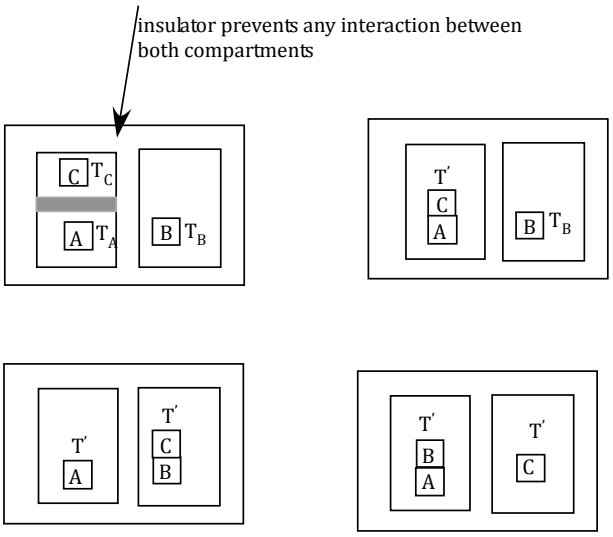
Zeroth Law of Thermodynamics

One of the most fundamental areas of physics is thermodynamics. Thermodynamics is the study of energy exchanges between different systems and has a vast number of applications in science and engineering.

We'll begin by introducing the Zeroth Law of Thermodynamics. It was introduced after the 1st and 2nd law had been already established and thus the name.

Consider 3 different objects enclosed in an insulating container as shown below:



1. Object C is brought into contact with object A until they both reach the same temperature T' and the properties of both objects are stable. When this occurs we say both objects are in Thermal Equilibrium.

   Two objects are in thermal Equlibrium if and only if they have the same temperature!

2. We now place object C in contact with object B and observe that both objects also come to thermal equilibrium at the same temperature T'.

If we now place object A and object B in contact, are they in thermal equilibrium??? YES!!!!

3. When object A and B are placed in contact experimentally we find that nothing happens! The properties of both objects remained unchanged.

Thus, we conclude:

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If objects A and B are separately in thermal equilibrium with a third object C, then A and B are in thermal equilibrium with each other (same temperature).