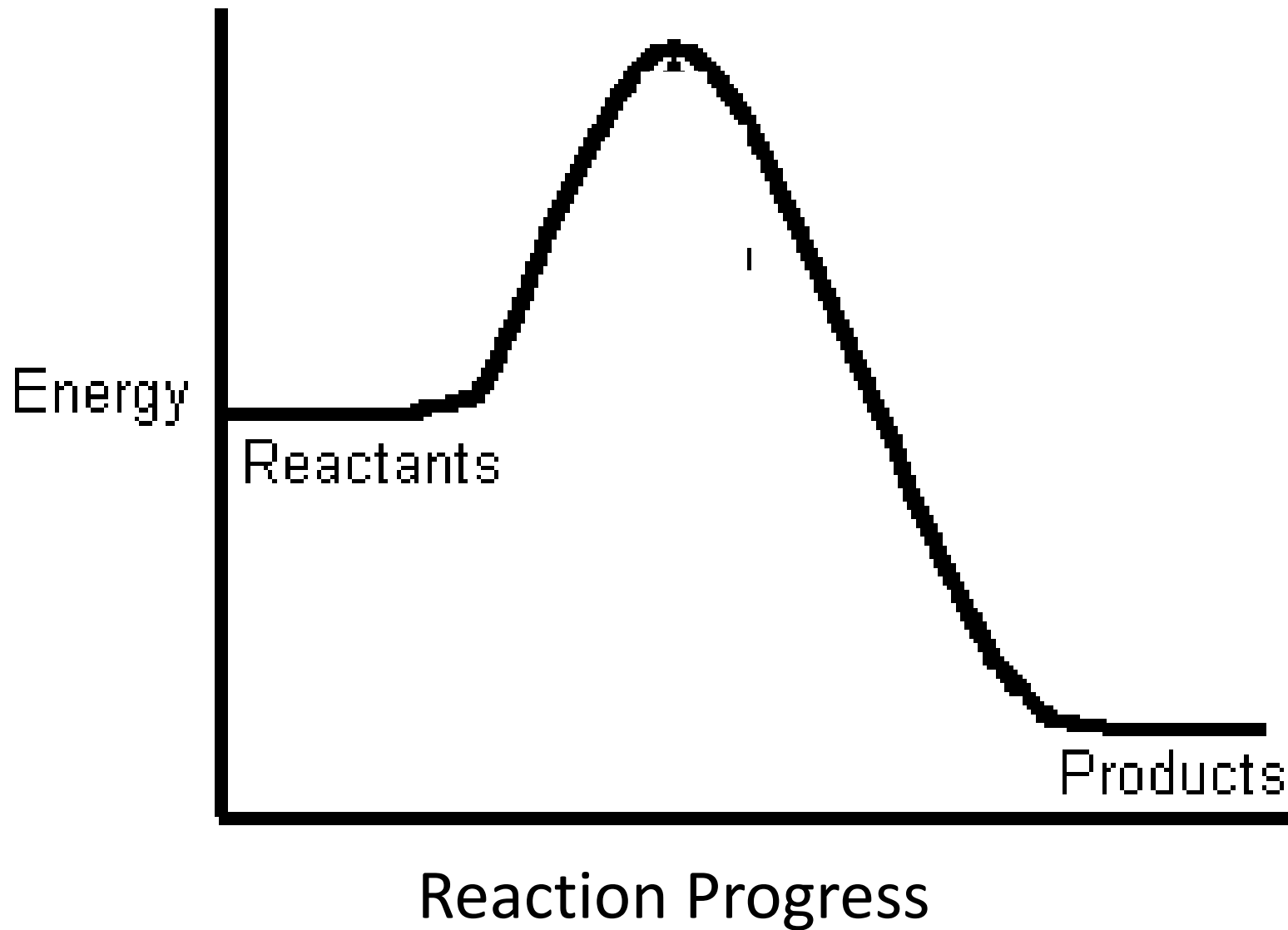


Notes: Energy and Chemical Reactions

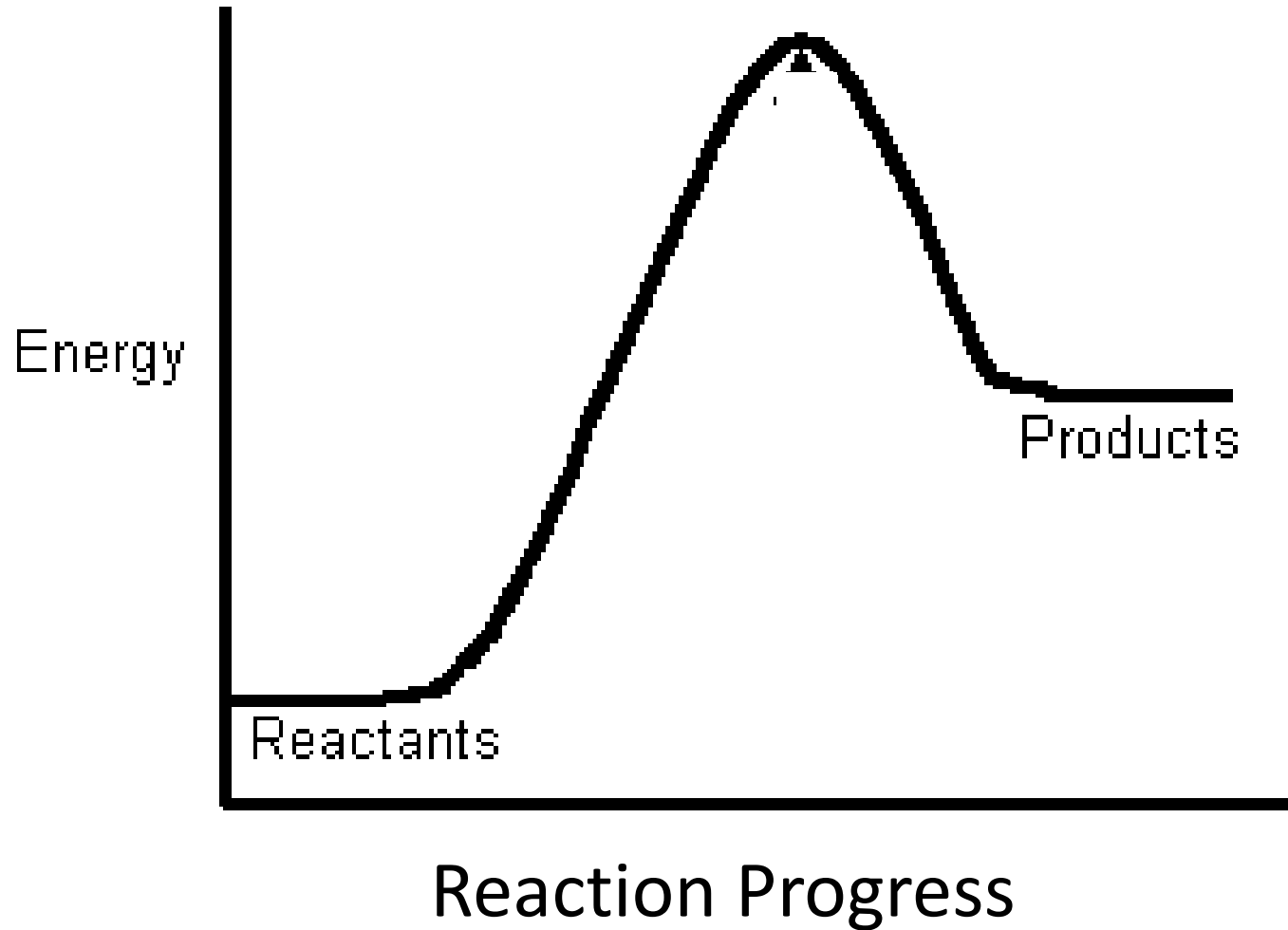
- **Exothermic** – Reaction in which heat energy is released.
 - “Exo” means **outside**. Energy is released to the “outside.”
 - Example: Burning – Substance combines with Oxygen to form heat, Light, CO₂ or Water. (Combustion)
 - Energy of products is **lower** than reactants.

