**CONCEPT:** LAWS OF THERMODYNAMICS

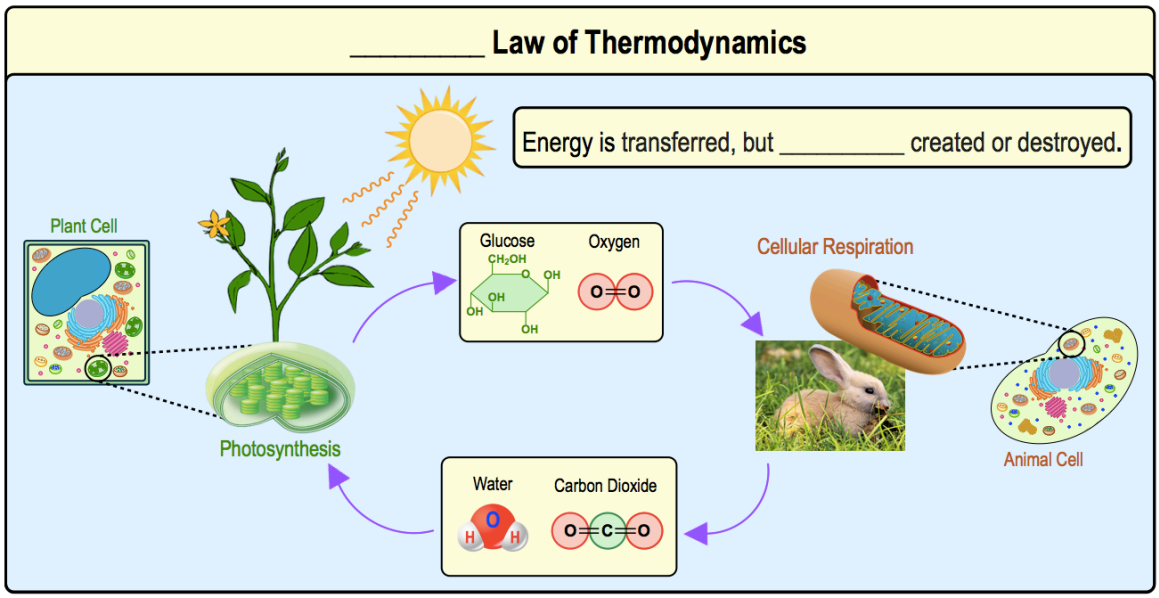
## First Law of Thermodynamics

●"Energy _____ be *transferred* and *transformed*, but it _____ be *created* or *destroyed*."

□ AKA: The Principle of _____ of Energy.

□ The TOTAL amount of *energy* in the universe does _____ change.

**EXAMPLE:** First Law of Thermodynamics.




**PRACTICE:** Which of the following statements describes the first law of thermodynamics?

a) Energy cannot be created or destroyed.

b) Energy cannot be transferred or transformed.

c) Also called The Principle of Creation of Energy.

d) Energy can be destroyed.

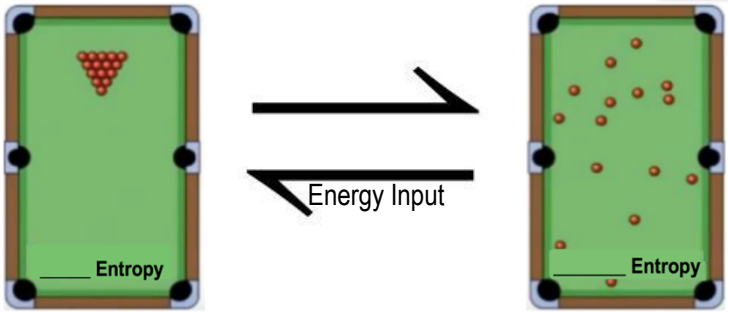
## Entropy

●A measure of _____, or randomness; the greater the disorder, the _____ the entropy.

●The "natural tendency" of reactions is to move the Universe toward a state of _____ entropy (disorder).

□ Reactions can decrease entropy of a system with an _____ *input*.

