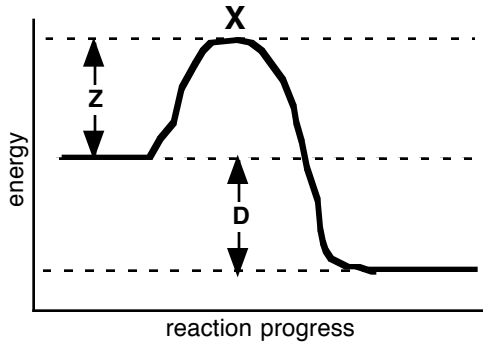
Review Sheet - Kinetics and Equilibrium ***ANSWERS***

1. Use the diagram at right to answer these questions:



a. Is this reaction endothermic or exothermic? exothermic

b. Which is higher in energy; the reactants or products? reactants

c. What is point "X" called? activated complex

d. What does line "Z" represent? activation energy

e. What does line "D" represent? enthalpy, ΔH

2. For the following, indicate the most likely result in reaction rate: speed up or slow down

- increasing temperature: speed up
- adding water to reactants: slow down
- using higher concentration of reactants: speed up
- crushing the reactants into a powder: speed up

3. **A + B ---> C** Rate = $k[A]^2[B]^1$

a. Which will affect the reaction rate more; doubling [A] or doubling [B]? doubling [A]

b. What is the overall order of this reaction? third

4. **C + D ---> E**

	initial [C] (mol/L)	**initial [D]** (mol/L)	**initial rate** (mol/L • s)
experiment 1	0.025	0.020	1.2×10^{-6}
experiment 2	0.050	0.020	2.4×10^{-6}
experiment 3	0.025	0.040	2.4×10^{-6}

a. the reaction order with respect to [C]? first with respect to [D]? first overall? second

b. What is the value of the rate law constant? Rate = k[C][D]

$1.2 \times 10^{-6} = k(0.025)(0.020)$

k = 0.0024

5. **$F_{(s)}$ + $G_{(aq)}$ $\rightleftharpoons$ 3 $H_{(g)}$ + $J_{(g)}$ + 210 KJ**

a. Write the expression for K_{eq} for the above :

$$K_{eq} = \frac{[H]^3[J]}{[G]}$$

b. Name 5 ways to increase [**J**]:

- decrease [H]
- decrease [J]
- increase [G]
- lower temperature
- decrease pressure

6. **NH_4^+ $_{(aq)}$ + NO_2^- $_{(aq)}$ $\rightleftharpoons$ N_2 $_{(g)}$ + 2 H_2O $_{(l)}$**

At 400 K, the 1.0 L reaction vessel is found to contain 1.55 mol NH_4^+, 0.912 mol NO_2^-, and 3.20 mol H_2O. Given the equilibrium constant = 39.5, calculate the concentration of the N_2.

$$39.5 = \frac{[N_2]}{(1.55)(0.912)}$$

$[N_2]$ = 55.8 mol/L

(Ans: IRO) 0.0024 55.8