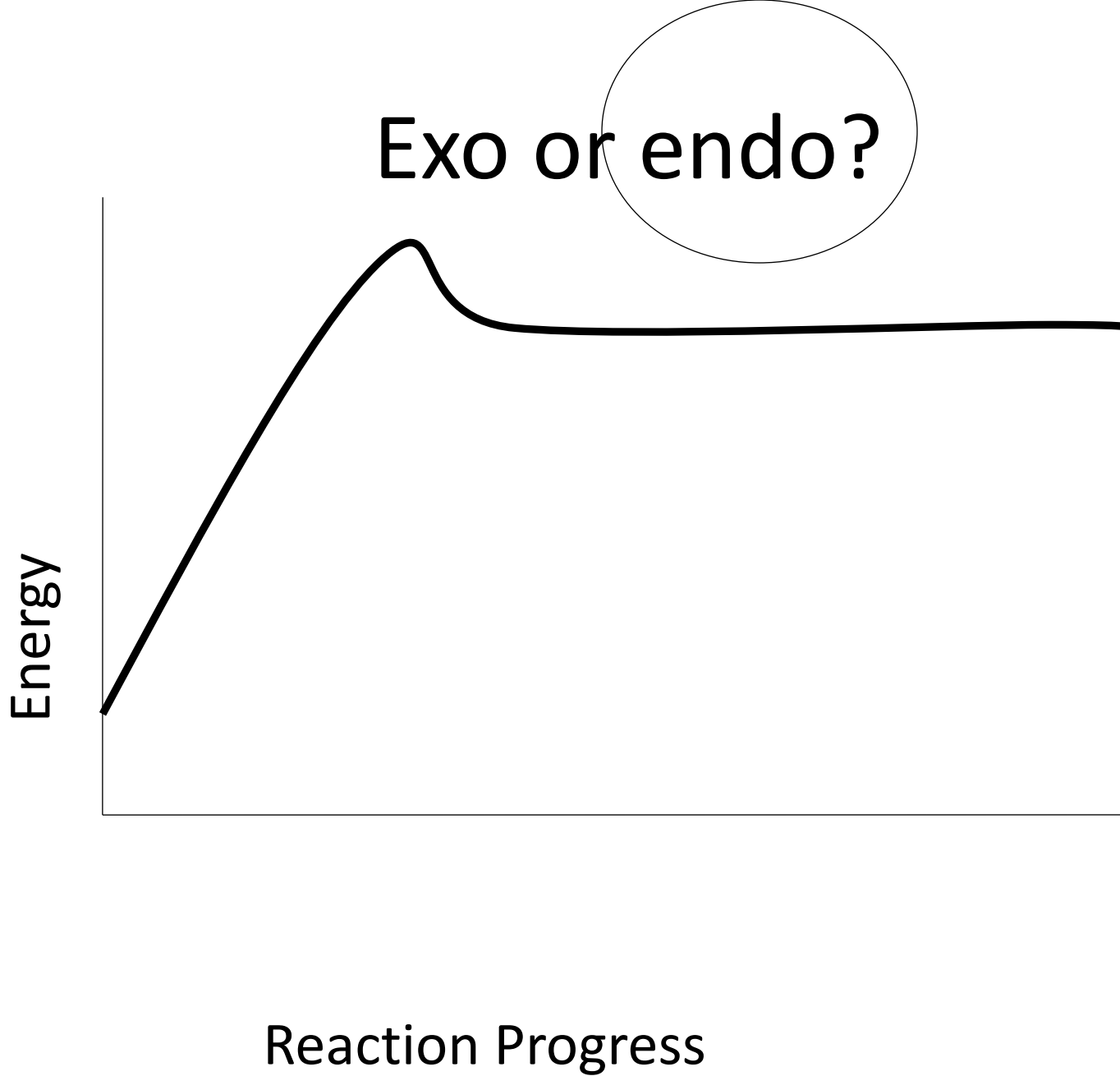
Exothermic Reaction



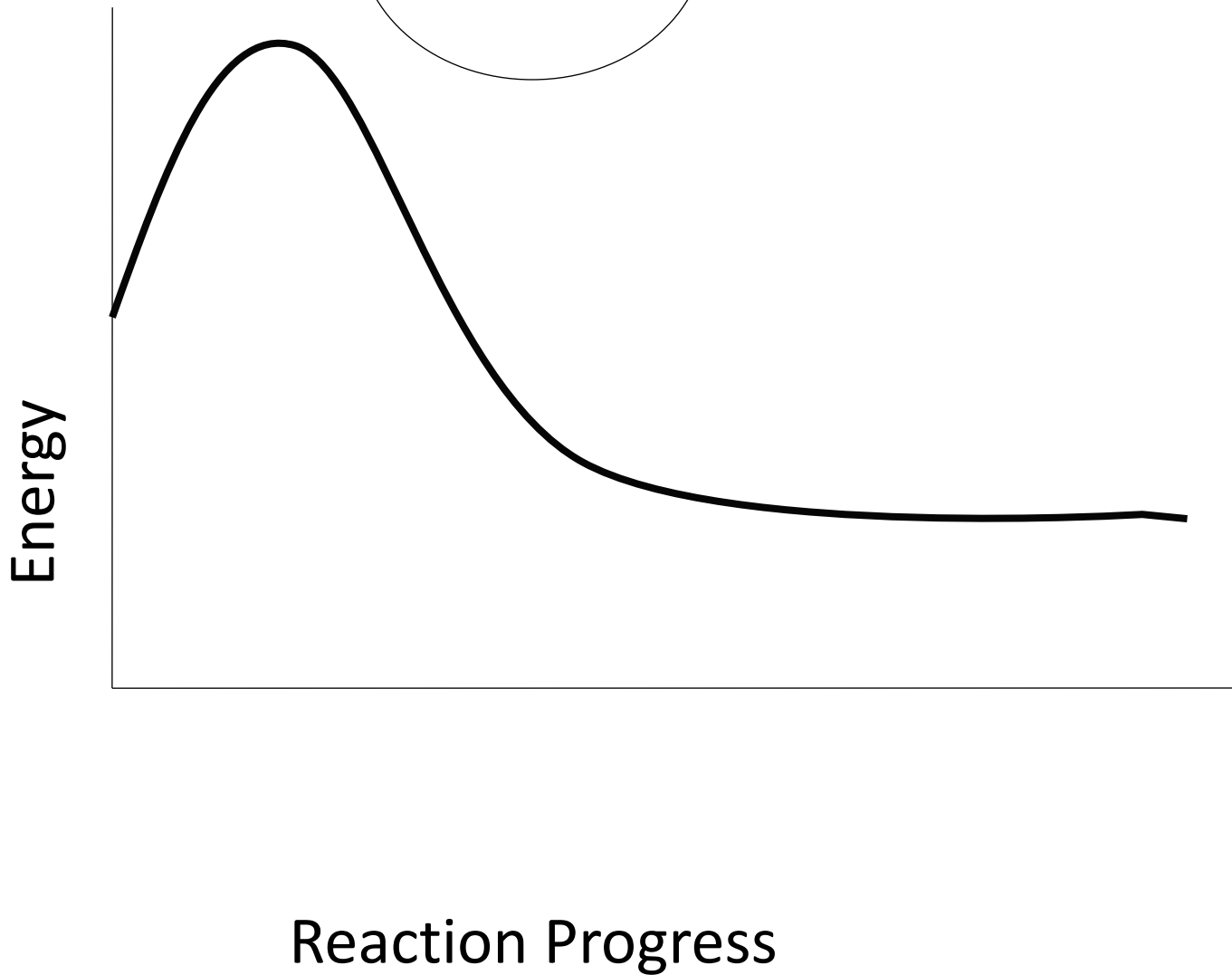
- **Endothermic** – Reaction in which heat energy is **absorbed**.
 - “Endo” means “**in.**” Energy goes IN to the reaction.
 - Example: A cold pack that dissolves a solution in water takes in heat from surrounding environment.
 - Energy of products is **higher** than reactants.

