Kinetics Questions and Problems

1. For a certain reaction, E_a is 50 kJ and ΔH is -100 kJ. In the presence of a catalyst the activation energy is lowered to 30 kJ. Draw a an energy diagram for this reaction:

$$A \rightarrow B$$

2. What is the only factor that will change the value of the rate constant ?

3. Consider the reaction is: $2\ NO_2 \rightarrow 2\ NO + O_2$. At 600°C the decomposition of NO_2 is second order. The rate constant is 0.002 $M^{-1}s^{-1}$.
   a) Write the rate expression:

   b) What is the rate when $[NO_2]$ = 0.02 M ?

4. The greatest increase in rate for the reaction between X and Z where $R = k[X][Z]^2$ will be caused by: _____
   (a)doubling[Z] (b) doubling [X] (c) tripling [X] (d) lowering the temperature

5. Given: $R = k[A]^2[B]$. What effect will doubling the [A] while cutting the [B] in fourth have on the rate of reaction ? (Will the rate double, triple,…… ?)

6. Complete the following data table for the reaction $2\ A + Z \rightarrow$ Products, which is first order in both reactants.

	[A] (M)	[Z] (M)	k ($M^{-1}s^{-1}$)	Rate (M/s)
experiment 1	0.45	0.30	4.0	?
experiment 2	?	0.053	0.32	0.018
experiment 3	0.75	0.80	?	0.010

Experiment 1:

Answer = _____

Experiment 2:

Answer = _____

Experiment 3:

Answer = _____

7. Complete the following data table for the reaction D $\rightarrow$ Products, which is first order.

	[D] (M)	k (s^{-1})	Rate (M/s)
experiment 1	0.60	0.05	?
experiment 2	0.04	?	2.80
experiment 3	?	0.17	0.085

Experiment 1:

Answer = _____

Experiment 2:

Answer = _____

Experiment 3:

Answer = _____

8. List the factors that affect the rate of reaction.

1)

2)

3)

4)

5)

9. Given: $2\ H_2O_{2(aq)} \rightarrow 2\ H_2O_{(aq)} + O_{2(g)}$ . . At the one minute mark of the reaction it was found bthat the rate at which $O_{2(g)}$ is being produce is 0.02 M/min.

a) What is the rate (at time = 1.0 minutes) at which H_2O_2 is being consumed ?

b) Why does the rate of reaction slow down as time goes on ?

10. The reaction of nitrogen monoxide, NO, with hydrogen, H_2, is represented by this equation:

$$2\ NO(g) + 2\ H_2(g) \rightarrow N_2(g) + 2\ H_2O(g)$$

The reaction obeys this rate law: Rate = $k[NO]^2[H_2]$. If [NO] is tripled and $[H_2]$ is doubled, how will the rate be affected? (Will it double, triple,… ?) Justify your answer with a calculation.