

## Reaction Rates

### I. Collision Theory

1. Define the term collision theory.

Collision Theory - atoms, ions, + molecules must collide in order to react

2. Molecules must be oriented properly to produce a reaction.

Circle One :  True  False

3. Under proper orientation, an activated complex develops, in which temporary, unstable arrangements develop when old bonds break & new bonds form.

4. The proper activation energy is necessary in order for an activated complex to change into products.

5. Identify the reaction rates if the  $E_a$  (activation energy) is :

Low  $E_a$  : Faster                      High  $E_a$  : Slower

6. Exothermic reactions occur when : (condensation, candle burning, rusting iron)

Circle One :            Net energy is absorbed             Net energy is released

Circle One :             Increase activation energy            Decrease activation energy

Circle One :            High-energy products form             Low-energy products form

7. Endothermic reactions occur when : (evaporation, baking bread, cooking egg)

Circle One :             Net energy is absorbed            Net energy is released

Circle One :             Increase activation energy            Decrease activation energy

Circle One :             High-energy products form            Low-energy products form

### II. Factors Affecting Reaction Rates

1. All elements react at the same rate regardless of their positions within the periodic table.

Circle One :            True  False

2. Aluminum (Al) and iron (Fe) are both metals, but why are baseball bats not made of iron?

Iron reacts more with oxygen  
( $4\text{Fe} + 3\text{O}_2 + 6\text{H}_2\text{O} \rightarrow 4\text{Fe}(\text{OH})_2$ )

Breaking a piñata.

Pushing a cart up a hill

① Sun  
 ② Stirring  
 ③ Surface Area

3. The more particles present, the more collisions that occur in a reaction.
4. How will a candle burn in a 100% oxygen environment versus 20% oxygen environment?

Candle burns brighter + larger  
(Small-mass vs. High-mass stars)

5. Increasing the surface area of a substance causes more collisions to occur and increases the rate of reactions.

6. Describe the most efficient way to burn a Chemistry book with matches.  
 (assuming the book is the only fuel)

- ① Rip out the pages
  - ② Crumple up the pages
  - ③ Burn..... baby, burn!!
- Increases surface area

7. Increasing the temperature of a reaction increases the rate of the reaction.

8. More collisions occur between molecules at higher temperatures.

9. What is the main purpose of a refrigerator?

- Slow down the rate of decomposition  
(Lower temp. = less collisions = less rot)

10. Increasing temperature or concentration of a reaction can produce negative consequences.

Circle One : True False

- Kill cells → too hot  
- Cell explodes → hypotonic sol.

11. Differentiate between the terms catalyst and inhibitor.

Not consumed in reactions

Catalyst : substance that ↑ the rate of reaction  
 Inhibitor : substance that ↓ the rate of reaction

12. List three examples of biological enzymes and inhibitors.

Trypsin  
 ↳ breaks proteins into AA

Enzymes 1. Amylase (starch into sugar) 2. Lipase (breaks down fats) 3. Lactase (milk sugar)

Inhibitors 1. Relenza (treats flu) 2. Cyanide (stops respiration) 3. Penicillin (breaks down cell walls)

13. How does a catalytic converter lower car exhaust emissions?

- Converter tubular coated with rhodium + platinum

(2NO → N<sub>2</sub> + O<sub>2</sub>) → ① Rhodium converts nitrogen oxide into N<sub>2</sub> + O<sub>2</sub>

② Platinum carbon monoxide into CO<sub>2</sub> and unburned gasoline into CO<sub>2</sub> + water vapor

(2CO + O<sub>2</sub> → 2CO<sub>2</sub>)      (C<sub>x</sub>H<sub>y</sub> + O<sub>2</sub> → CO<sub>2</sub> + H<sub>2</sub>O)