

# Enthalpy & Heat

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CHEMISTRY 161  
FALL 2019

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- If I push a helium balloon down, its natural tendency is to float. However, I use energy to hold the balloon down.
- If I roll a ball up a hill, its natural tendency is to roll back down. However, I use energy to keep it at the top of the hill.

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*Note: you may notice it gets difficult to define energy without using the word energy.*

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**ENDOTHERMIC:** energy goes *into* the system

$$q > 0$$

$q = \text{heat (or energy transfer)}$

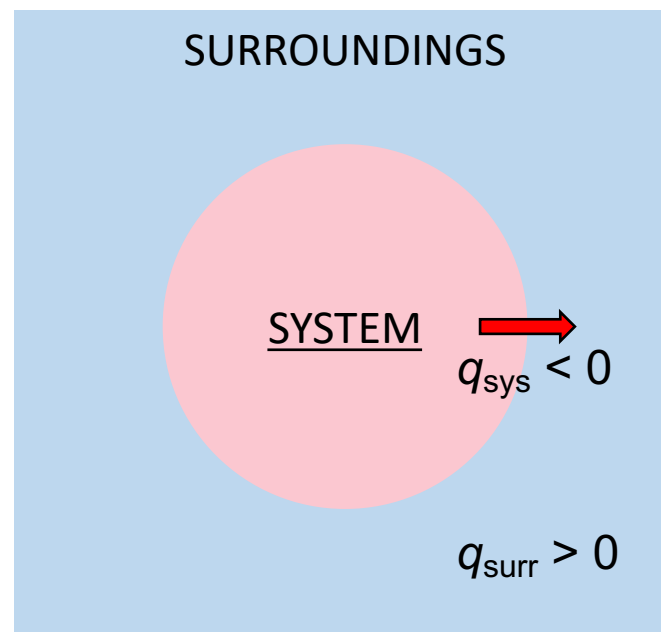
**EXOTHERMIC:** energy *leaves* the system

$$q < 0$$

# Conservation of Energy

Because of the law of conservation of energy (energy cannot be created or destroyed), any energy *lost* from the system is energy *gained* by the surroundings.  $q_{\text{surr}} = -q_{\text{sys}}$

Q1: Is this endothermic or exothermic relative to the system?

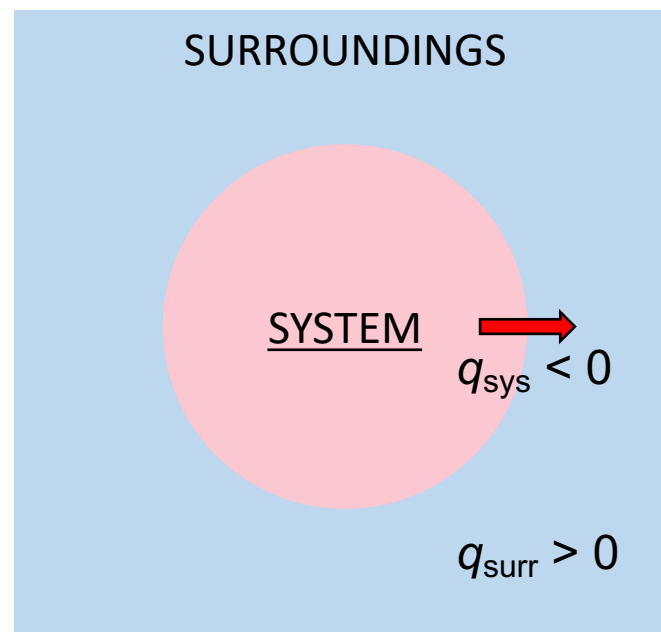


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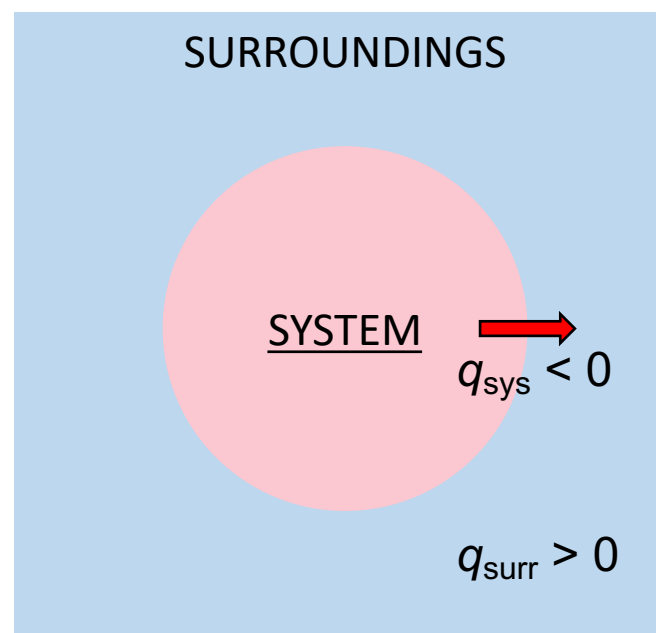
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Q2: Will the system be warmer or cooler than it was?



