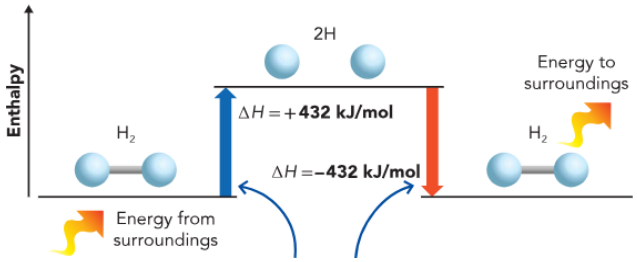
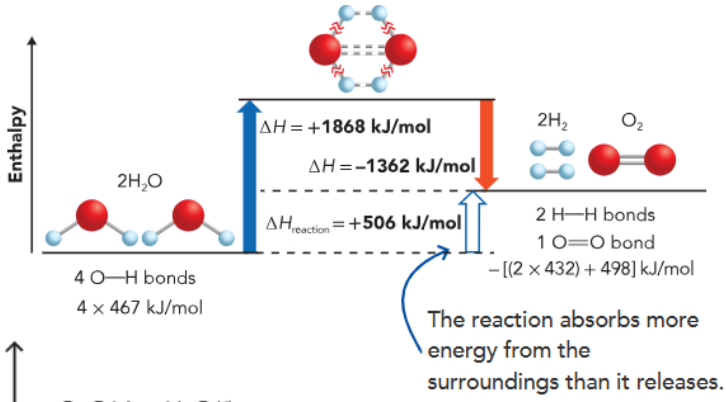
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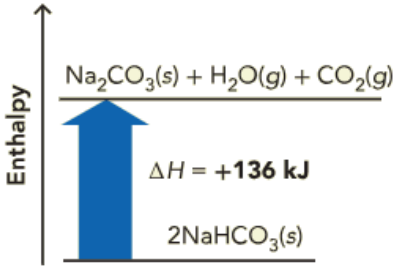
Unit 08 – THERMOCHEMISTRY	8.3 Models of Energy

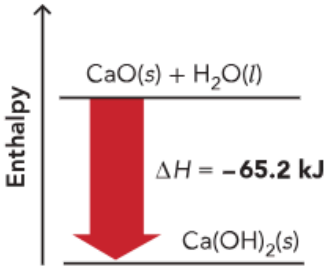
Enthalpy Diagrams

- Enthalpy (ΔH) is *the amount of energy in a substance, reaction, or system*. The enthalpy of the reactants for instance are the bond energies of all the reactants.
- An enthalpy diagram shows the change in enthalpy between parts of the reaction/system (reactants and products).



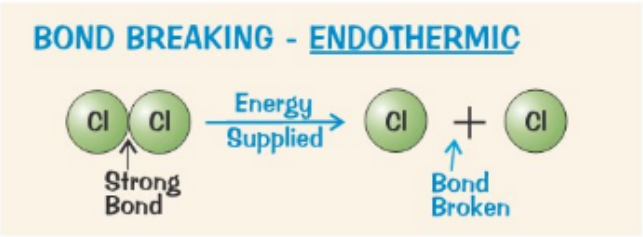


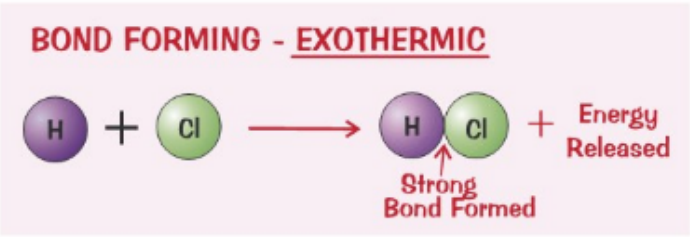




Exothermic & Endothermic

- A *reaction that releases energy* is called an exothermic reaction.
- A *reaction that absorbs energy* is called an endothermic reaction.
- Recall, bond breaking requires or absorbs energy while bond formation releases energy

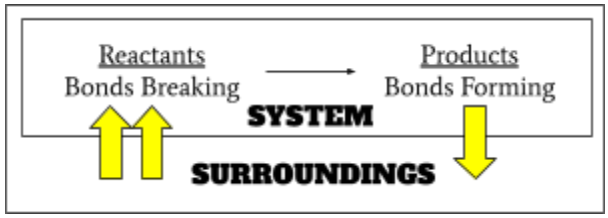
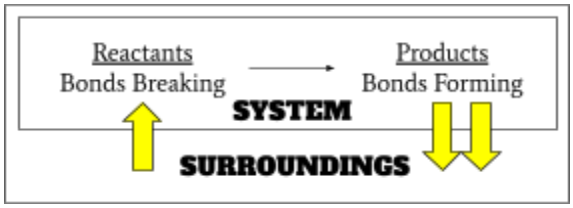




Endothermic	Exothermic
More energy absorbed than released	More energy released than absorbed
Reactants have more bond energy/more stable	Products have more bond energy/more stable
Surroundings become colder	Surroundings become hotter

