

# Temperature

Temperature: is a *measure* of **hotness** or **coldness** of an object.

## Basic Temperature Scales

	Celsius	Kelvin	Fahrenheit	Rankine
Boiling	100 C	373 K	212 F	672 R
Freezing	0 C	273 K	32 F	492 R
Absolut Zero	-273 C	0 K	-460 F	0 R

## Converting equations

$T_C = \frac{5}{9}(T_F - 32)$	$T_K = T_C + 273$	$T_R = T_F + 460$	$T_F = \frac{9}{5}(T_C + 32)$
-------------------------------	-------------------	-------------------	-------------------------------

<b>Heat</b>	is a form of <i>internal kinetic</i> and <i>potential energy</i> contained in an object.		
	<i>transferred</i> from an object at a <i>higher temperature</i> to one at a <i>lower temperature</i> .		
	*Heat cannot be stored. Heat is a transformed energy.		
	<b>Units</b>	SI system = Joule (J ).	
		U.S. system = ft lb.	
	<b>Other Units</b>	SI system\Metric = kilocalorie (kcal) (Cal).	
U.S. system = Btu (British thermal unit).			
<b>Conversation factor</b>		$1 \text{ kcal} = 4190 \text{ J} \quad \dots \quad 1 \text{ cal} = 4.19 \text{ J}$	
		$1 \text{ Btu} = 778 \text{ ft lb}$	

<b>Specific Heat</b>	The specific heat of a substance is the amount of heat necessary to change the temperature of <b>1kg of its 1C (SI)</b> or <b>1 lb of it 1F (U.S.)</b>		
	SI system	$Q = cm\Delta T$	<i>c</i> = specific heat <i>Q</i> = heat <i>m</i> = mass <i>w</i> = weight $\Delta T$ = change in temperature
	U.S. system	$Q = cw\Delta T$	

# Density

**Density:** is a property of all three states of matter.

**Generally,** density increases with decreasing temperature.

**Exception** is water for which ice is less dense than liquid water

Mass Density	Weight Density
Is defined as mass per unit volume.	Is defined as weight per unit volume.
$D_m = \frac{m}{V}$  $D_m$ = mass density <i>m</i> = mass <i>V</i> = volume	$D_w = \frac{F_w}{V}$  $D_w$ = weight density $F_w$ = weight <i>V</i> = volume

## Change of Phase

is a change in a substance from one form of matter (solid, liquid, or gas) to another.

\* No temperature change during change of phase.

Fusion		Vaporization	
The change of phase from solid to liquid is called <b>melting or fusion</b> .		The change of phase from liquid to a gas or vapor is called <b>vaporization</b> .	
The change from liquid to solid is called <b>freezing or solidification</b> .		The reverse process is called <b>condensation (gas → liquid)</b> .	
<i>Heat of fusion <math>L_f</math></i>		<i>Heat of vaporization <math>L_v</math></i>	
SI system	U.S. system	SI system	U.S. system
$L_f = \frac{Q}{m}$	$L_f = \frac{Q}{w}$	$L_v = \frac{Q}{m}$	$L_v = \frac{Q}{w}$

## Elasticity

is a measure of a deformed object's ability to return to its original size and shape once the outside forces are removed. (like stretch and squeeze a rubber ball).

The Elastic Limit	Stress
is the point beyond which a deformed object cannot return to its original shape.	Is the ratio of the outside applied force, which tends to cause a distortion, to the area over which the force acts.
<b>Stress basic types: -</b> <ol style="list-style-type: none"> <li>1. Tension</li> <li>2. Compression</li> <li>3. Shear</li> <li>4. Torsion</li> <li>5. Bending</li> </ol>	$S = \frac{F}{A}$ <p><math>S</math> = stress, usually in <math>\text{N/m}^2</math> (Pa) or <math>\text{lb/in}^2</math> (psi)  <math>F</math> = force applied, N or lb, perpendicular to the surface to which it is applied  <math>A</math> = area, <math>\text{m}^2</math> or <math>\text{in}^2</math></p>
<b>Strain</b>	Stress cause strain. (Strain is unit less). <b>Strain</b> is the deformation of an object due to an applied force. $\text{Strain} = \frac{\text{Change (lengh. volum. area)}}{\text{Original (lengh. volum. area)}}$
<b>Hook's Law</b>	$k = \frac{F}{\Delta l}$ <p><math>\Delta l</math> = change in length  <math>\Delta</math> (the Greek letter delta) = "change in."      <math>F</math> = applied force  <math>k</math> = elastic constant</p>