Radiation Heat Transfer

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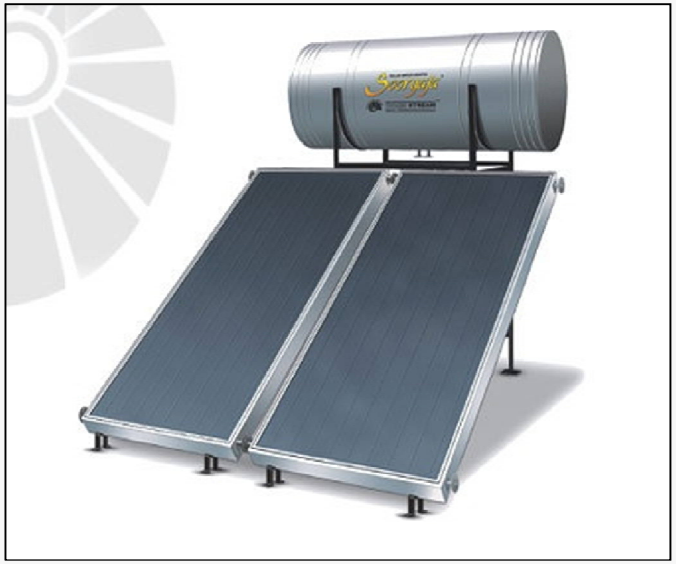
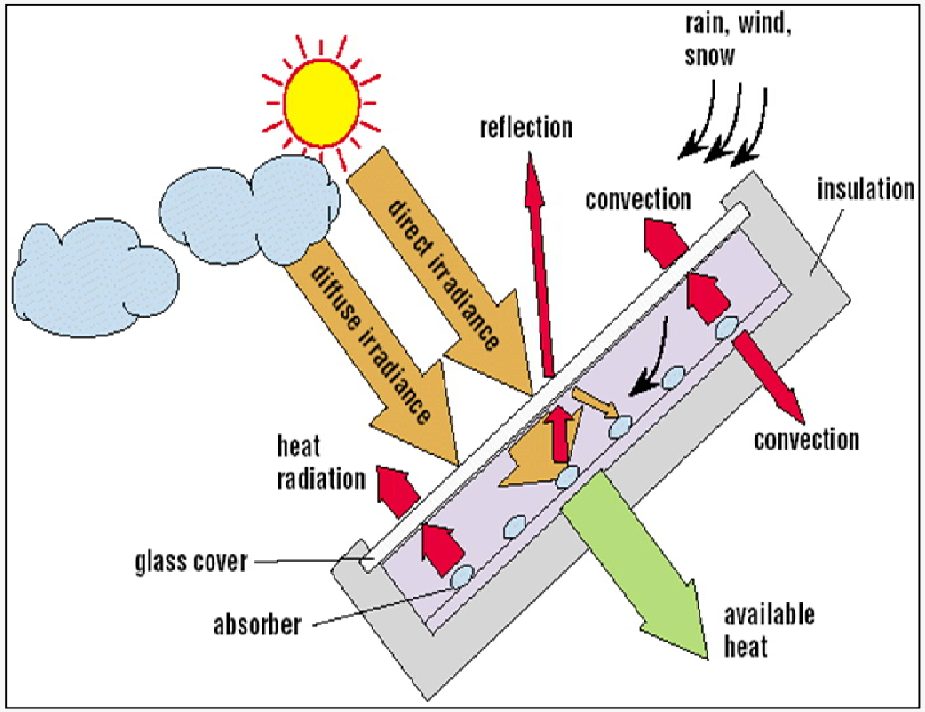
Course Objective

To explain various laws of radiation heat transfer and to determine the radiation heat transfer between black and grey surfaces of simple Mechanical systems

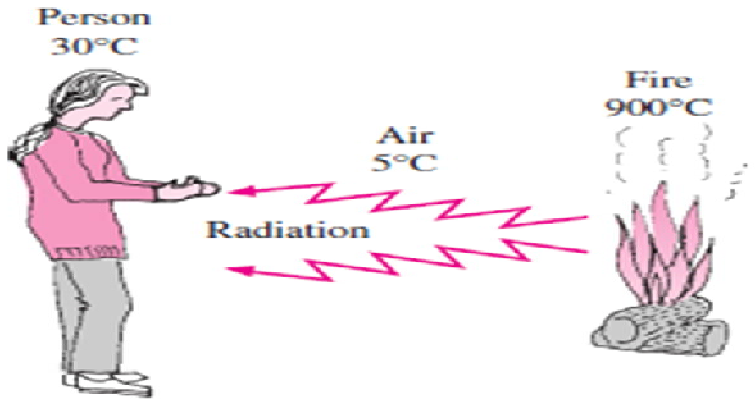
Contents…..

Flat Plate Solar Water Heater



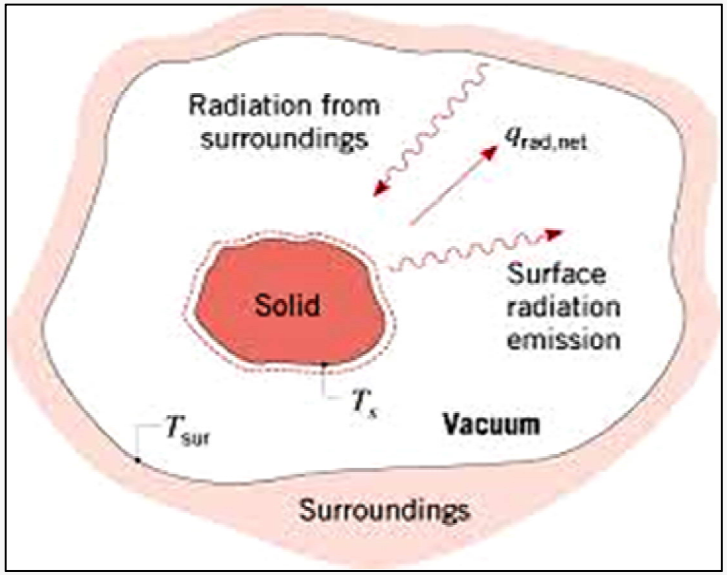


Concept...