Endothermic Reaction





Exo or endo?

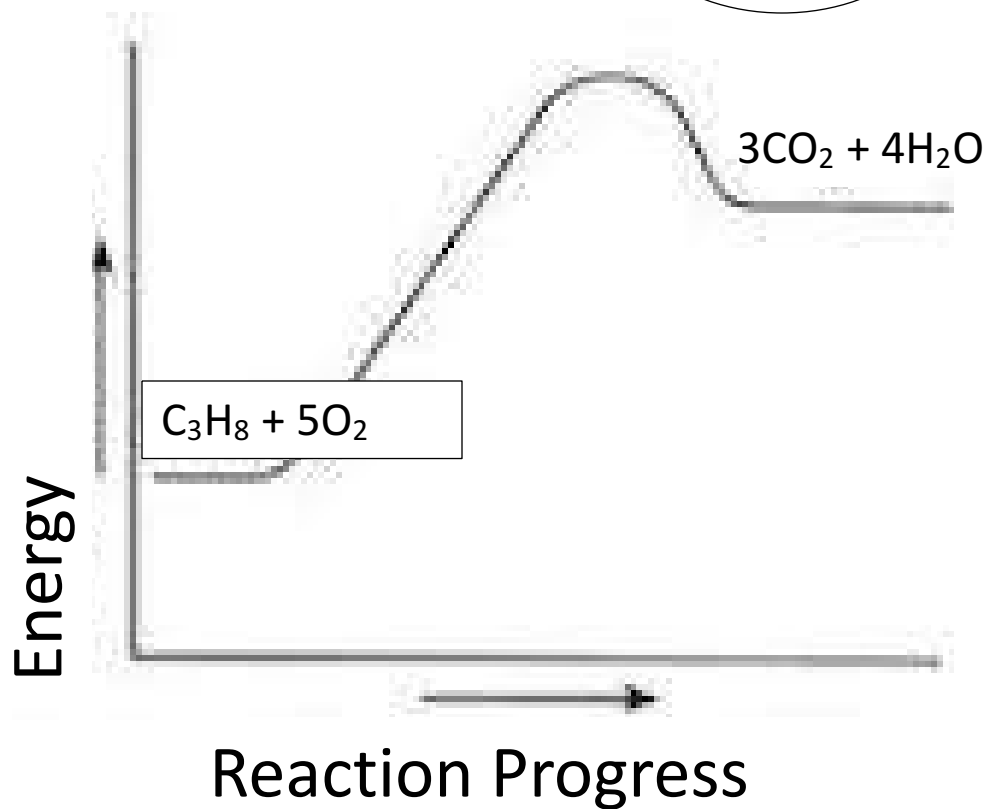


Putting it all together!

Remember Types of Reactions?

- **S = Synthesis:** $A + B \rightarrow AB$
- **D = Decomposition:** $AB \rightarrow A + B$
- **SR = Single Replacement:** $AX + B \rightarrow A + BX$
- **DR = Double replacement:** $AX + BY \rightarrow AY + BX$
- **C = Combustion** $C_xH_y + O_2 \rightarrow CO_2 + H_2O$

