Heat
Thermal Energy

Thermal Energy content of an object is the total kinetic and potential energies of the particles in it that are associated with their random motions and locations. Thermal energy is NOT associated with the motion or location of the object itself.
Thermal energy and heat are not concepts that apply to individual atoms or molecules.

Heat is the amount of thermal energy transferred from one objet to another.

The word "object" is intentionally vague and could refer to anything from a black hole to a galaxy, to a star, the sun, the earth, an ocean, a marble or a drop of water.

Temperature is directly proportional to the average kinetic energy of the particles within an object. The constant of proportionality is a characteristic property of a particular material.

There are several temperature scales in common use and it is necessary to understand the relationships among them and to be able to convert from one temperature scale to another.

We are most concerned with three temperature scales: Fahrenheit, Celsius and Kelvin.
The Rankine scale is an absolute scale based on Fahrenheit.

The units for Fahrenheit are degrees Fahrenheit. The symbol is ºF.
The units for Celsius are degrees Celsius. The symbol is ºC.
The units for Kelvin are Kelvins. The symbol is K.
Note: Kelvins use neither the symbol for degrees (º) nor the word 'degrees'.

A Kelvin is exactly the same size as a degree Celsius. 1K = 1ºC.

The following formulas are for temperature conversions:

$$F = \frac{9}{5}C + 32$$

$$C = \frac{5}{9}(F - 32)$$

$$K = C + 273.16$$

$$C = K - 273.16$$

Specific Heat or Specific Heat Capacity (c) is a characteristic property of a material and is the amount of heat (in joules) required to raise the temperature of one kg of the material on Kelvin (K). The units are J/kg•K.
The symbol used for heat is *Q*. The symbol for Specific heat is *c*. The symbol for temperature is *T*. The formula for finding the heat added to or removed from an object is:

$$Q = cm\Delta T$$

When heat is transferred from one object to another, the amount gained by one is equal to the amount lost by the other.

$$c_a m_a \Delta T_a = c_b m_b \Delta T_b$$