Post-Break Review: Kinetics (key)

1. What is meant by the *rate* of a chemical reaction?

how fast reactants are converted into products

2. How does each of the following factors affect the rate of a chemical reaction?
   a. Temperature

↑ temp, ↑ rate of rxn

   b. Concentration

↑ concentration of reactants, ↑ rate of rxn

   c. Surface Area

↑ surface area, ↑ rate of rxn

   d. Pressure (for gases)

↑ pressure, ↑ rate of rxn

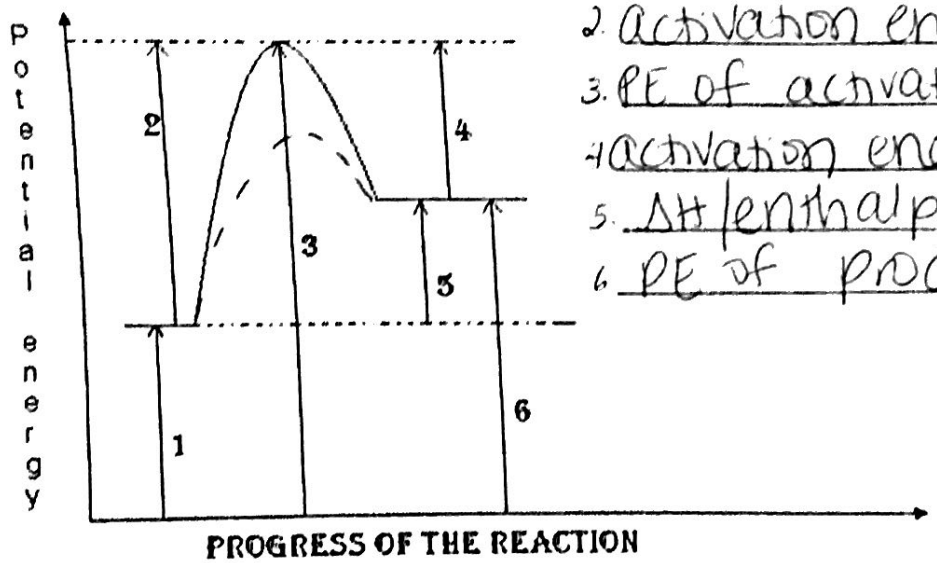
   e. Nature of reactants (covalent vs. ionic substances)

Dissolved (aq) ionic substances react faster than covalent since they dissociate into ions, so fewer bonds to break (less energy required)

3. Does every collision between reacting particles lead to products? Explain.

No, need enough energy & appropriate orientation

4. Label the numbered segments on the following potential energy diagram.



1. PE of reactants
2. activation energy of forward rxn
3. PE of activated complex
4. activation energy of reverse rxn
5. ΔH / enthalpy / heat of rxn
6. PE of products

5. On the PE diagram above, draw a dashed line to indicate how the reaction pathway would change with the addition of a catalyst.

see above

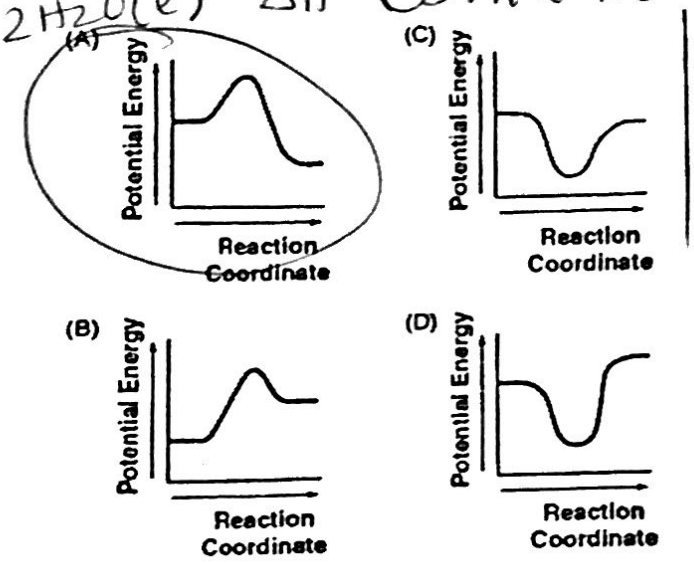
6. According to the PE diagram above, is the forward reaction endothermic or exothermic? Justify your response.

endothermic; products have more PE than reactants

7. According to Table I, which potential energy diagram best represents the reaction that forms $H_2O(l)$ from its elements?

$2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$ $\Delta H = -571.6$ kJ

ΔH is negative, so exothermic



8. The heat of reaction (ΔH) is equal to the
   a. Heat content of the products minus heat content of the reactants
   b. Heat content of the reactants minus heat content of the products
   c. Entropy of the products minus entropy of the reactants
   d. Entropy of the reactants minus entropy of the products

9. According to Table I, which compound releases the greatest amount of energy per mole when it is formed from its elements? exothermic
   a. Hydrogen iodide $H_2(g) + I_2(g) \rightarrow 2HI(g)$ $\Delta H = +53.0$ kJ
   b. Carbon dioxide $C(s) + O_2(g) \rightarrow CO_2(g)$ $\Delta H = -393.5$ kJ
   c. Ethyne (C_2H_2) $2C(s) + H_2(g) \rightarrow C_2H_2(g)$ $\Delta H = +227.4$ kJ
   d. Ethene (C_2H_4) $2C(s) + 2H_2(g) \rightarrow C_2H_4(s)$ $\Delta H = +52.4$ kJ

10. Given the reaction: $2H_2\,(g) + O_2\,(g) \rightarrow 2H_2O\,(l) + 571.6$ kJ
    What is the approximate ΔH for the formation of **1 mole** of $H_2O\,(l)$?
    a. -285.8 kJ
    b. +285.8 kJ
    c. -571.6 kJ
    d. +571.6 kJ

need to halve the rxn, or divide by 2.

571.6 ÷ 2 = 285.8

on products side so ΔH is (-) / exothermic