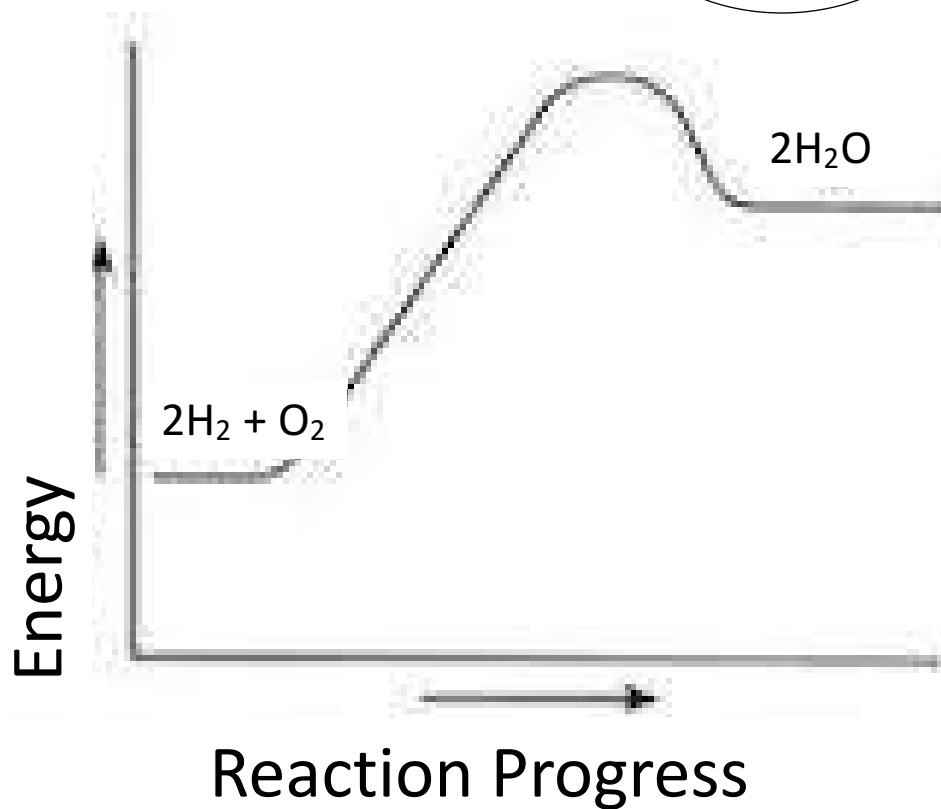
Exo or Endo?



What "type" of reaction is this?

combustion

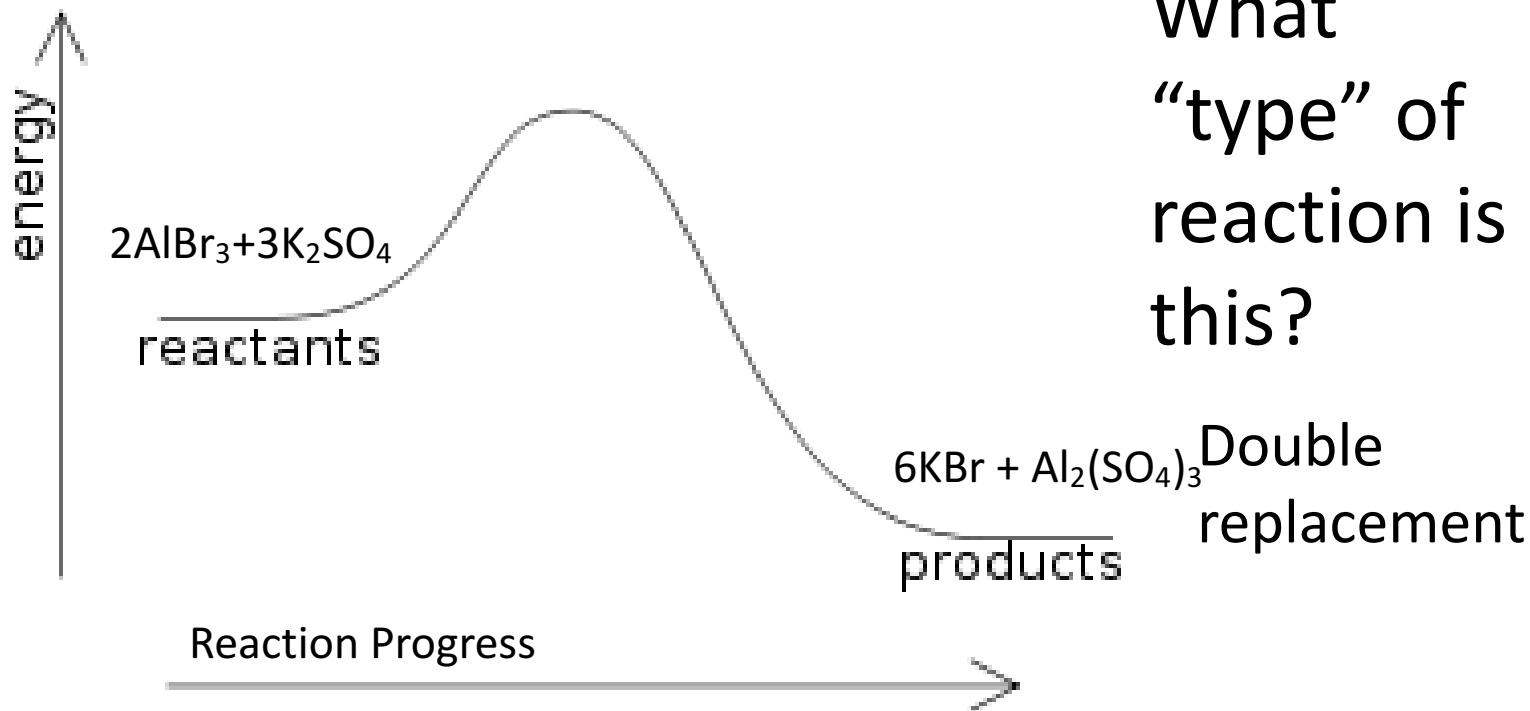
Exo or Endo?



