Unit 13 – Chapter 12: Kinetics **Name _____**

Assignment #3 **Period _____**

1) Write the rate laws for the following elementary reactions.
   a. $CH_3NC_{(g)} \rightarrow CH_3CN_{(g)}$
   b. $O_{3(g)} + NO_{(g)} \rightarrow O_{2(g)} + NO_{2(g)}$
   c. $O_{3(g)} \rightarrow O_{2(g)} + O_{(g)}$

2) The mechanisms shown below have been proposed to explain the kinetics of the reaction considered in the reaction: $2\ H_{2(g)} + 2\ NO_{(g)} \rightarrow N_{2(g)} + 2\ H_2O_{(g)}$ with an observed rate law of Rate = $k[NO]^2[H_2]$. Which of the following are acceptable mechanisms? Explain.

Mechanism I:

$2\ H_{2(g)} + NO_{(g)} \rightarrow N_{2(g)} + 2\ H_2O_{(g)}$

Mechanism II:

$H_{2(g)}$	+	$NO_{(g)}$	$\rightarrow$	$H_2O_{(g)}$ + $N_{(g)}$	Slow
$N_{(g)}$	+	$NO_{(g)}$	$\rightarrow$	$N_{2(g)}$ + $O_{(g)}$	Fast
$H_{2(g)}$	+	$O_{(g)}$	$\rightarrow$	$H_2O_{(g)}$	Fast

Mechanism III:

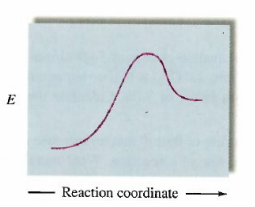
$H_{2(g)}$	+	$2\ NO_{(g)}$	$\rightarrow$	$N_2O_{(g)}$ + $H_2O_{(g)}$	Slow
$N_2O_{(g)}$	+	$H_{2(g)}$	$\rightarrow$	$N_{2(g)}$ + $H_2O_{(g)}$	Fast

3) A proposed mechanism for a reaction is

C_4H_9Br			$\rightarrow$	$C_4H_9^+$	+ Br^-	Slow
$C_4H_9^+$	+	H_2O	$\rightarrow$	$C_4H_9OH_2^+$		Fast
$C_4H_9OH_2^+$	+	H_2O	$\rightarrow$	C_4H_9OH	+ H_3O^+	Fast

Write the rate law expected for this mechanism. What is the overall balanced equation for the reaction? What are the intermediates in the proposed mechanism?

4) For the following reaction profile, indicate:
   a. the positions of reactants and products.
   b. the activation energy.
   c. ΔE for the reaction.



5) Draw a rough sketch of the energy profile for each of the following cases:
   a. ΔE = +10 kJ/mole, E_a = 25 kJ/mol
   b. ΔE = -10 kJ/mole, E_a = 50 kJ/mol
   c. ΔE = -50 kJ/mole, E_a = 50 kJ/mol