This is BCE#34.

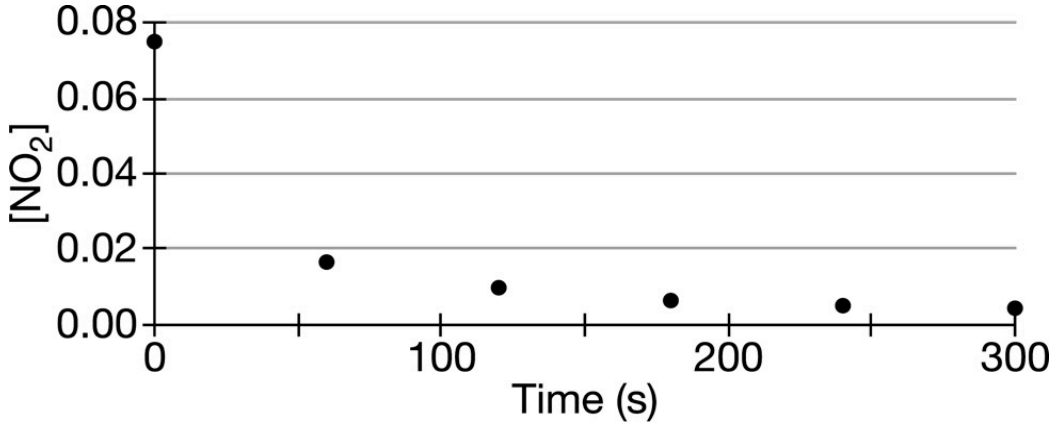
I recommend you print out this page and bring it to class. Click here to show a set of five BCE34 student responses randomly selected from all of the student responses thus far in a new window.

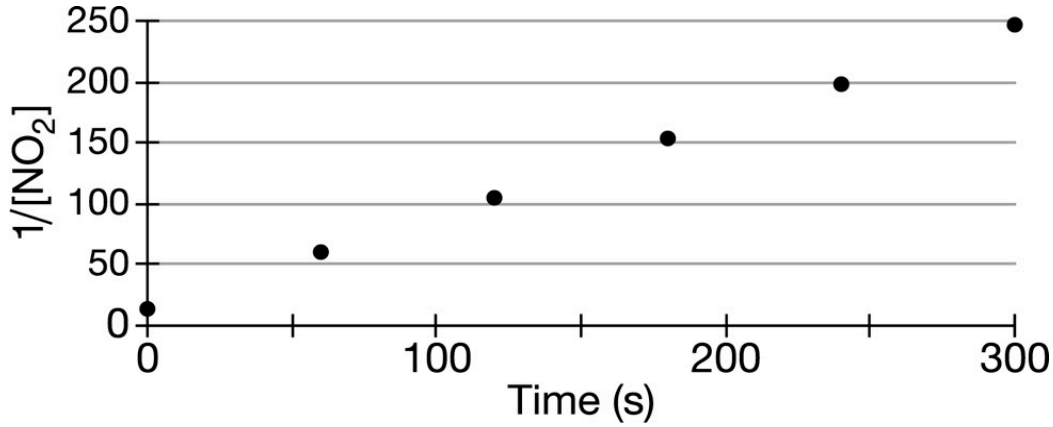
John , here are your responses to the BCE and the Expert's response.

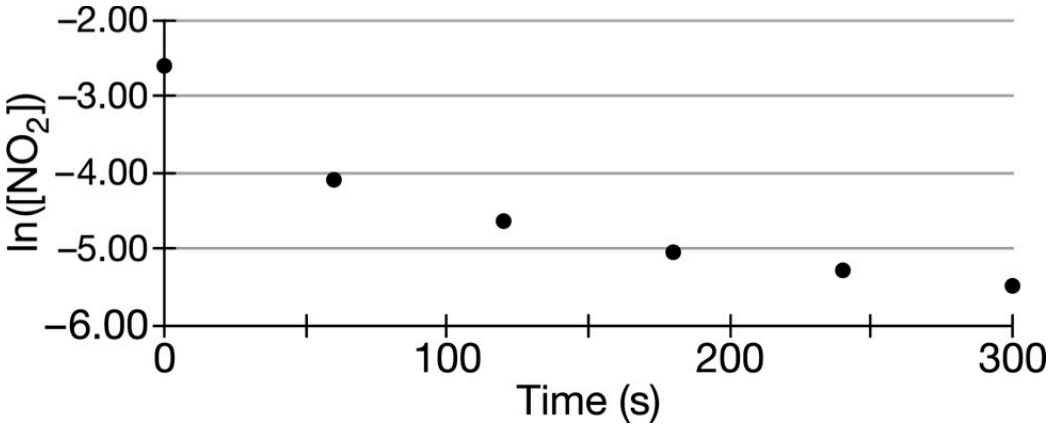
1. Nitrogen dioxide, $NO_2(g)$, is a by-product of the combustion of gasoline in an internal combustion engine. At elevated temperatures $NO_2(g)$ decomposes according to the equation below.

$$2\ NO_2(g) \rightarrow 2\ NO(g) + O_2(g)\ \Delta H^\circ = +112\ kJ/mol_{rxn}$$

The concentration of a sample of $NO_2(g)$ is monitored as it decomposes and is recorded on the graph directly below. The two graphs that follow it are derived from the original data.







