



Chemistry ★

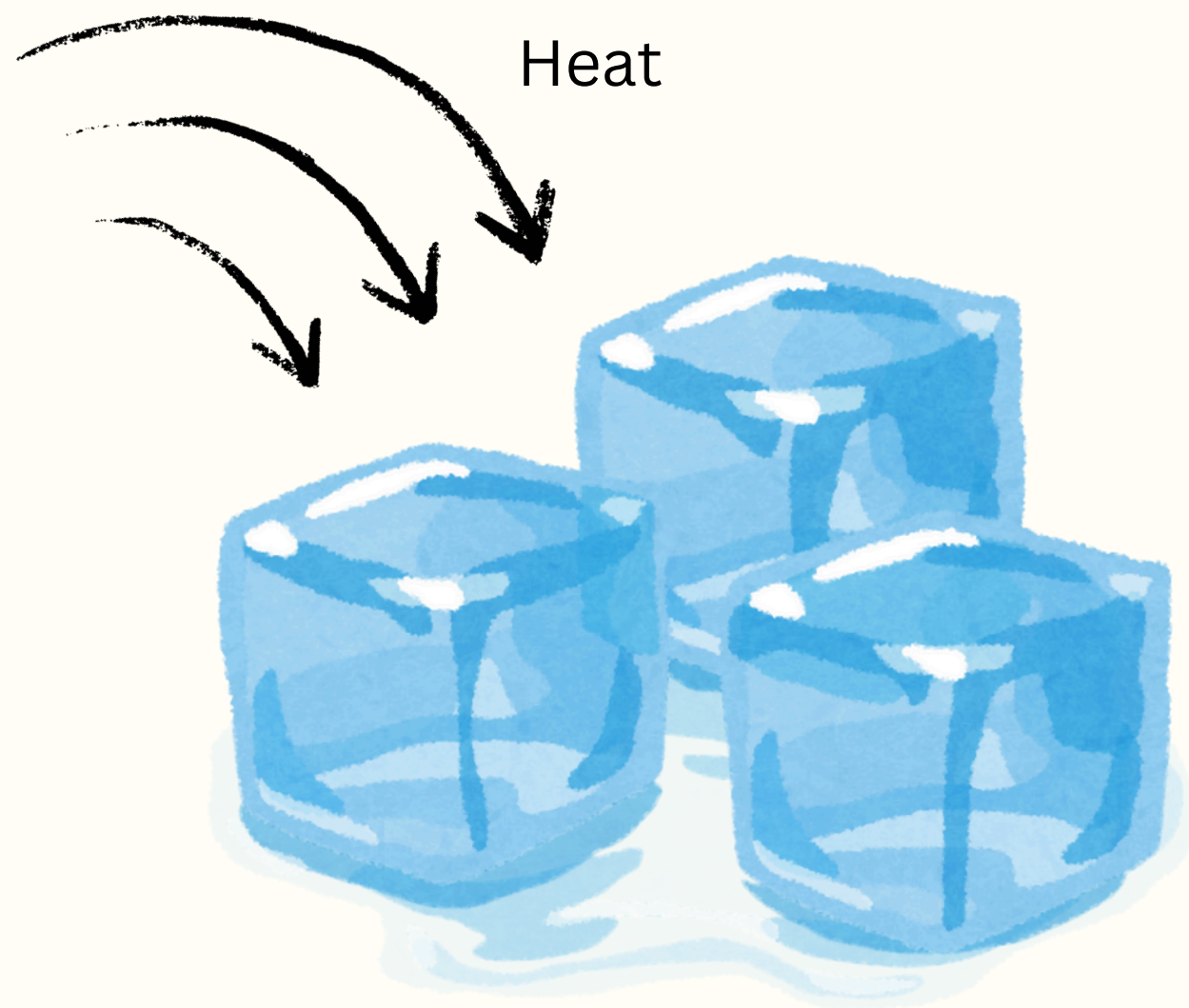


Energy is conserved in chemical reactions.