**EAMPLE:** Low vs High Entropy Systems.

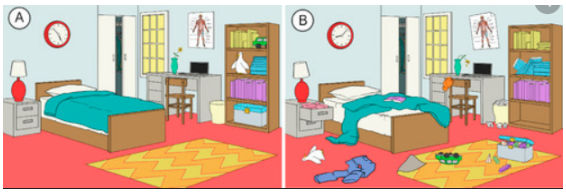


**CONCEPT:** LAWS OF THERMODYNAMICS

**PRACTICE:** Which of the following images has less entropy?

a) Image A has less entropy.

b) Image B has less entropy.

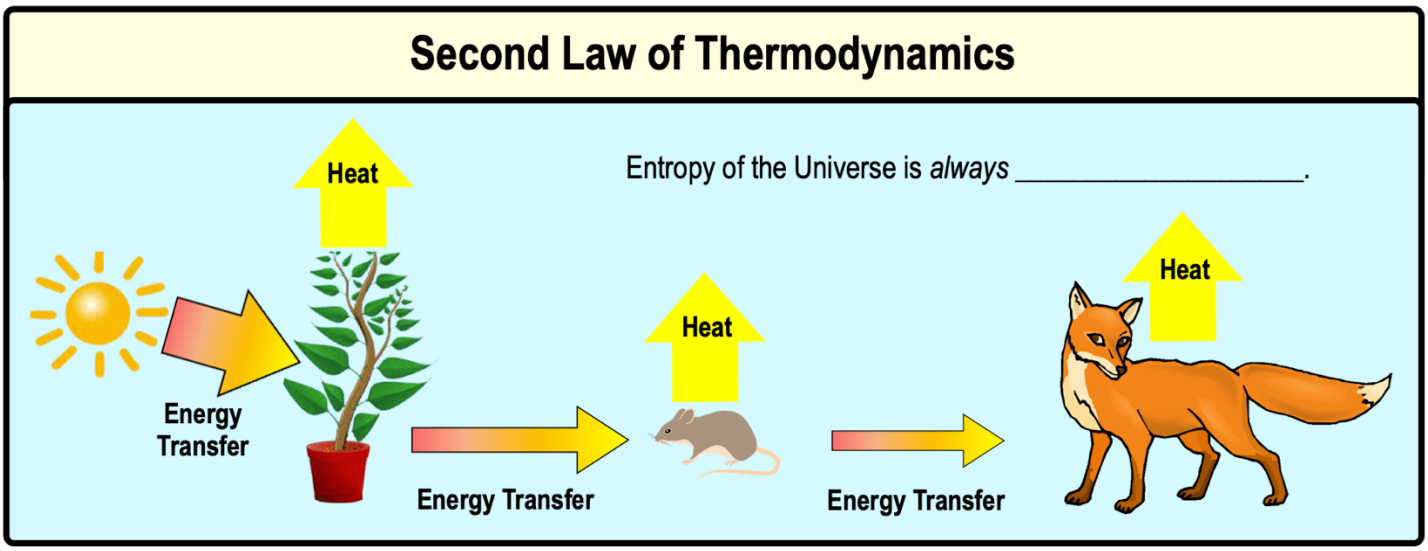



## Second Law of Thermodynamics

●2nd law: 100% efficient energy conversion is *impossible* since _____ energy is lost, increasing *universal entropy*.

□ **Heat**: form of _____ *energy* that is transferred between two objects with different *temperatures.*

**EXAMPLE:** Second Law of Thermodynamics.




**PRACTICE:** When chemical, transport, or mechanical work is done by an organism, what happens to the heat generated?

a) It is used to power yet more cellular work in the surroundings.

b) It is captured to store energy as more heat in the system.

c) It is used to generate ADP.

d) It is lost to the environment.

**PRACTICE:** Which of the following statements is true regarding how energy moves up the food chain?

a) All of the energy is not transferred from producer to consumer because some of the energy is destroyed.

b) All of the energy is transfer from producer to consumer.

c) All of the energy is not transferred from producer to consume because some of the energy is lost as heat.

d) None of the above.