

# KEY

## Unit 9 Outline- Thermodynamics, Reaction Rates, & Chemical Equilibrium Chapters 17 & 18

### Essential Skills/ State Standards:

- 9-1. Describe how temperature and heat flow in terms of the motion of molecules (or atoms). (CSS: 7a)  
 9-2. Know that chemical processes & phase changes can either release energy (exothermic) or absorb energy (endothermic). (CSS: 7b, 7c)  
 9-3. Solve problems involving heat flow and temperature changes, using known values of specific heat ( $q = m \cdot c \cdot \Delta T$ ) & latent heat of phase change ( $q = m \cdot \Delta H$ ). (CSS: 7d)  
 9-4. Know the rate of reaction is the decrease in concentration of reactants or the increase in concentration of products with time & depends on such factors as: concentration, temperature, and pressure. (CSS: 8a, 8b)  
 9-5. Know the definition and role of activation energy & catalyst in a chemical reaction. (CSS: 8d\*, 8c)  
 9-6. Know how to use Le Chatelier's principle to predict the effect of changes in concentration, temperature, and pressure. (CSS: 9a)  
 9-7. Know that equilibrium is established when the forward and reverse reaction rates are equal. (CSS: 9b)

### Vocabulary

- |                |                   |  |                           |
|----------------|-------------------|--|---------------------------|
| • Condensation | • Deposition      | • Calorimeter                                  | • Heat of reaction        |
| • Freezing     | • Heat            | • Joule  | • Le Chatlier's principle |
| • Vaporization | • Temperature     | • Specific heat                                | • Equilibrium             |
| • Melting      | • Thermochemistry | • $q = m \cdot c \cdot \Delta T$               | • Activation Energy       |
| • Boiling      | • Exothermic      | • $q = m \cdot \Delta H_{\text{vaporization}}$ | • Catalyst                |
| • Sublimation  | • Endothermic     | • $q = m \cdot \Delta H_{\text{fusion}}$       |                           |

### Study Guide (Use notes, worksheets, and labs in addition to this study guide)

1. According to the collision theory, what 3 things must happen in order for two molecules to react?

*Must collide with each other, Must collide with enough energy, & in the correct orientation*

2. What is the importance of the activation energy in a chemical reaction?

*Amount of energy needed for a reaction to occur.*

3. Using the collision theory, explain if the following would increase/ decrease the rate of reaction:

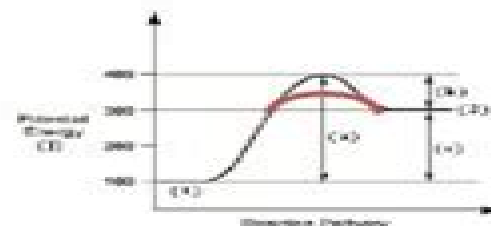


- Increase temp: *Increase, molecules collide more*
- Increase HCl: *Increase, more collisions because more reactants to collide*
- Increase pressure: *Hard to say, wouldn't affect the reactants directly because none of them are gases. One of the products is a gas, so it might cause the gas particles to collide more with the reactants and could slow it down. Tough call.. (this one won't be on the test).*
- Remove  $\text{MgCl}_2$ : *Increase, less products means less chance for them to interfere with reactant collisions*
- Add  $\text{H}_2$ : *Decrease, more products mean they interfere more with reactants and the reactants would collide less.*

4. Identify the following terms with their correct letter from the graphs:

- Reactants- **I**
- Products- **2**
- Activation energy (number/ letter & amount)-  
**A (300 Joules)**
- Is this reaction exothermic or endothermic?  
**Endothermic**

5. Explain how a catalyst affects the activation energy in a chemical reaction. (Also, show on the above graph what a catalyst might do). It lowers the activation energy (see on graph).  
*Speeds it up by lowering the activation energy.*



# Reaction Rates And Equilibrium Test And Answers

**Rachel S Tattersall**



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