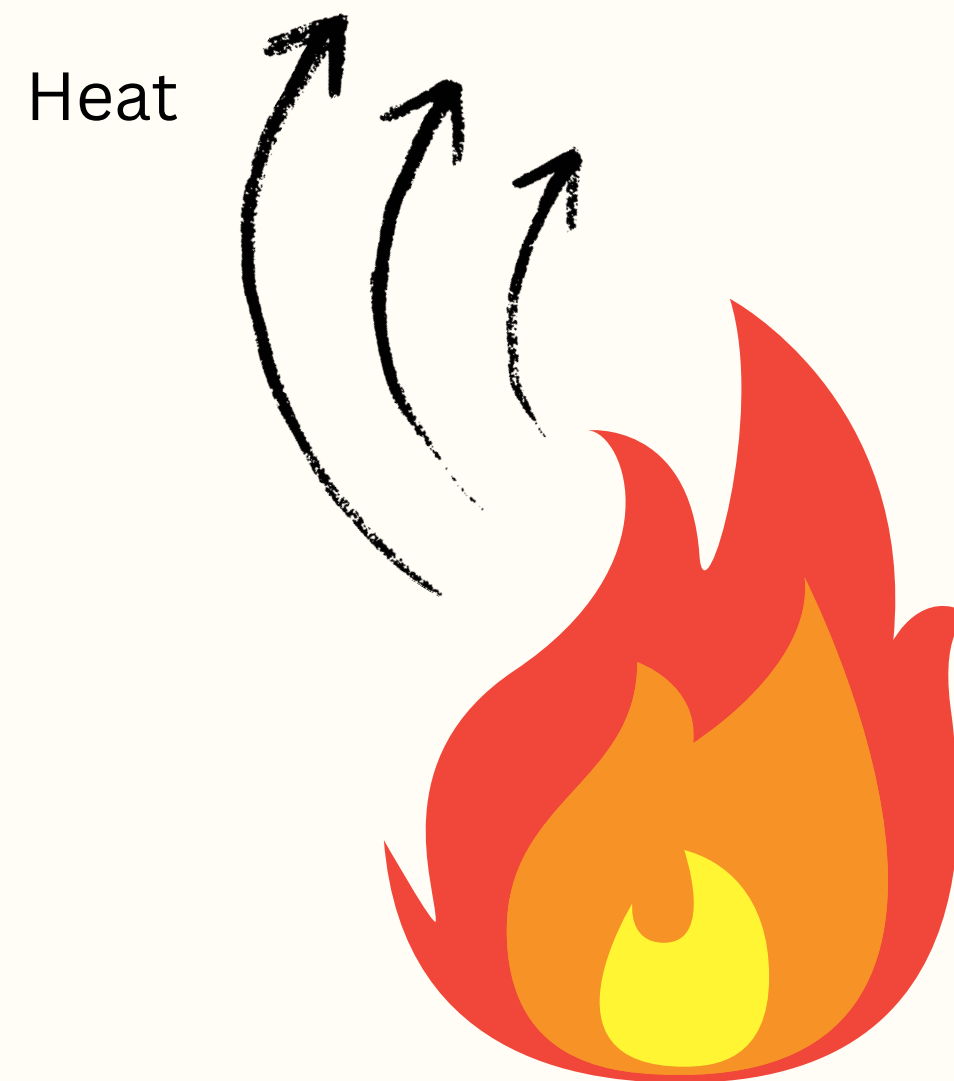
The total energy of the system is the same before and after a reaction.

Endothermic : the endothermic reaction is cooler than surroundings. (Heat enters the system).

Exothermic : the exothermic reaction is hotter than surroundings. (Heat leaves the system).



