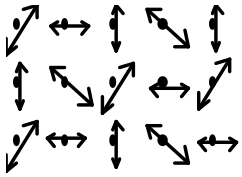
Heat - is a form of **energy** and is measured in *Joules (J)*. **Whereas……..**

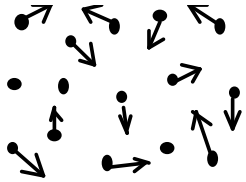
Temperature is a measure of the **average K.E**. of the molecules and is measured in °C (k).



Solid: Zero Kelvin (OK) atoms are stationary
In a solid, particles are held next to each other in fixed positions. With temperature, they vibrate about their fixed positions. A solid will keep it's *shape*.

On heating, molecules - vibrate more - move slightly further apart (< 1%) and gain K.E.

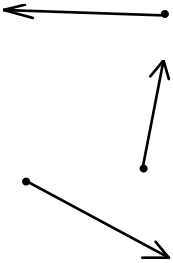
Melting: **solid to liquid -** Molecules gain P.E. (temperature constant) *now free* to move.



Liquid. The particles are in contact with each other, but are *free to move*, so a liquid can *flow* and takes the *shape of it's container*.

On heating molecules - move faster - move further apart (5%) and gain K.E.

Boiling: **liquid to gas** Molecules gain P.E. (temperature constant move x10 further apart).



Gas. The molecules are much further apart and move much faster and in random directions. The density of a gas is much less than for a solid or liquid (1000 x's less!)

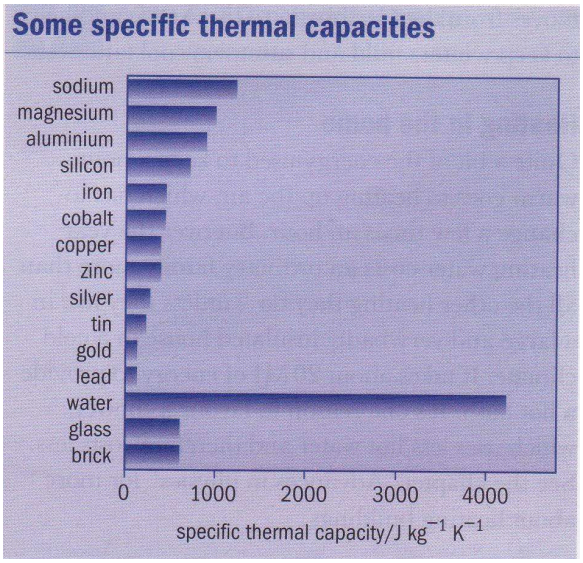
On heating molecules - move much faster only

	Similarities	Differences
Solids and liquids	Molecules are close together; State is incompressible	S - fixed positions L - free to move.
Liquids and gases	Molecules are free to move, flow	L – close together, shape of container G – further apart, fill any space
Solids and gases	none	S – close, not free to move, definite shape G – further apart, fill any space, no shape.

Heat always travels from hot areas to cooler areas. If you were to heat a material from it's solid state to liquid and then to a gas, then that material would have the least energy in the solid state, more energy in the liquid state and most energy in the gaseous state.

The temperature rise for a substance, on being heated, depends on:

1. The amount of energy supplied to it.
2. The MASS of the substance.
3. What the substance is made up of.



Specific Heat capacity – of a substance is the energy required to raise the temperature of 1kg of the substance by 1°C.

Water has an shc of 4200 J/Kg/ °C – This means that to raise **1 kg** of water by a temperature of **1°C**, then **4200J** of energy are required.

Water has a very large shc – compare it to other materials shown in the table.

Question if 50 000J of energy are supplied to 1Kg of water and then 1Kg of Iron, which will show the greater temperature rise?

……

……

Equation for shc:

Energy supplied = Mass x shc x temperature change

E = m x c x $\Delta\theta$

Example – What is the energy required to heat 2Kg of Oil (c= 2100 J/kg/ °C) by 15 °C?

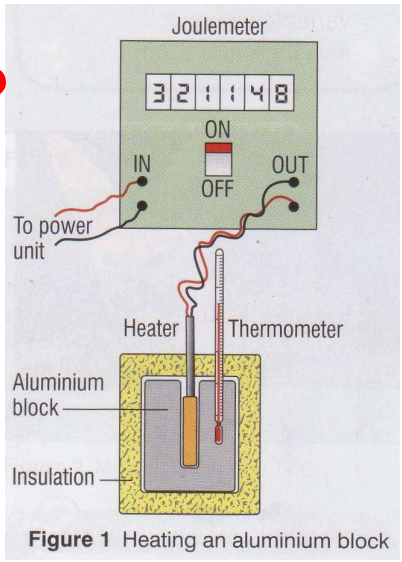


Figure 1 Heating an aluminium block

Example 2 – 1Kg of an aluminum block is supplied with 7200J. If the initial temp = 14 °C, and the final temperature is 22 °C, calculate the shc for aluminum.

(Further space for calculations can be found at the bottom of page 14)

Some shc values:	water	oil	aluminum	iron	copper	lead	concrete
Unit: J/Kg/ °C:	4200	2100	900	390	490	130	850

Storage heaters:

They are made of concrete blocks which are heated up at night – using cheap rate electricity – and they then they cool down slowly, heating up a room during the day. Their shc value is reasonably large – so they can store a lot of heat energy, and being an insulator, they give out heat *slowly* over a period of hours. The heat energy stored, is the same energy given out by it during the day (Summary q's page 39).