

Energy, Heat and Work

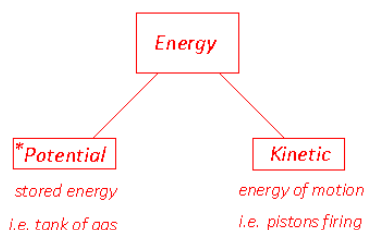
1. What is Energy?

The capacity to do work or produce heat.

2. What does the 1st Law of Thermodynamics State? What else is it known as?

This is also known as the Law of Conservation of Energy. This law states that energy isn't created or destroyed - It is transferred from one form to another.

3. What are the 2 primary types of energy? Give an example of each.



*Potential energy has 2 main interpretations.

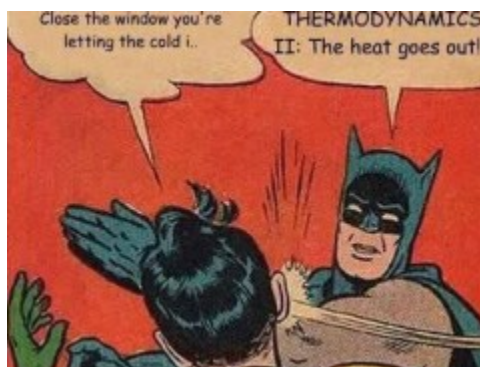
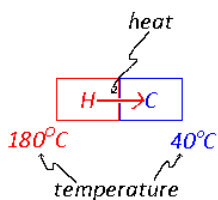
In physics potential energy is based on the position an object has in space. Think in terms of a ball raised high above the ground – before it is dropped it has a potential energy relative to its position relative to the ground.

In chemistry potential energy is the energy stored up in the bonds between atoms in a molecule.

4. What is heat? What is its symbol?

Energy transferred due to a temperature differential. Represented by “q”. It is important to understand the difference between heat and temperature. Temperature is a quantity that can be measured by a thermometer. Heat is, on the other hand, the energy that is transferred from a hot object to a cold object – ultimately, given enough time, bringing

the two bodies to the same temperature.

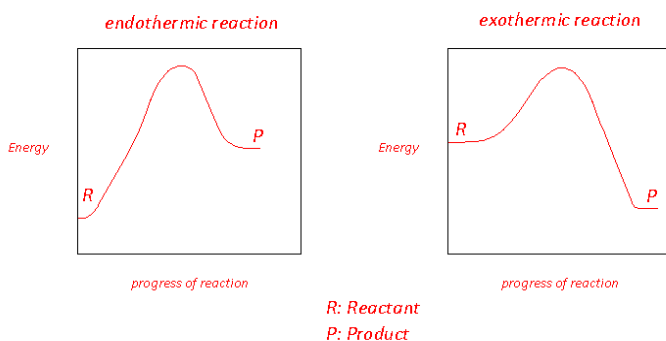


5. What does exothermicity indicate? Endothermicity? How does that relate to potential energy graphs?

An exothermic reaction is one in which heat energy is released by the reaction.

An endothermic reaction is one in which heat energy is absorbed in the process of the reaction.

Potential Energy Graph:



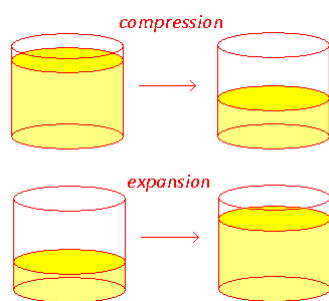
As can be seen by the graphs above, in an exothermic reaction the products potential energy is lower than the reactants. This means that energy was released in the process of the reaction. Whereas in an endothermic reaction the reactants are lower in energy, thus energy is absorbed by the reaction.

6. What is work? What is its symbol?

Force applied over a distance. Represented by “w”

7. What is PV work? What is the equation?

PV work is work done by (an expansion) or on (a compression) a gas.



The formula for PV-work is

$$w = -P\Delta V$$

P = Pressure of the atmosphere

ΔV = change in volume

This means that if there is no change in volume, then there is no work done.

8. Indicate the signs of heat and work from system’s perspective for the following:

- a. Exothermic: $-q$
- b. Endothermic: $+q$
- c. Compression: $+w$
- d. Expansion: $-w$