Endothermic



Exothermic

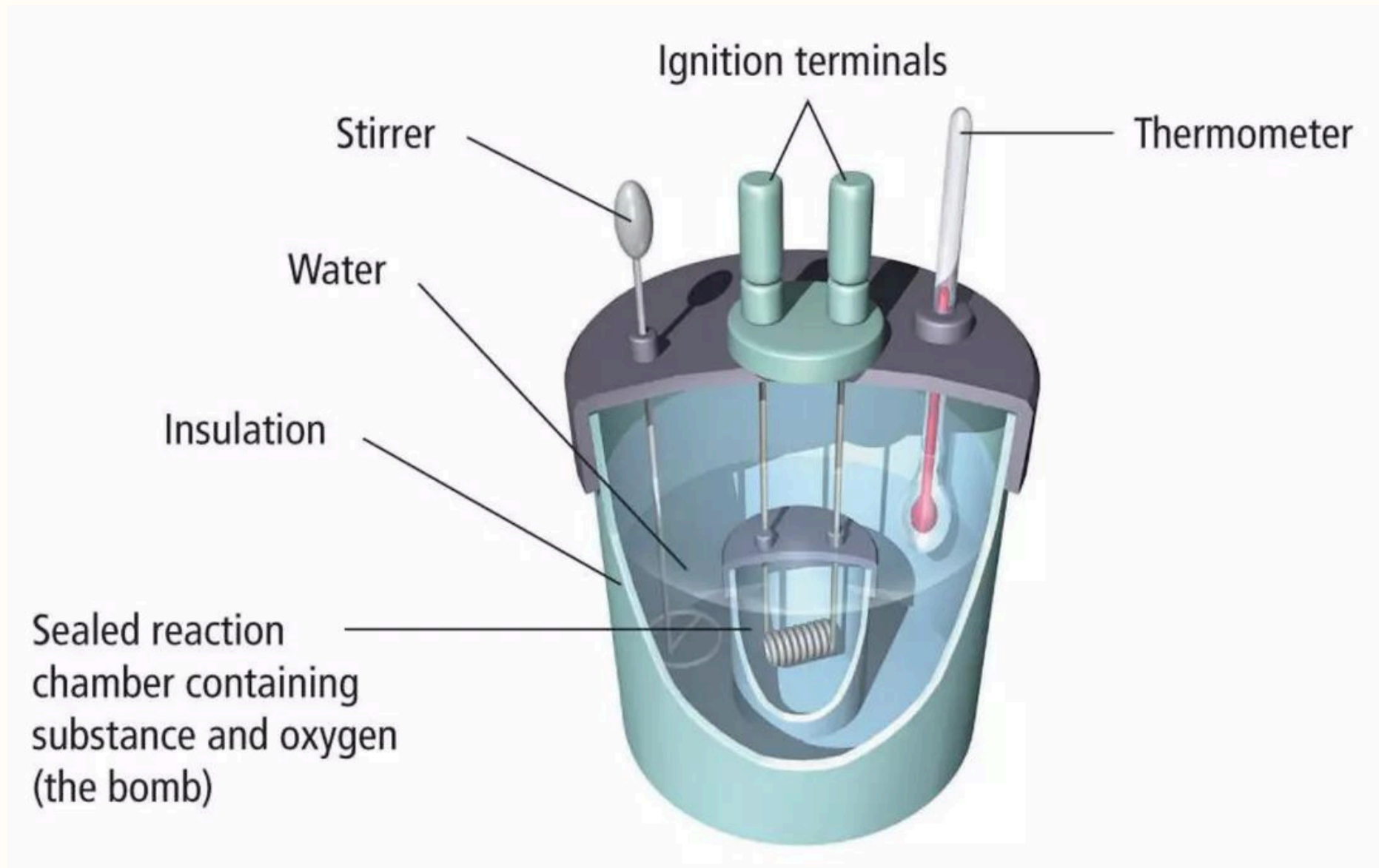
Calorimetry : is the process of measuring the amount of heat released or absorbed during a chemical reaction.

A calorimeter : is an insulated device used for measuring the amount of heat (q) absorbed or released during a chemical or physical process.

