Chem Notes - Kinetics

Name: _____

CHEMICAL KINETICS - deals with the rates of chem reactions and the mechanisms by which they occur.

I. Factors that affect the rate of a chem reaction

1. Nature of the reactants - Reactions involving ions in solution are usually extremely rapid, because no bonds must be broken. Reactions between molecules usually require the breaking of bonds and are slower to react.

2. Concentration - An increase in concentration of a reactant _____ reaction rate. This is a result of the increase in the frequency of _____.

3. Pressure - has an effect on reactions involving _____. Increased preessure results in increased _____ and therefore increases reaction rate.

4. Temperature - Increasing the temperature always _____ the reaction rate. Since temperature represents average _____ energy, the effectiveness and the number of collisions are _____.

5. Surface Area - Increasing surface area provides a greater opportunity for collisions to occur.

6. Catalysts - are substances that increase the rate of reaction This increased rate is brought about by a change in the reaction _____.

The Role of Energy in Reactions

1. Activation Energy - is the minimum energy needed to cause a reaction to occur.

2. Heat of Reaction (ΔH) - is the difference between the potential energy of the _____ and the potential energy of the _____.

*This potential energy is also known as _____.

$$\Delta H = H_{products} - H_{reactants}$$

3. Exothermic reactions _____ energy. In these reactions the potential energy of the products is _____ than the potential energy of the reactants. In exothermic reactions the sign of ΔH is _____.

- For the reaction: $N_2 (g) + 2O_2 (g) \rightarrow 2NO_2 (g) + 15.8$ kcal
  for this reaction the ΔH = _____kcal.

DRAW A....
Potential Energy diagram for the exothermic reaction:

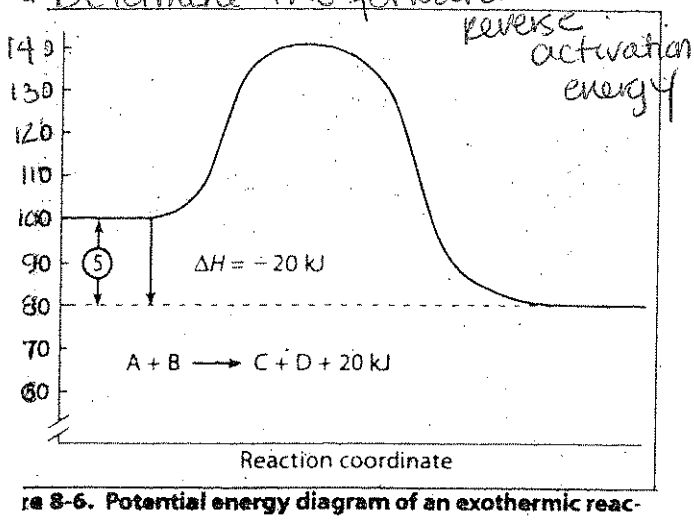
$A + B \rightarrow C + D +$ heat

4. Endothermic reactions _____ energy. In these reactions the potential energy of the products is _____ than the potential energy of the reactants. In endothermic reactions the sign of ΔH is _____.

- For the reaction: H_2 (g) + I_2 (g) + 12.6 kcal → 2HI (g)
  for this reaction the ΔH = _____kcal.

DRAW A . . .
Potential Energy diagram for the exothermic reaction:
A + B + heat → C + D

• Calculate ΔH
• Determine the forward and reverse activation energy

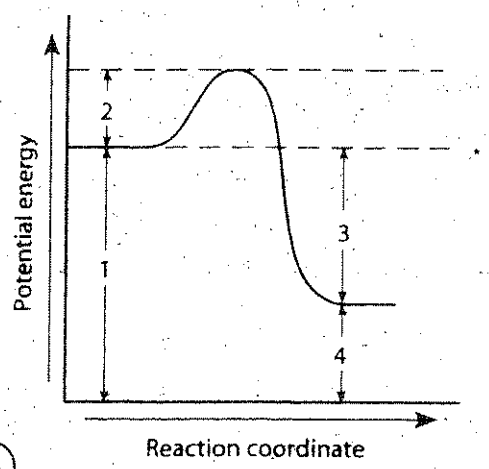


re 8-6. Potential energy diagram of an exothermic reac- Note that there is a loss of potential energy from reactants oducts.

Review Questions

e your answers to Questions 11 and 12 on the dia- m below, which represents the reaction:

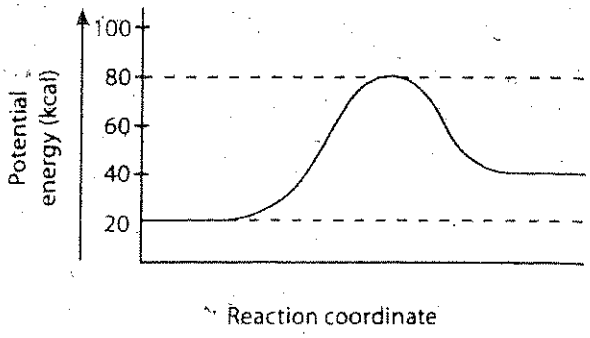
$$A + B \rightarrow C + \text{energy}$$



11. Which statement correctly describes this reaction? (1) It is endothermic and energy is absorbed. (2) It is endothermic and energy is released. (3) It is exothermic and energy is absorbed. (4) It is exothermic and energy is released.

12. Which numbered interval will change with the addition of a catalyst to the system? (1) 1 (2) 2 (3) 3 (4) 4

13. A potential energy diagram of a chemical system is shown below:

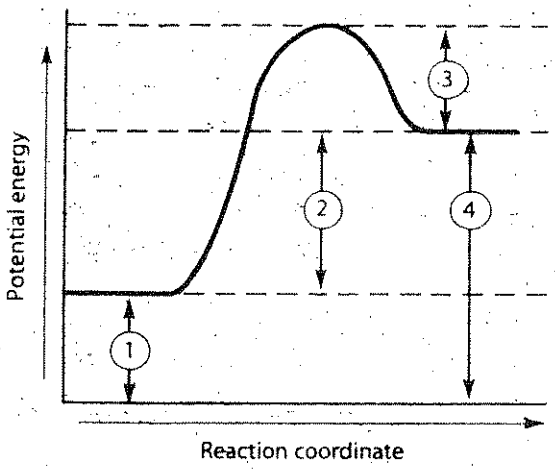


What is the difference between the potential energy of the reactants and the potential energy of the products? (1) 20. kcal (2) 40. kcal (3) 60. kcal (4) 80. kcal

14. Consider the reaction for which $\Delta H = +33$ kJ/mol.

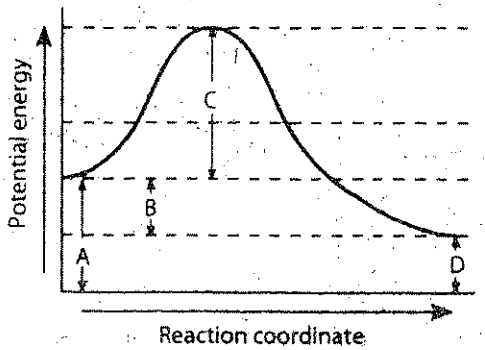
$$N_2(g) + 2O_2(g) \rightleftarrows 2NO_2(g)$$

The potential energy diagram of the reaction is shown below.



Which arrow represents the heat of reaction for the reverse reaction? (1) 1 (2) 2 (3) 3 (4) 4

15. The potential energy diagram of a chemical reaction is shown below.



Which letter in the diagram represents the heat of reaction? (1) A (2) B (3) C (4) D