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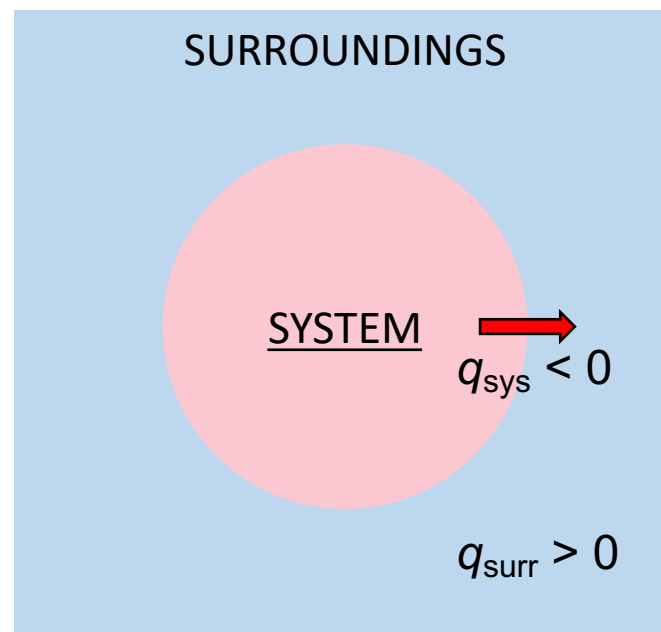
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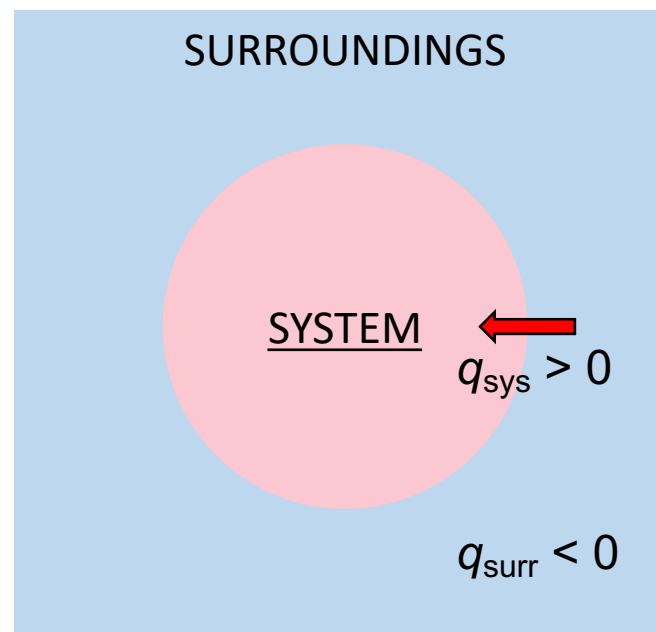
A2: Cooler, lost energy.



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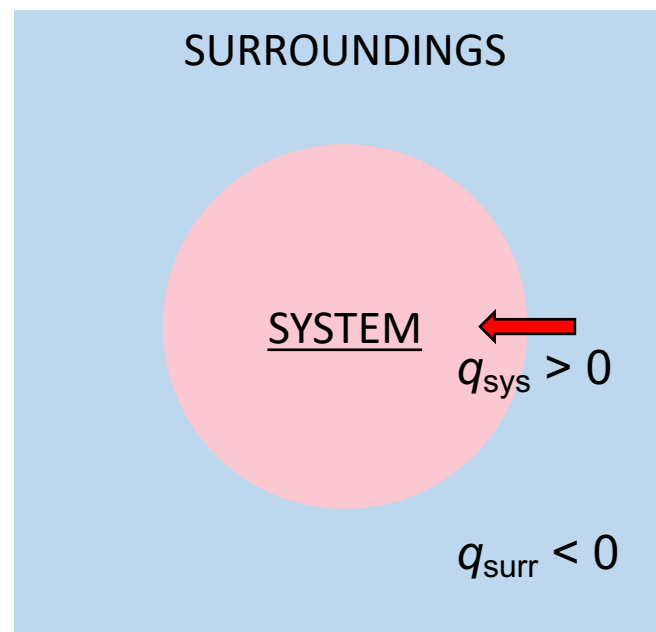
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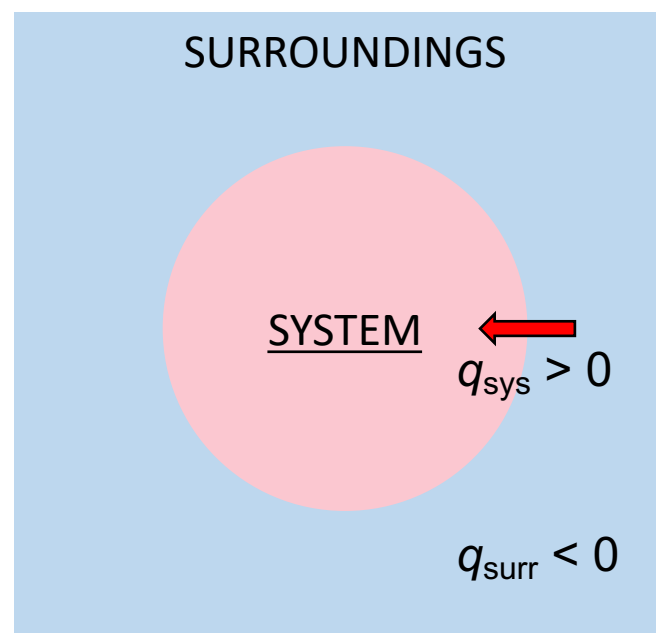
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Q1: Is this endothermic or exothermic relative to the system?

A1: Endothermic

Q2: Will the system be warmer or cooler than it was?

A2: Warmer