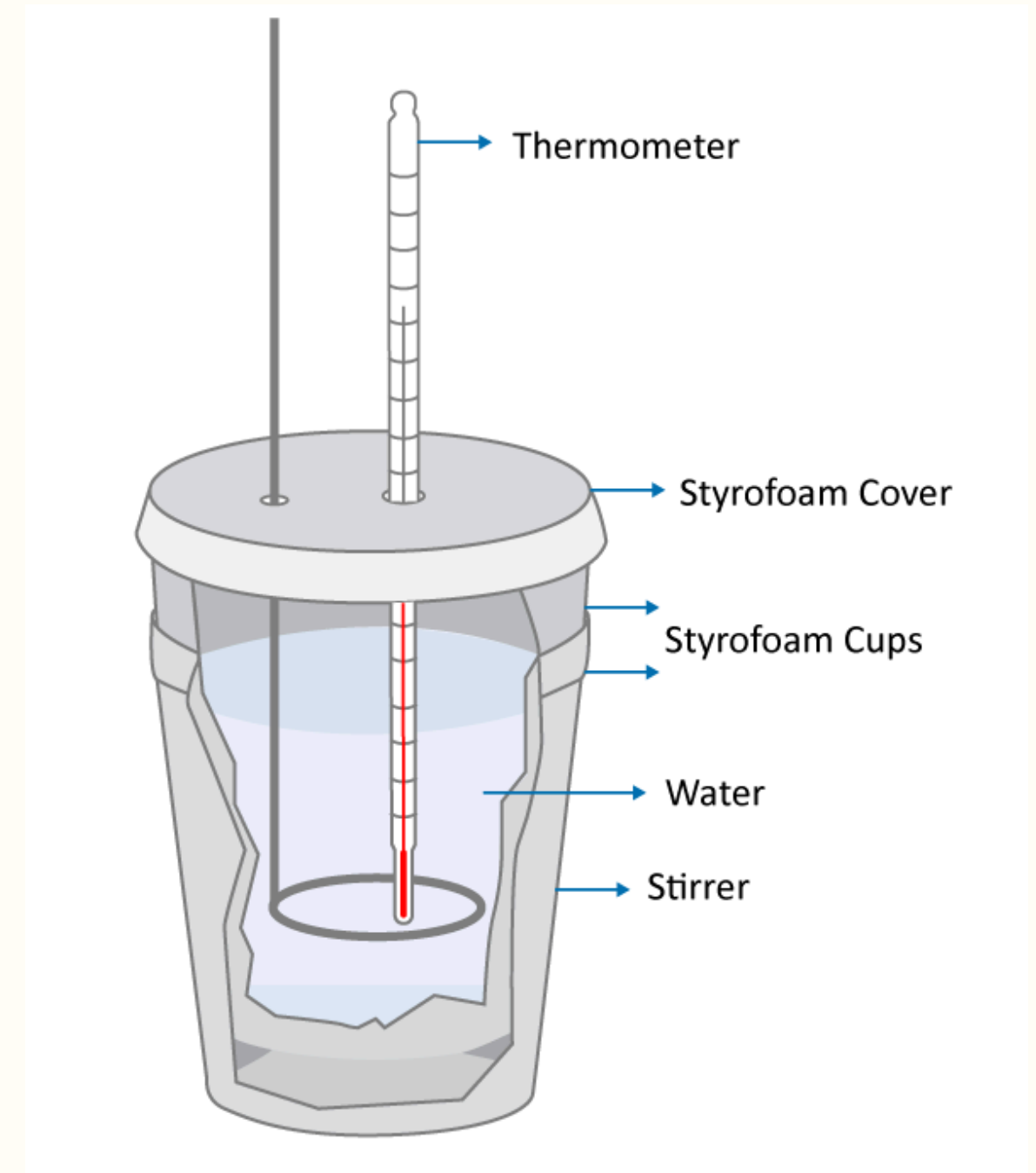
The data to be collected is the change in temperature.

You can use a calorimeter to determine the specific heat of an unknown metal.

Bomb calorimeter :



Coffee-cup calorimeter :



- a. An initial temperature of 25.60°C is recorded for the 125 g of water in the calorimeter.
- b. A 50.0-g sample of an unknown metal is heated to 115.0°C and placed in the calorimeter.
- c. The metal transfers heat to the water until the metal and the water are at the same temperature. The final temperature is 29.30°C .