Name: _____

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Heat is a reactant	Heat is a product

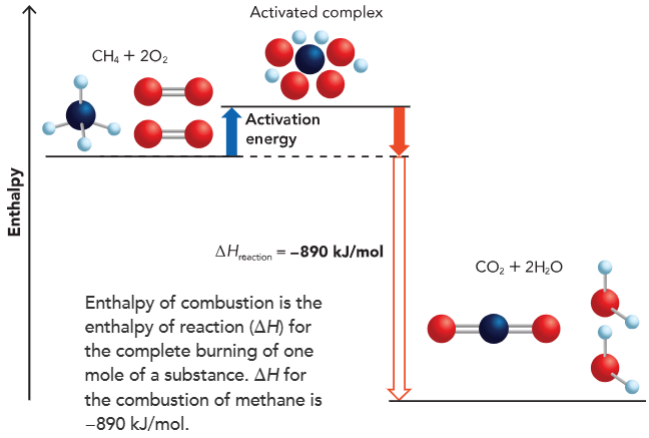
Thermochemical Equations

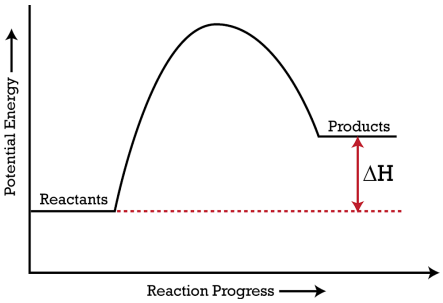
- A thermochemical equation is a model of a reaction that shows the reaction as an equation with thermochemical information.

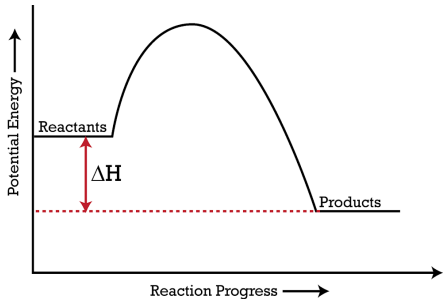
Endothermic	Exothermic
$2NaHCO_3(s) + 136\ kJ \rightarrow Na_2CO_3(s) + H_2O(g) + CO_2(g)$	$CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(s) + 65.2\ kJ$
$2NaHCO_3(s) + heat \rightarrow Na_2CO_3(s) + H_2O(g) + CO_2(g)$	$CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(s) + heat$
$2NaHCO_3(s) \rightarrow Na_2CO_3(s) + H_2O(g) + CO_2(g)\ \ \Delta H = +136\ kJ$	$CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(s)\ \ \Delta H = -65.2\ kJ$

Potential Energy Diagrams

- Potential energy diagrams show the change in potential energy (y-axis) during the progression or time of a chemical reaction (x-axis.)
- The initial absorption of energy from the surroundings is known as activation energy.
- Substances with more bond energy are more stable and therefore have a lower potential energy.
- If the reactants are at a lower potential energy than the products, then the reactants are more stable and more energy is absorbed than released to the surroundings. This is an endothermic reaction.
- The difference in potential energy of the products and reactants is known as the energy of the reaction or reaction enthalpy (ΔH).
- If the potential energy of the products is lower, then more energy is released to the surroundings and the enthalpy is negative (showing a release or loss of energy by the system).







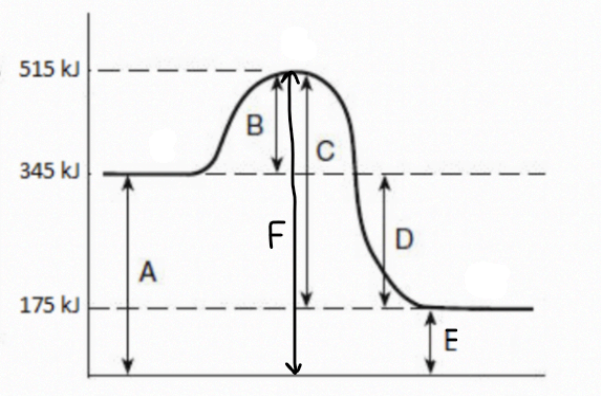
Name: _____

Unit 08 – THERMOCHEMISTRY	8.3 Models of Energy

Example Problem #1

Label the following parts from the energy diagrams below:

___ = Potential energy of the reactants
___ = Potential energy of the products
___ = Potential energy of the transition state
___ = Activation energy of the Forward reaction (R → P)
___ = Activation energy of the Reverse reaction (P → R)
___ = Heat of the reaction
(ΔH = PE of products – PE of reactants)



Example Problem #2

$$C(s) + O_2(g) \rightarrow CO_2(g)$$

In this reaction, carbon dioxide is more stable than carbon or diatomic oxygen molecules.

a. The reactants have [more / less] potential energy than the products.
b. Sketch the potential energy diagram.
c. The reaction [absorbs / releases] energy from/to the surroundings.
d. This is an [endothermic / exothermic] reaction.

