This is ACA # 35. It is OK to use your textbook, but if you can answers the questions without it that is OK too.

I recommend you print out this page and bring it to class. <u>Click here</u> to show a set of five ACA35 student responses, randomly selected from all of the student responses thus far, in a new window.

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

Cisplatin reacts with water according to the equation

 $PtCl_2(NH_3)_2(aq) + H_2O(l) ---> PtCl(H_2O)(NH_3)_2^+(aq) + Cl^-(aq)$

The rate of the reaction of cisplatin with water was studied and the following data was obtained.

Experiment	[PtCl ₂ (NH ₃) ₂]	[H ₂ O]	Initial Rate (M min ⁻¹)
1	0.015	55.5	2.19 x 10 ⁻⁵
2	0.025	55.5	3.65 x 10 ⁻⁵
3	0.080	55.5	1.17 x 10 ⁻⁴

Answer the following questions.

1. Compare Experiment 1 and 2. By what factor did the $[PtCl_2(NH_3)_2]$ increase? 1.67 $67^{\circ}/_{0}$ $5^{\circ}/_{3}$ $7^{\circ}/_{6}$ 2 $10^{\circ}/_{5}$ To obtain a ratio divide the $[PtCl_2(NH_3)_2]$ in Exp 2 by the $[PtCl_2(NH_3)_2]$ in Exp 1. $[PtCl_2(NH_3)_2]$ in Exp 2/ $[PtCl_2(NH_3)_2]$ in Exp 1 = 0.025 M/0.015 M = 1.66 2. Compare Experiment 1 and 2. By what factor did the initial rate increase?

1.67
$$67\%$$
 $5/3$ 12% 2 11% 1.5 5%

To obtain a ratio divide the Initial Rate in Exp 2 by the Initial Rate in Exp 1.

Initial Rate in Exp 2/Initial Rate in Exp $1 = 3.65 \times 10^{-5} \text{ M min}^{-1}/2.19 \times 10^{-5} \text{ M min}^{-1} =$ 1.66

3. Compare the ratio of the [PtCl₂(NH₃)₂] in Exp 1 and 2 to the ratio of the Initial rate for Exp 1 and 2. What is the order of the reaction with respect to [PtCl₂(NH₃)₂]? (NOTE: If you are not sure what order is say so.)

first order 5

When going from Exp 1 to Exp 2 the [PtCl₂(NH₃)₂] increased by a factor of 1.66. The Initial Rate also increased by this same factor. The general rate law for this system is rate = $k[PtCl_2(NH_3)_2]^n$. So based on these two experiments the exponent n must have a value of 1.

4. What is the rate law for this reaction (assume H₂O does not appear in the rate law equation.) (NOTE: If you are not sure what a rate law is say so.)

rate = $k[PtCl2(NH3)2]^{1}$

The general rate law for this system is rate = $k[PtCl_2(NH_3)_2]^n$. There is not enough information to determine if H₂O has any effect, so it is not included

5. Calculate the magnitude and the units for the rate constant. (NOTE: If you are not sure what a rate constant is say so.)

magnitude =
$$0.00146$$
 2%
units are min^-1 3%

units are min⁻¹ 33% 5^{-1} [[$time^{-5}\%$ $M^{-1}.5^{-1}$ [] $M^{-1}.5^{-1}$ [] substitute for rate and [PtCl₂(NH₃)₂]¹ and solve for k. So using Exp #1 the equation becomes,

$2.19 \ge 10^{-5} \text{ M min}^{-1} = \text{k} [0.015 \text{ M}]^{1}$

$k = 2.19 \text{ x } 10^{-5} \text{ M min}^{-1} / [0.015 \text{ M}]^1 = 1.46 \text{ x } 10^{-3} \text{ min}^{-1}$

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

nothing

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

nothing