<i>Water :</i>	<i>Metal :</i>
$m = 125g$	$m = 50g$
$T_i = 25.6^{\circ}C$	$T_i = 115^{\circ}C$

$$T_f = 29.3^{\circ}C$$

$$T_f(\text{for the metal}) = 29.3^{\circ}C$$

$$T_f(\text{for the water}) = 29.3^{\circ}C$$

$$q = c \times m \times \Delta T$$

$$\Delta T = T_f - T_i$$

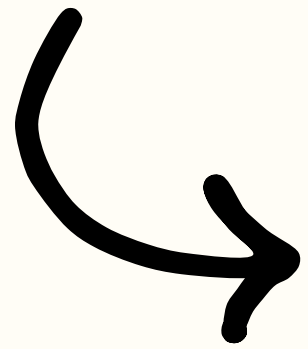
$$q_w \rightarrow \text{water energy}$$

$$q_m \rightarrow \text{metal energy}$$

Specific heat of water = $4.186 \text{ J/g}\cdot^{\circ}C$
(given)

$$q_w = (4.186) \times (125) \times (29.3 - 25.6)$$

$$q_w = 1940 J$$



As the water absorbed 1940 joules then the metal
released that amount of joules

The metal released 1940 joules

(-) ---> released



$$q_m = -1940 J$$

$$-1940 = c \times (50) \times (29.3 - 115)$$

$$c = 0.452 J/g \cdot ^\circ C$$

The temperature increased by $x^{\circ}\text{C}$, then $\Delta T = x^{\circ}\text{C}$

The temperature decreased by $x^{\circ}\text{C}$, then $\Delta T = -x^{\circ}\text{C}$

y released -9J , then z absorbed 9J

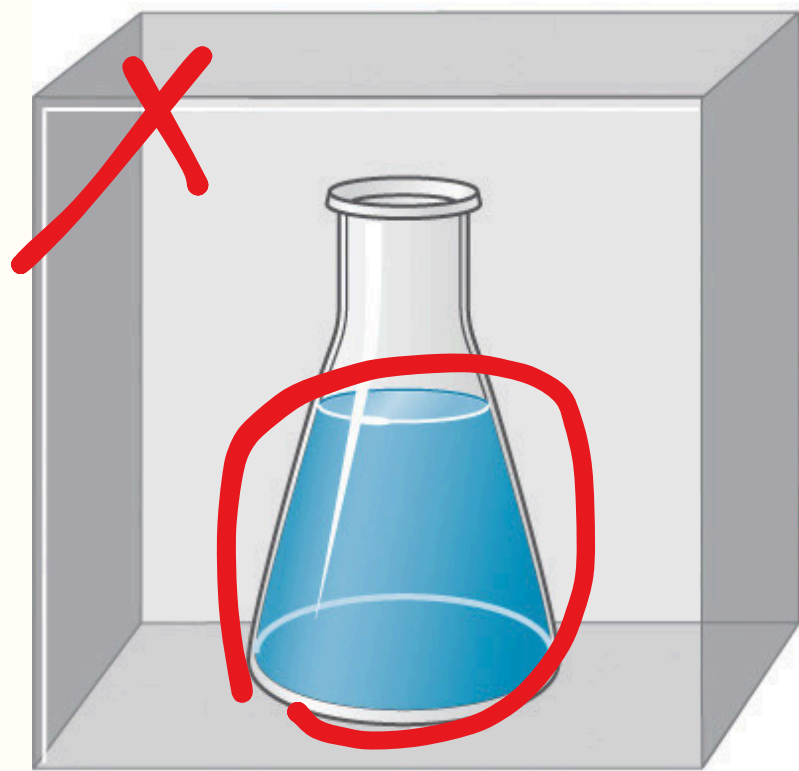
y absorbed 8J , then z released -8J

Thermochemistry : is the study of heat changes that accompany chemical reactions and phase changes.

A system is the specific part of the universe that contains the reaction or process you wish to study.

The surroundings are everything else other than the system in the universe.

The universe is defined as the system plus the surroundings.



System

+



Surroundings

=



Universe

The energy released or evolved from reactions carried out at constant pressure is sometimes given the symbol q_p (heat).

Enthalpy (H) : is the heat content of a system at constant pressure.

$$\Delta H_{\text{rxn}} \rightarrow q$$

Enthalpy (heat) of reaction : is the change in enthalpy during a reaction, symbolized as ΔH_{rxn} .

