

# Difference Between Thermochemistry and Thermodynamics

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## Key Difference – Thermochemistry vs Thermodynamics

Thermodynamics is the branch of [physical science](#) that deals with the relations between heat and other forms of energy such as mechanical, electrical, or chemical energy. Thermochemistry is a branch of thermodynamics. Thermochemistry is also a branch of chemistry that describes the heat energy in relation to chemical reactions. The key difference between thermochemistry and thermodynamics is that **thermochemistry is the quantitative study of the relation between heat and chemical reactions whereas thermodynamics is the study of laws associated with the relation between heat and chemical reactions.**

## What is Thermochemistry?

Thermochemistry is the study and measurement of heat energy associated with [chemical reactions](#). Chemical reactions are associated with releasing and absorbing heat energy. This is due to chemical bond cleavage and formations that take place in reactions. To break down a chemical bond, energy should be absorbed from outside. When a chemical bond forms, energy is released to the surrounding. According to these heat transfer mechanisms, there are two types of chemical reactions;

- **Exothermic reaction** – heat energy is released
- **Endothermic reaction** – heat energy is absorbed.

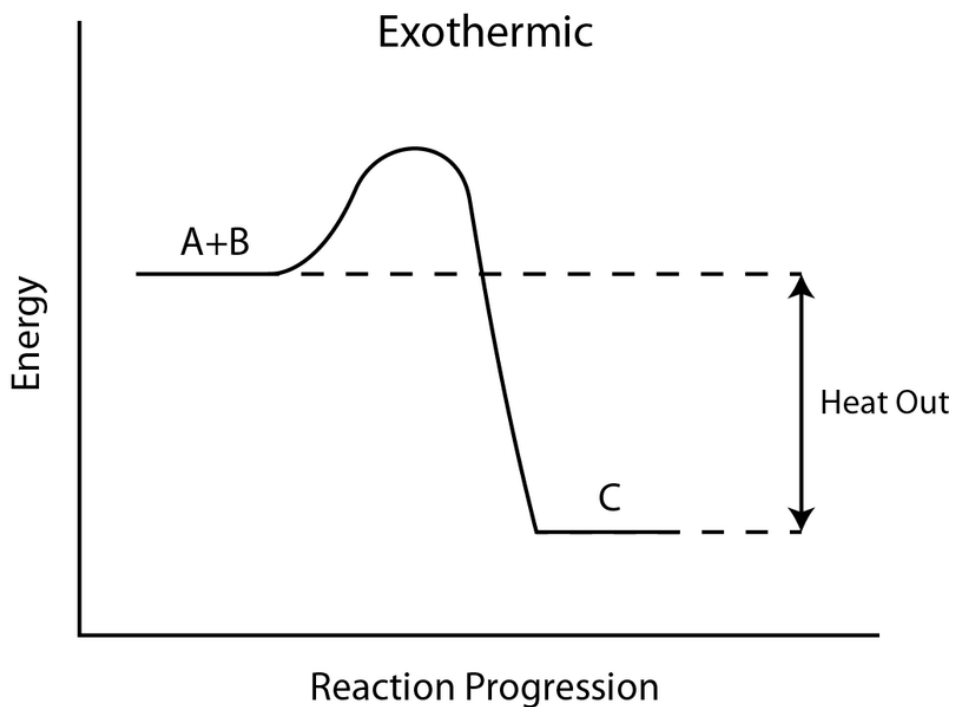


Figure 01: A Graph Showing an Exothermic Reaction

In thermochemistry, the term “[enthalpy](#)” is often used. It is a thermodynamic quantity equivalent to the total heat content of a system. The enthalpy ( $\Delta H$ ) is equal to the [internal energy](#) of the system plus the product of pressure (P) and volume (V).

$$\Delta H = U + PV$$

Using the enthalpies of different chemical species, the heat of reaction and many other parameters can be determined. The heat of reaction is the change in enthalpy. That is given by the difference between the enthalpy of [products](#) and enthalpy of [reactants](#).

$$\Delta H = \Delta H (\text{products}) - \Delta H(\text{reactants})$$

## What is Thermodynamics?

Thermodynamics is the branch of physical science that deals with the relations between heat and other forms of energy such as mechanical, electrical, or chemical energy. It explains the relationship between all energy forms. The main idea of thermodynamics is the association of heat with work done by or on a system. There are several important terms in thermodynamics.

