(1)

$R'_{withWood}$: $0.03 + 0.14 + 0.11 + 0.63 + 0.079 + 0.12 = 1.109 \ m^2 \cdot {}^\circ\frac{C}{W}$

$R'_{withIns} = 0.03 + 0.14 + 0.11 + 3.528 + 0.079 + 0.12 = 4.007 \ m^2 \cdot {}^\circ\frac{C}{W}$

$$U_{withwood} = \frac{1}{R'_{wood}} = \frac{1}{1.109} = 0.9017 \ \frac{W}{m^2 {}^\circ C}$$

$$U_{ins} = \frac{1}{R'_{ins}} = \frac{1}{4.007} = 0.2495 \ \frac{W}{m^2 {}^\circ C}$$

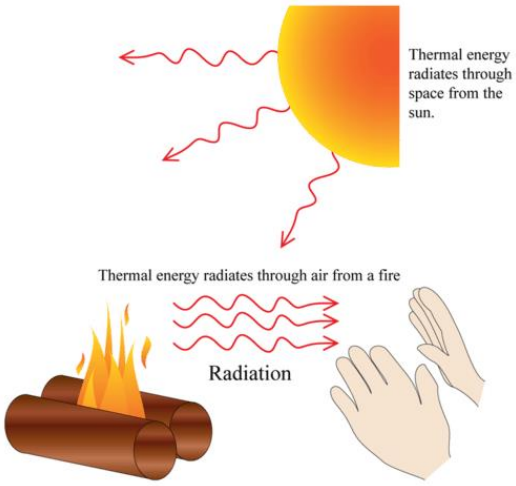
$$A_{wall} = 50 \times 2.5 \times 0.8 = 100 \ m^2$$

$$\Rightarrow U_{tot} = U_{wood} \times \frac{A_{wood}}{A_{tot}} + U_{ins} \times \frac{A_{ins}}{A_{tot}} = U_{wood} \times 0.25 + U_{ins} \times 0.75$$

$$= 0.901 \times 0.25 + 0.249 \times 0.75 = 0.412 \ \frac{W}{m^2 {}^\circ C}$$

$$\Delta T = 24 \ {}^\circ C$$

$$Q_{tot} = U_{tot} \times A_{tot} \times \Delta T = 988.8$$



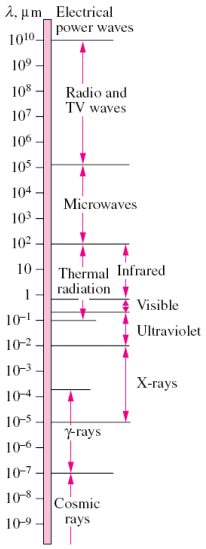
(2)

Radiation: Radiation is discharge or transmission of energy in the form of waves or particles which does not need materials to transfer the heat. The most common examples of radiation are heat and light. Moreover, electromagnetic waves do not require a medium to spread and travel through space. They include both visible and invisible waves.

Once the energy transported by electromagnetic waves contact with another medium it increases the temperature of medium because of increase in the movement of the particles of that medium.

$$\lambda = \frac{c}{\nu}$$

The wavelength is calculated as follows:

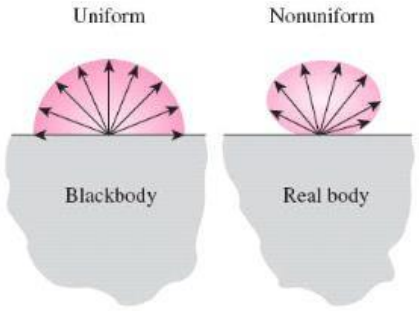


C is speed of light which is a constant amount equals roughly to 299792 km/s

ν is the wave frequency

Visible light, is an electromagnetic radiation with a wavelength ranging from 380 nm of violet to 760 nm of red

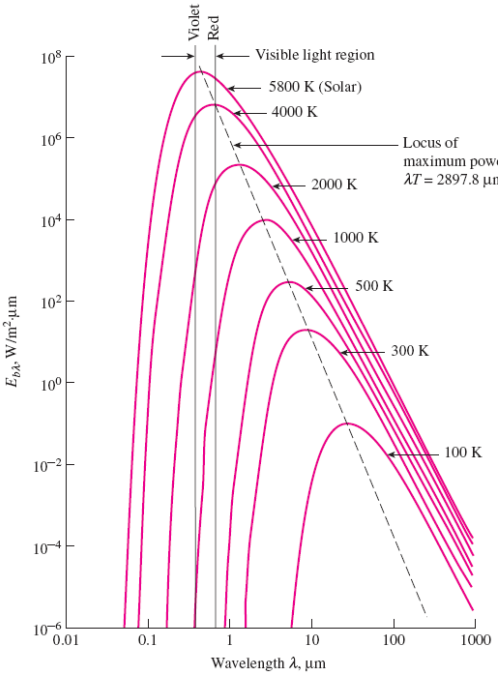
Blackbody is a surface that absorbs all radiant energy from any direction and also does not depend on wavelength.



Blackbody emissive power

$$E_b(T) = \sigma T^4 \qquad (\mathrm{W/m^2})$$

$$\sigma = 5.670 \times 10^{-8}\ \mathrm{W/m^2 \cdot K^4}$$



Wien's law formula:

-**Wien's law** is the relationship between the wavelength of maximum intensity a blackbody emits and its temperature in a way that.

- The emitted radiation increases with increasing of the temperature.

-A larger fraction of the radiation is emitted at shorter wavelength at higher temperatures.

- Maximum wavelength $\boldsymbol{\lambda_{max}}$**= b/T**

- Most of the visible wave are have low wavelength and at the same time high temperature

- The surfaces at T<800 k emit almost totally in the infrared region and hence are not visible to the human eye unless they reflect light coming from other sources.

- **The reason we can see the sun light is that** the radiation emitted by the sun reaches it's peak in the visible light region