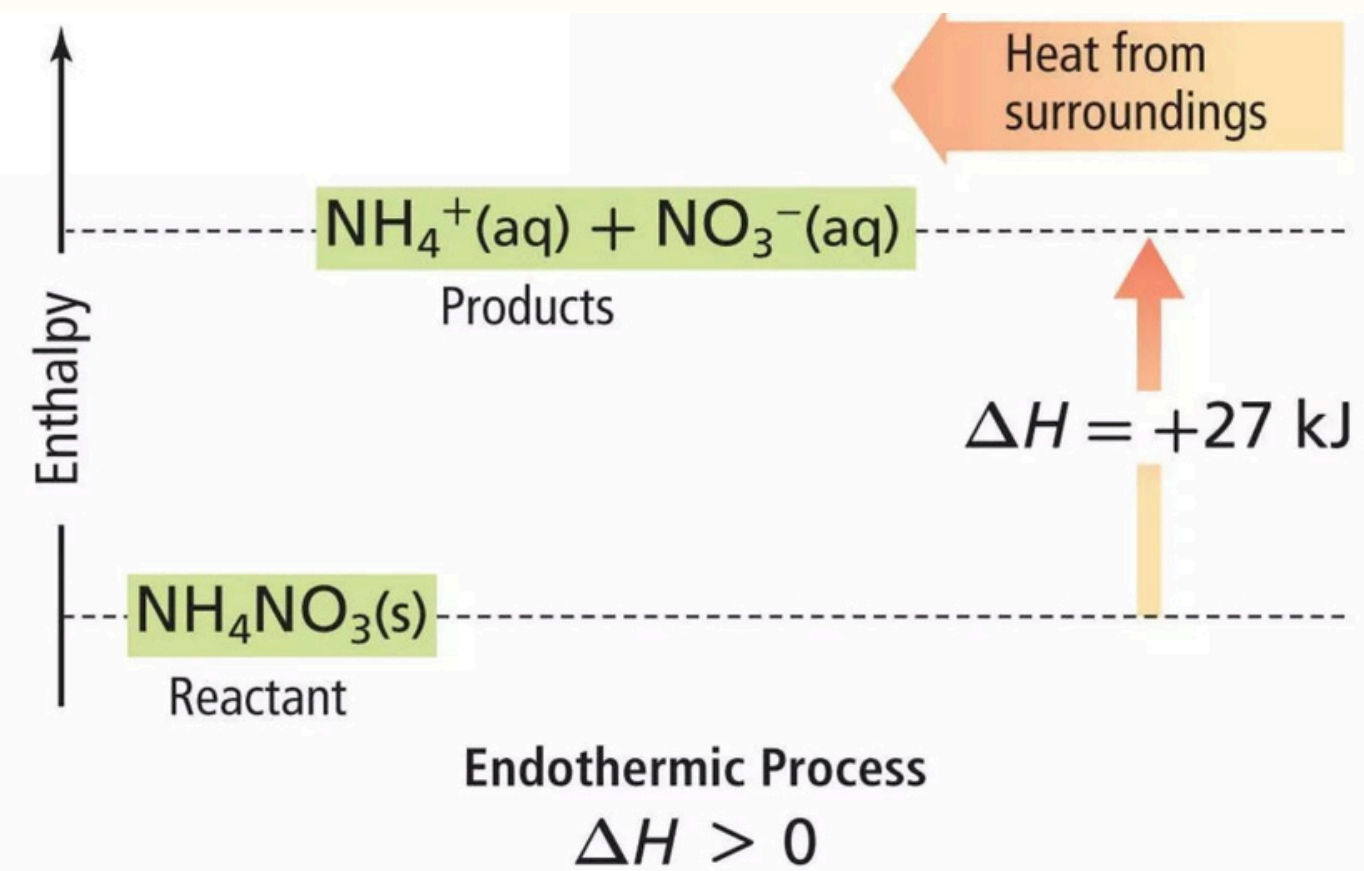
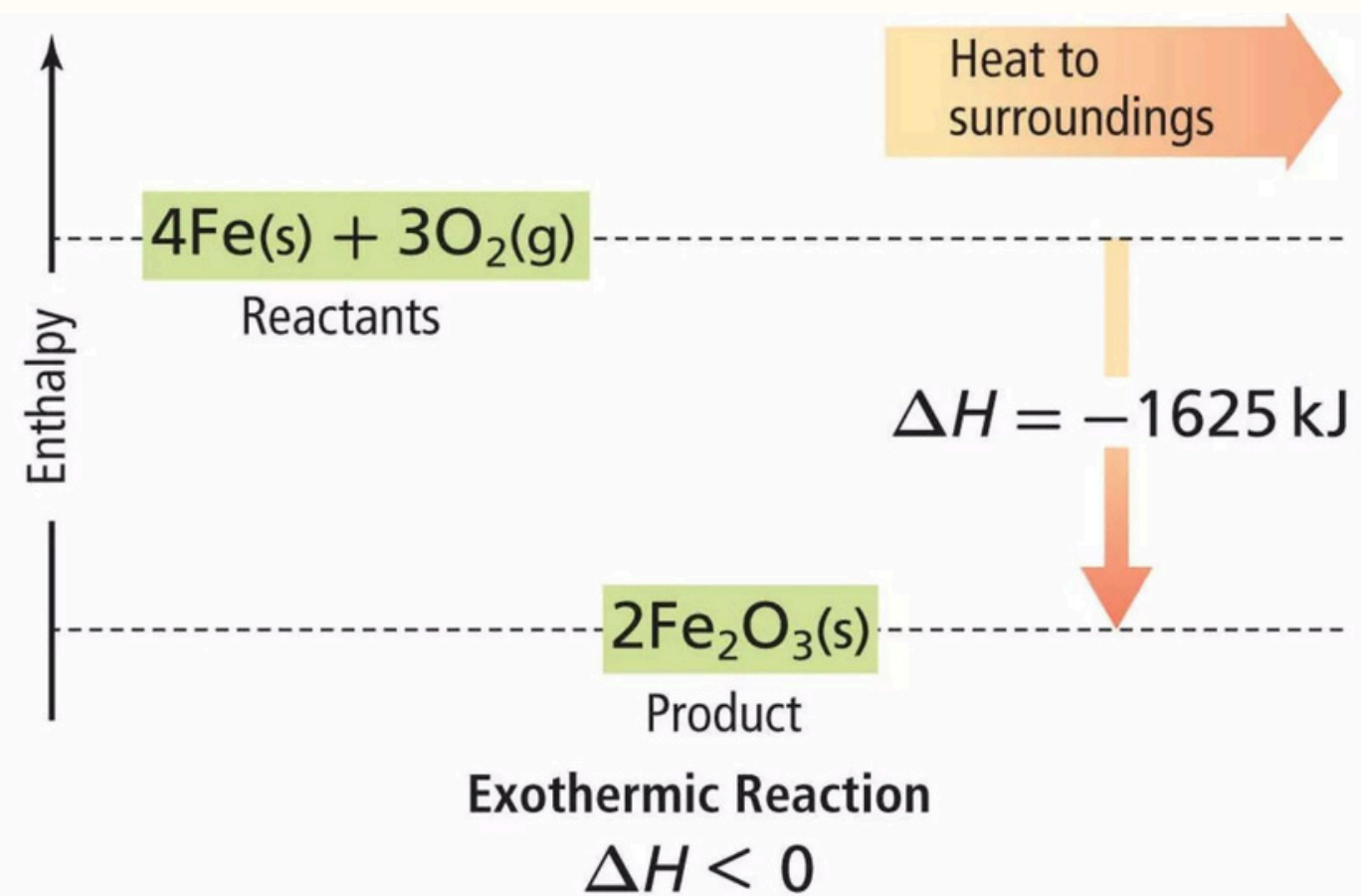
$$\Delta H_{\text{rxn}} = H_{\text{final}} - H_{\text{initial}}$$

$$\Delta H_{\text{rxn}} = H_{\text{products}} - H_{\text{reactants}}$$

rxn ---> reaction

Enthalpy changes for exothermic reactions are always negative. (Before > After).
(heat released).

Enthalpy changes for endothermic reactions are always positive. (Before < After).
(heat absorbed).





Have a nice day ★