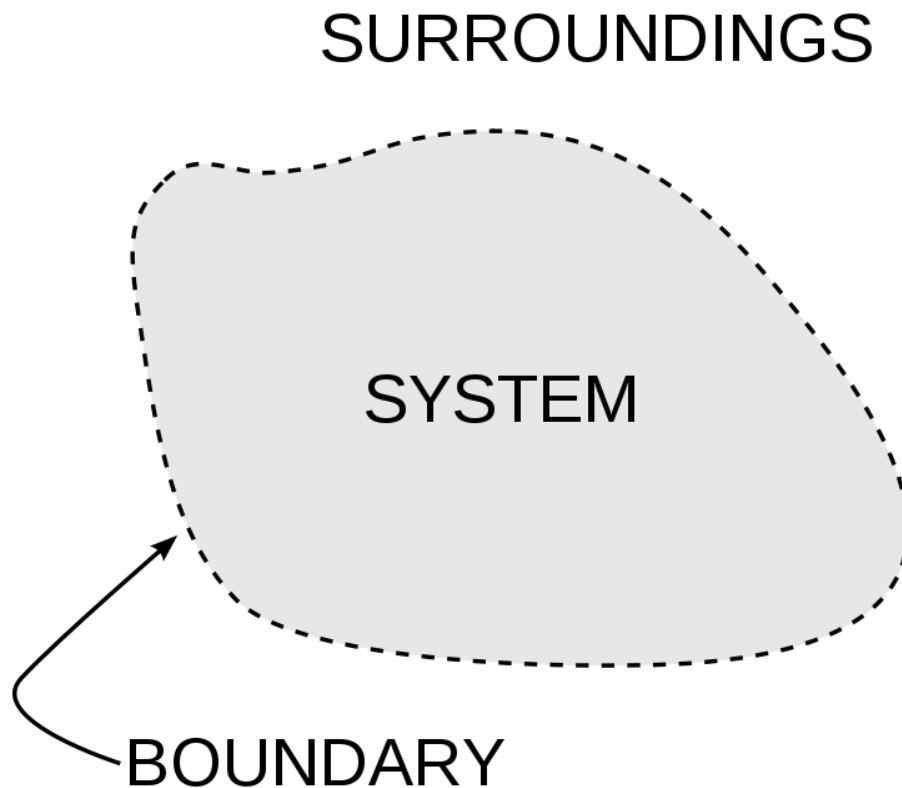


Figure 02: A Thermodynamic System

**Enthalpy** – the total energy content of a thermodynamic system.

**Entropy** – a thermodynamic expression explaining the inability of a thermodynamic system to convert its thermal energy into mechanical energy

**Thermodynamic state** – the state of a system at a given temperature

**Thermodynamic equilibrium** – the state of a thermodynamic system being in equilibrium with one or more other thermodynamic systems

**Work** – the amount of energy that is transferred to the surrounding from a thermodynamic system.

**Internal energy** – the total energy of a thermodynamic system that is caused by the motion of molecules or atoms in that system.

Thermodynamics includes a set of laws.

- **Zeroth Law of Thermodynamics** – When two thermodynamic systems are in thermal equilibrium with a third thermodynamic system, all three systems are in thermal equilibrium with each other.
- **First Law of Thermodynamics** – The internal energy of a system is the difference between energy it absorbs from surrounding and the work done by the system on the surrounding.
- **Second Law of Thermodynamics** – Heat cannot flow from a colder location to a hotter area spontaneously.
- **Third Law of Thermodynamics** – As a system approach absolute zero, all processes cease and the entropy of the system becomes minimum.

## What is the Relationship Between Thermochemistry and Thermodynamics?

- Thermochemistry is a branch of thermodynamics.

## What is the Difference Between Thermochemistry and Thermodynamics?

Thermochemistry vs Thermodynamics	
Thermochemistry is the study and measurement of heat energy associated with chemical reactions.	Thermodynamics is the branch of physical science that deals with the relations between heat and other forms of energy.
Theory	
Thermochemistry describes the relationship between heat energy and chemical reactions.	Thermodynamics describes the relationship between all energy forms with heat energy.

## Summary – Thermochemistry vs Thermodynamics

Thermochemistry is a branch of thermodynamics. The key difference between thermochemistry and thermodynamics is that thermochemistry is the quantitative study of the relation between heat and chemical reactions whereas thermodynamics is the study of laws associated with the relation between heat and chemical reactions.

## Reference:

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2. Drake, Gordon W.F. "Thermodynamics." Encyclopædia Britannica, Encyclopædia Britannica, inc., 20 Oct. 2017, [Available here](#).
3. "Laws of thermodynamics." Wikipedia, Wikimedia Foundation, 17 Feb. 2018, [Available here](#).

## Image Courtesy:

1. "Exothermic Reaction" By Brazosport College – Own work ([CC BY-SA 3.0](#)) via [Commons Wikimedia](#)
2. "System boundary" By en:User:Wavesmikey, traced by User:Stannered – en:Image:System-boundary.jpg (Public Domain) via [Commons Wikimedia](#)

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