

o difference between energy and power?

- Power is the amount of energy per time unit that consumes

o convection: for liquid type objects

o conduction: for solid type objects

o radiation: doesn't matter for the type of the material it could be solid, liquid and ...

ways of transforming heating ↑

energy balance for walls:

$$\dot{Q}_{in} - \dot{Q}_{out} = \frac{dE_{wall}}{dt}$$

heating the wall

cooling the wall

$Q$ : energy (J)

$\dot{Q} = \frac{dQ}{dt}$  (J/s) → W

other definition of power

conductive material: how the material will transfer heating and it indicates with  $k$

water is high conductive and wood or plastic is low conductive



$$\frac{\Delta T}{\Delta x} \rightarrow \text{homo Assumption} \rightarrow \frac{dT}{dx}$$

$$\dot{Q}_{\text{cond, wall}} = -KA \frac{dT}{dx} \rightarrow -KA \frac{T_i - T_r}{L}$$

thermal comfort in winter :  $18 - 20^\circ$

Simplified conclusions of Fourier's law of heat conduction

$$\dot{Q} = KA \times \frac{\Delta T}{L}$$

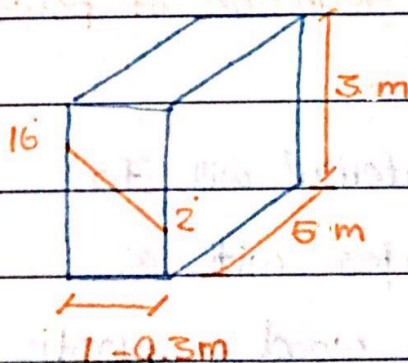
• heat transfer through a wall is proportional to its area.

• It is proportional to the difference of temperature and the conductivity of course 😊

the thicker the wall, the less heat goes through it

Temperature units :  $K = ^\circ C + 273,15$

$\Delta T$  : is not dependent on units, so no matter it is K or C, the difference is always same



$$\dot{Q} = KA \frac{\Delta T}{L} \rightarrow 0.9 \times 15 \times \frac{16 - 2}{0.3} = 630 \text{ W}$$

## Practice NO 1:

$$L : 0.4 \text{ m} \quad A : 20 \text{ m}^2 \quad \Delta T : 25 \text{ K} \quad K : 0.75 \text{ W/m}$$

$$Q = \frac{KA \Delta T}{L} \rightarrow \frac{0.75 \times 20 \times 25}{0.4} = 937.5 \text{ W}$$

$$R = \frac{L}{KA} \rightarrow R = \frac{0.4}{0.75 \times 20} = 0.0267 \text{ } ^\circ\text{C/W}$$

## natural convection:

when there is a warm obj in room, by movement of it, molecules warm air due to density moves

$$T_s \xrightarrow{Q} T_\infty$$

up and cold air comes down. Since warm air is lighter

inclusive  $\rightarrow$  resin

• Rate of convection heat transfer depends on

1. temperature difference
2. velocity of liquid or gas
3. kind of