

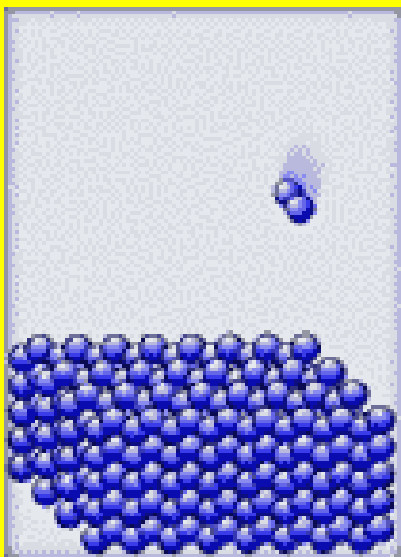
Unit I Heat and Thermodynamics

Kinetic Theory of Matter

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The kinetic theory and the physical states of matter:



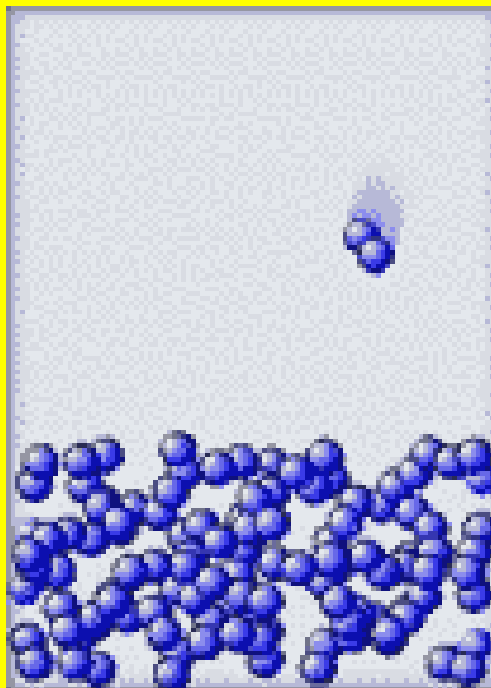
Solid

- particles have a low kinetic energy
- particles are held close
- vibrate around a fixed point

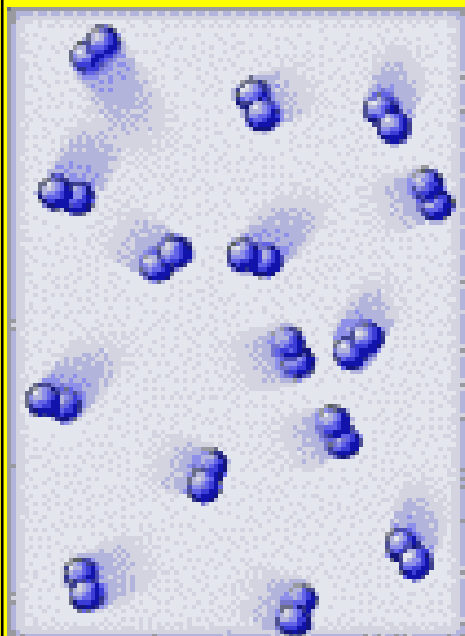
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Liquid

- particles have enough kinetic energy to spread out
- collisions move particles around



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Gas

- Kinetic energy can break all forces of attraction
- particles move independently of each other

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Thermal Energy, Temperature & Heat

They are not the same thing

Thermal Energy (E_{Th})

$$\begin{array}{l} \text{Total Energy} = \\ \text{Thermal Energy} \\ (E_{Th}) \end{array} = \left\{ \begin{array}{l} \text{\# of particles} \\ \times \\ \text{kinetic energy} \\ (E_K) \end{array} \right\} \left\{ \begin{array}{l} \text{Mug with steam and particles} \end{array} \right\}$$

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Does an Ice cube have thermal energy?



- particles
- kinetic energy

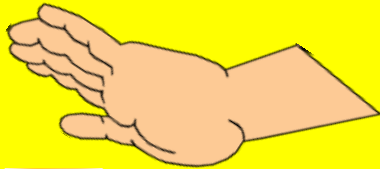
E_{Th}

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Heat (Q)

Can you feel the energy?

What you feel is the movement of energy



Heat is the transfer of thermal energy



$$Q = \Delta E_{Th}$$

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Temperature (T)

a measure of the average kinetic energy of the particles of matter

Particles with more Energy give it away and temperature reads higher.

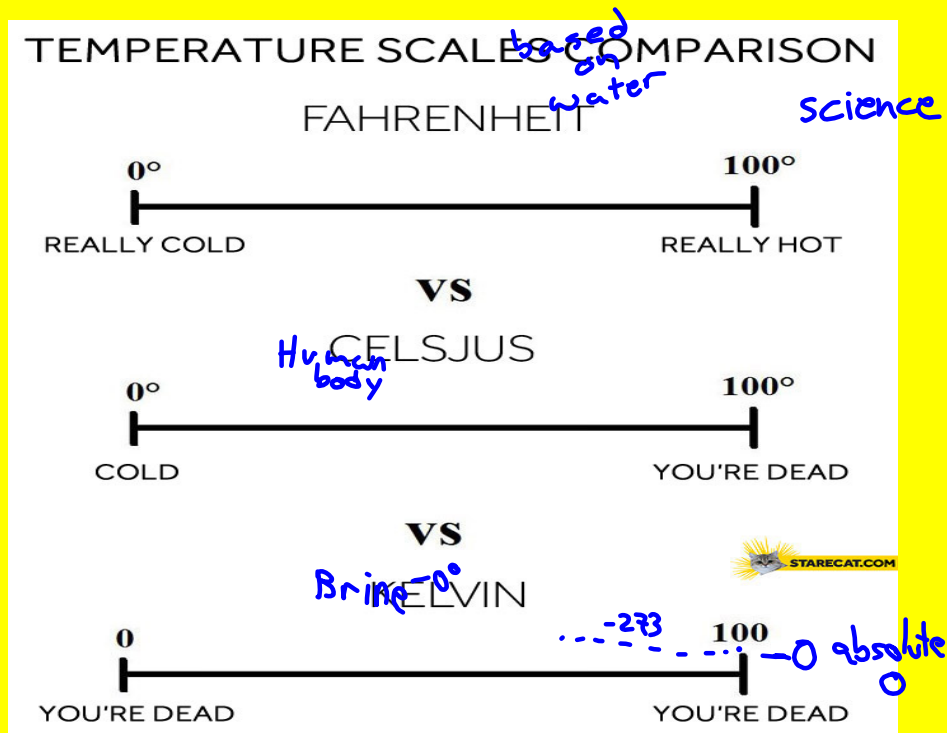
Particles with less Energy take some and the temperature reads lower.



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Measuring Temperature

Scales



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Converting Temperature

$$^{\circ}\text{C} = (^{\circ}\text{F} - 32) \times \frac{5}{9}$$

What is 0 F $^{\circ}\text{C} = (0 - 32) \frac{5}{9} = -18^{\circ}\text{C}$

$$^{\circ}\text{F} = ^{\circ}\text{C} \times \frac{9}{5} + 32$$

What is 45 C $^{\circ}\text{F} = 45 \times \frac{9}{5} + 32 = 113^{\circ}\text{F}$

$$\text{K} = ^{\circ}\text{C} + 273$$

What is 45 C $\text{K} = 45 + 273 = 318 \text{ K}$

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