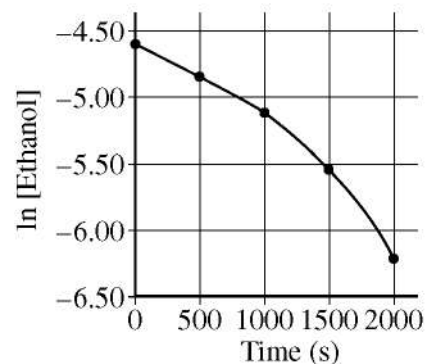
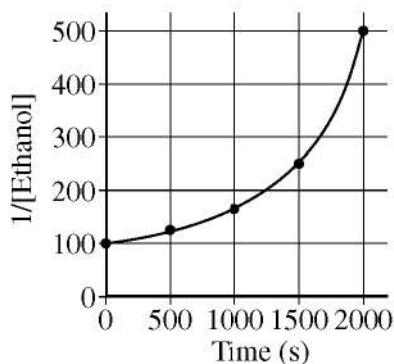
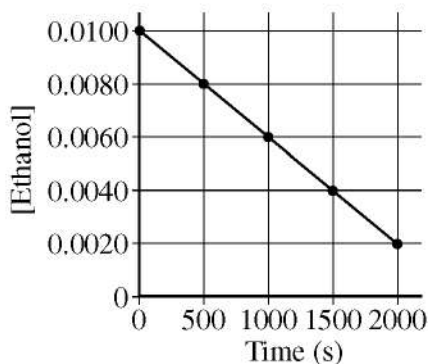
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**Question 6 (continued)**

In a second experiment, which is performed at a much higher temperature, a sample of ethanol gas and a copper catalyst are placed in a rigid, empty 1.0 L flask. The temperature of the flask is held constant, and the initial concentration of the ethanol gas is 0.0100 M. The ethanol begins to decompose according to the chemical reaction represented below.



The concentration of ethanol gas over time is used to create the three graphs below.



(c) Given that the reaction order is zero, one, or two, use the information in the graphs to respond to the following.

(i) Determine the order of the reaction with respect to ethanol. Justify your answer.

The order of the reaction is zero. The plot on the left is a straight line, indicating that the rate of decrease in [ethanol] is constant as [ethanol] changes. Therefore the rate of reaction does not depend on [ethanol].

1 point is earned for the correct choice with a valid justification.

(ii) Write the rate law for the reaction.

$$\text{rate} = k$$

1 point is earned for the correct rate law.

(iii) Determine the rate constant for the reaction, including units.

$$\begin{aligned} \text{rate} = k &= - \frac{\Delta[\text{ethanol}]}{\Delta t} = - \frac{(0.0020 - 0.0100) \text{ mol/L}}{2000 \text{ s}} \\ &= 4.0 \times 10^{-6} \text{ M s}^{-1} \end{aligned}$$

1 point is earned for the correct setup.  
1 point is earned for the correct units.

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**Question 6 (continued)**

- (d) The pressure in the flask at the beginning of the experiment is 0.40 atm. If the ethanol completely decomposes, what is the final pressure in the flask?

The final pressure is 0.80 atm (twice the original pressure because the products represent twice as many moles of gas as the reactant).

1 point is earned for the correct final pressure.