What "type" of reaction is this?

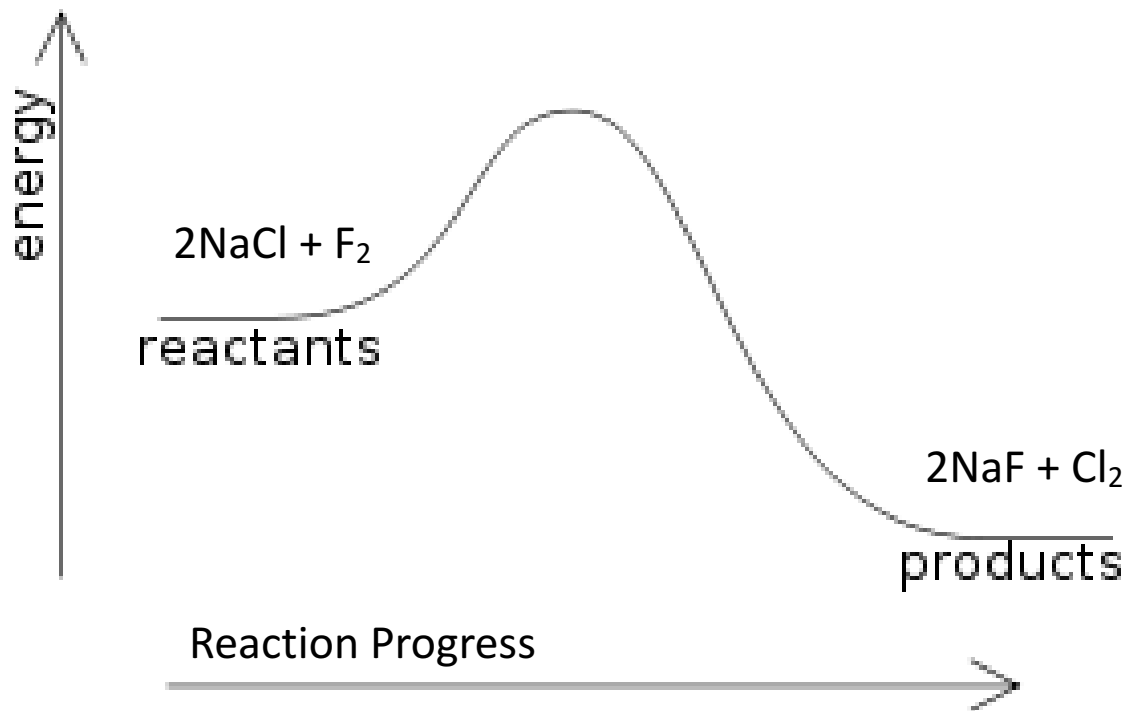
synthesis

Exo or Endo?



What
“type” of
reaction is
this?

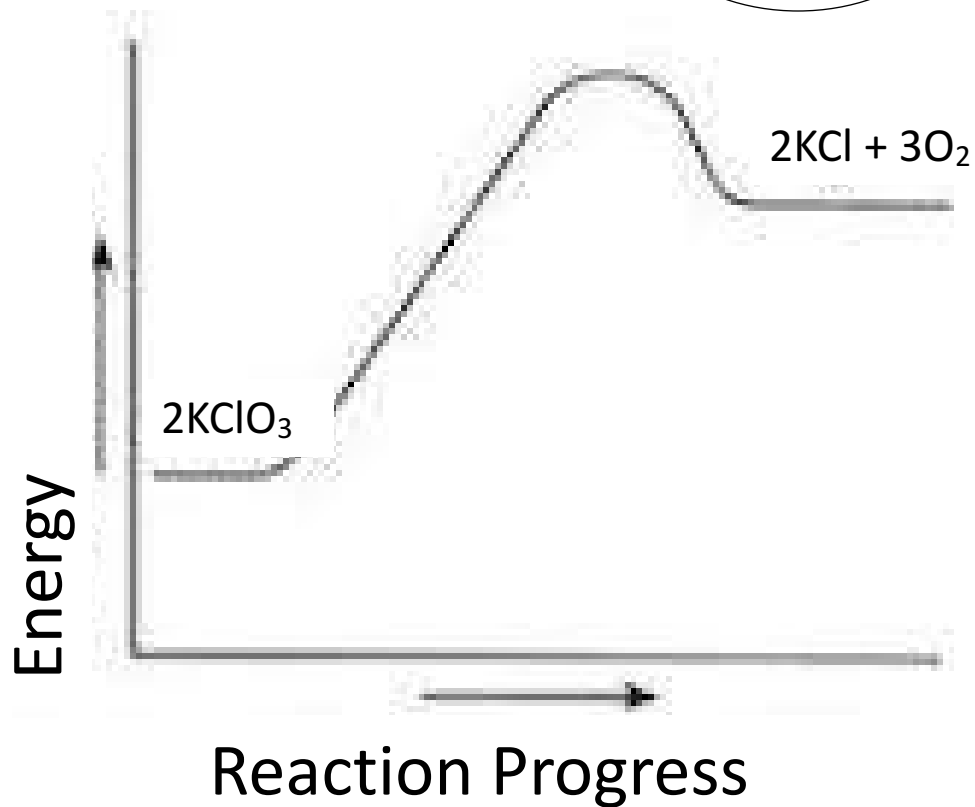
Exo or Endo?