1. What is the order of this decomposition reaction?

2nd order 80%

2. What evidence supports the order you have entered in Question #1?

The plot of 1/[A] versus time is linear with a positive slope 60%

what is different about each graph?

3. Estimate the magnitude of the rate constant for this reaction.

between 0.78 and 0.85 40%

$\frac{1.3-2.45}{0-300} = \frac{-2.32}{-300} = 0.77$ .73-.83

4. What are the units on the rate constant?

20% $M^{-1} \cdot m^{-1}$

M^-1·s^-1 50%

---

5. What is the rate law for this decomposition reaction? (For example, rate = k[A]^{m})

rate = k[NO2]^2 90%

6. Is the rate law described by mechanism I shown below consistent with the rate law you wrote in Question 5?

yes 70%

Mechanism I

Step1: $NO_2(g) + NO_2(g) \rightarrow NO(g) + NO_3(g)$ slow

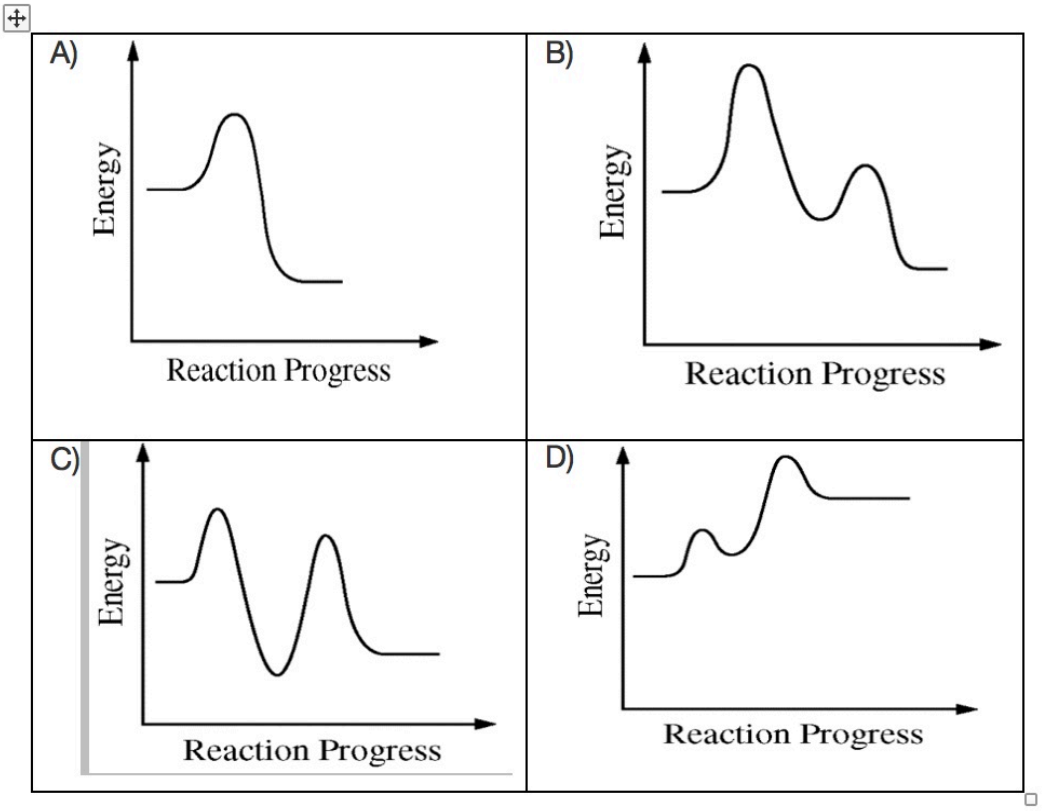
Step2: $NO_3(g) \rightarrow NO(g) + O_2(g)$ fast

2-steps → 2nd order
Step 1 is RDS
The slow step reactant is used in rate law

7. Justify your response in Question 6.

The coefficient for NO2 in the slow step of the mechanism is 2, so the rate law for the slow step is rate = k [NO2]^2

8. Below are four Reaction Coordinate diagrams for the reaction mechanism. Do any of these diagrams fit this mechanism and the enthalpy change for the reaction?



No 50%

If Yes, which diagram. If No describe the correct diagram. Use may want to use terms like Step 1, Step 2, first peak, second peak, intermediate, energy, activation energy, enthalpy change, exothermic, endothermic, reactants, and products.

The correct diagram should have the energy of the products higher than the energy of the reactants. Also the activation energy for the first peak should be larger than the activation energy for the second peak.

9. Is there anything about the questions that you feel you do not understand? List your concerns/questions.

nothing

10. If there is one question you would like to have answered in lecture, what would that question be?

nothing