**Energy Changes in Chemical Reactions**

**Exothermic Reactions** – \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ A + B → \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Endothermic Reactions** – \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ → C + D

**Endothermic or Exothermic?**

1. Reactants → Products + Energy
2. Reactants + Energy → Products
3. 2NaHCO3 (s) + 129 kJ → Na2CO3 (s) + H2O (g) + CO2 (g)
4. CaO (s) + H2O (l) → Ca(OH)2 (s) + 65.2 kJ
5. baking bread
6. campfire
7. photosynthesis
8. breaking down carbohydrates for energy

**Exothermic Reactions:** net \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of energy (heat)

* + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + ex. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + PE of Reactants > PE of Products (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)

**Endothermic Reactions:** net \_\_\_\_\_\_\_\_\_\_\_\_\_\_ of energy (heat)

* + “Feels \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to the touch”
  + ex. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + PE of Reactants < PE of Products

**Activation Energy & Catalysts**

**Activation energy**: The amount of energy needed to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + Required for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_endothermic and exothermic reactions.

**How does a catalyst speed up a reaction?**

* Catalyst: speeds up the reaction, but is not used up during the reaction.