What
“type” of
reaction is
this?

Single
replacement

Exo or Endo?



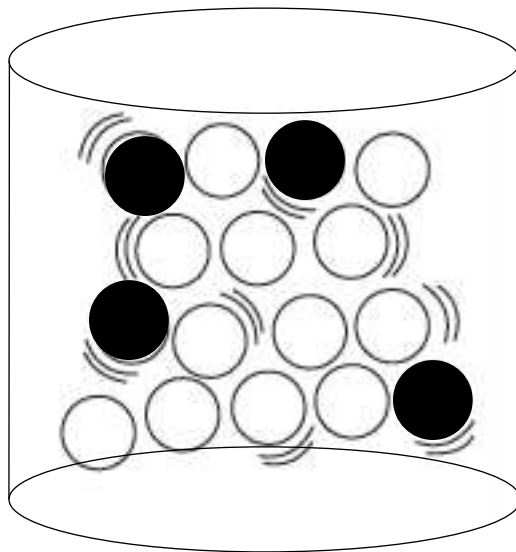
What "type" of reaction is this?

decomposition

How do temperature and concentration affect the rate of chemical reactions?

(molecules have to bump in to each other to react)

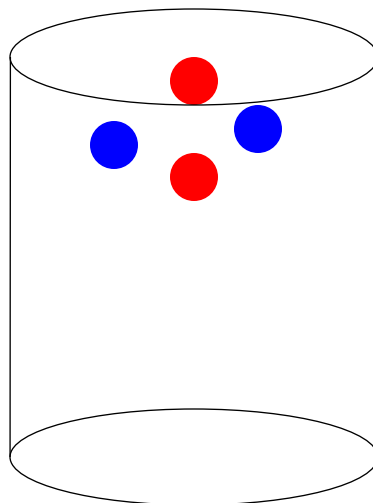
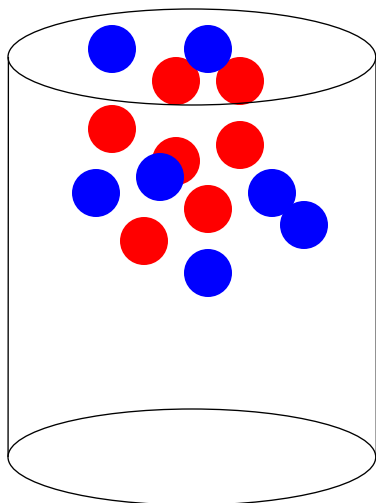
- Temperature – When temperature is increases, **molecular speed** is increased. Faster molecules are more likely to bump in to each other, making reactions happen faster.
 - Temperature **Up** = Reaction Rate **Up**
 - Temperature **Down** = Reaction Rate **Down**



Analogy: You are more likely to bump into or “react” people in a hallway when people are moving faster!



- **Concentration** – Concentration is the amount of substance in a given volume. The higher the concentration, the closer the molecules are together. They are more likely to bump in to each other!
 - *Concentration **Up** = Reaction Rate **Up***



Concentration

<http://www.ewart.org.uk/science/patterns/pat2.htm>

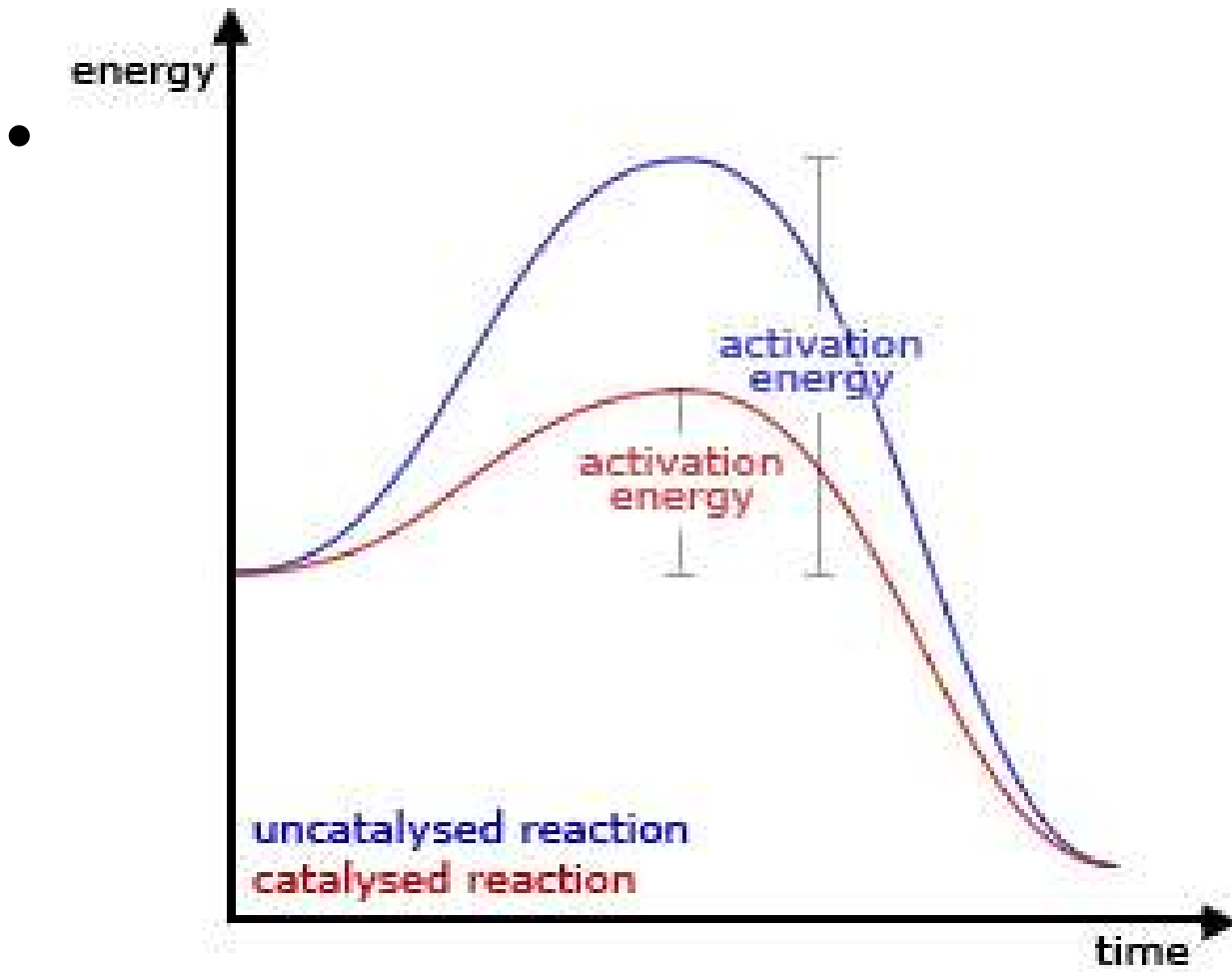
Analogy: You are more likely to bump into or “react” people in a crowded hallway with people closer together.



- **Activation Energy** – The amount of energy needed to **start** a reaction. The “**hill**” in the diagrams. You have to climb the hill before the reaction can start.



- **Catalyst** – **Speeds up** reactions **without** being used up or changed in the process. Lowers the activation energy of a reaction. It **lowers** the hill! (Analogy: Like a matchmaker setting up a couple.)



•

Would you rather be a catalyzed or uncatalyzed reaction?

Which do you think occurs more easily?

Is this exo or endothermic?

Catalysts you have heard about!

- Enzymes = Your body's catalysts!
 - Ex. Enzymes in your saliva help food be broken down FAST!



- Can a person act like a catalyst?

A “catalyst” is a person who gets something started or speeds something up (MLK’s speech, starting a club, a starting a winning streak on a sports team, etc).



http://www.middleschoolchemistry.com/multimedia/chapter6/lesson5#elephant_toothpaste

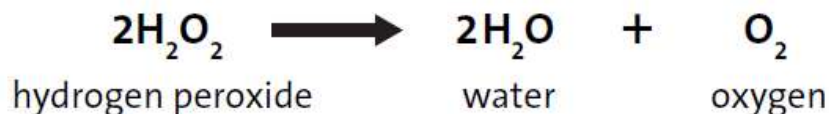
DEMONSTRATION

1. Your teacher showed you videos of two chemistry demonstrations: Elephant's toothpaste and genie in a bottle. Are both of these chemical changes?

How do you know?

Gas was produced in both reactions – lots of bubbles

2. Even though the two demonstrations seem different, the chemical reaction behind both is exactly the same—the decomposition of hydrogen peroxide. Refer to the following equation as you answer the questions below.



Which new substances are created when hydrogen peroxide decomposes?

Water and oxygen

Each demonstration used a substance called a catalyst. What does a catalyst do in a chemical reaction?

Speeds up the reaction by lowering activation energy

If the catalyst is involved in the chemical reaction, why isn't it included as a product in the chemical equation?

The catalyst makes it easier for the reaction to occur. It is not consumed in the reaction.

3. What clues did you have that a chemical reaction occurred in this activity?

4. What is the catalyst in this activity?

5. What evidence do you have that hydrogen peroxide decomposed faster when you added yeast?
6. When writing the chemical equation for this reaction, should yeast be included on the product side of the chemical equation?