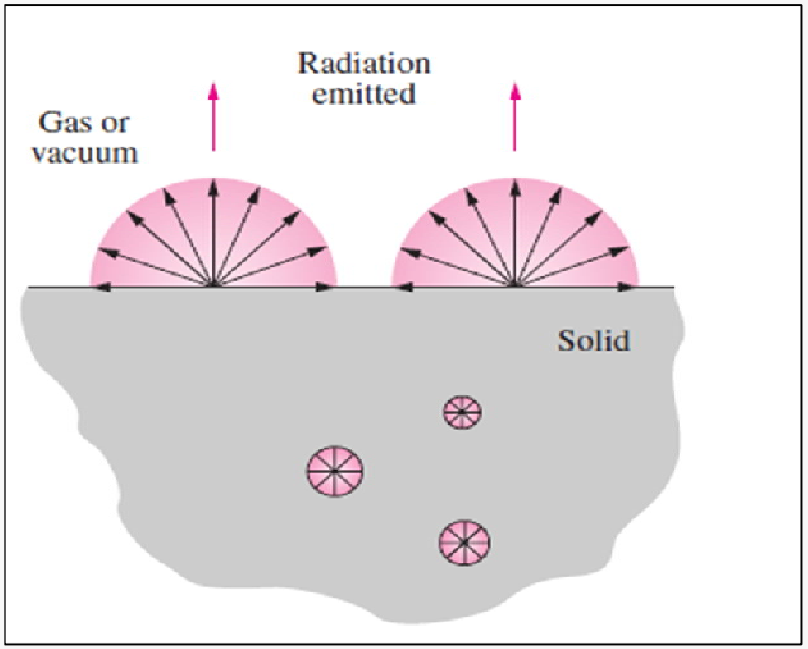
Unlike conduction and convection, heat transfer by radiation can occur between two bodies, even when they are separated by a medium colder than both of them.

Thermal Radiation

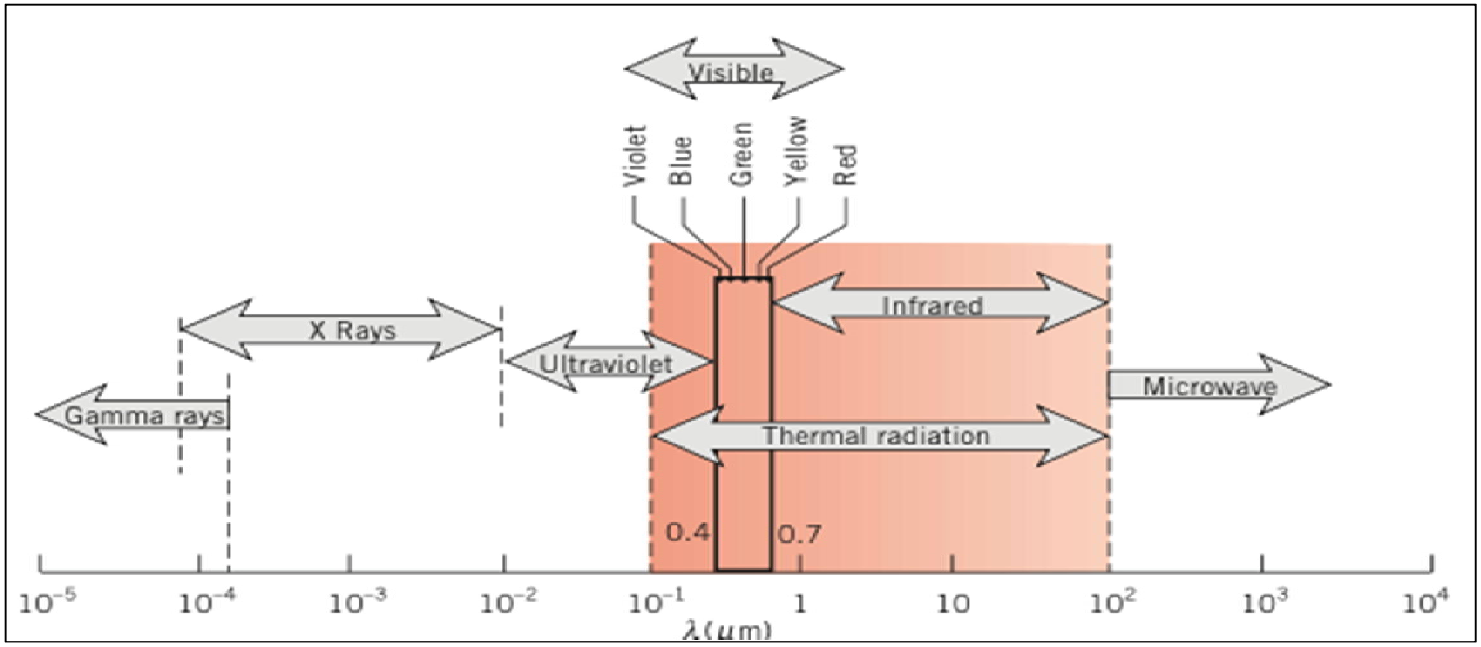


Any matter with temperature above absolute zero (0 K) emits electromagnetic radiation.

Surface and Volumetric Phenomenon

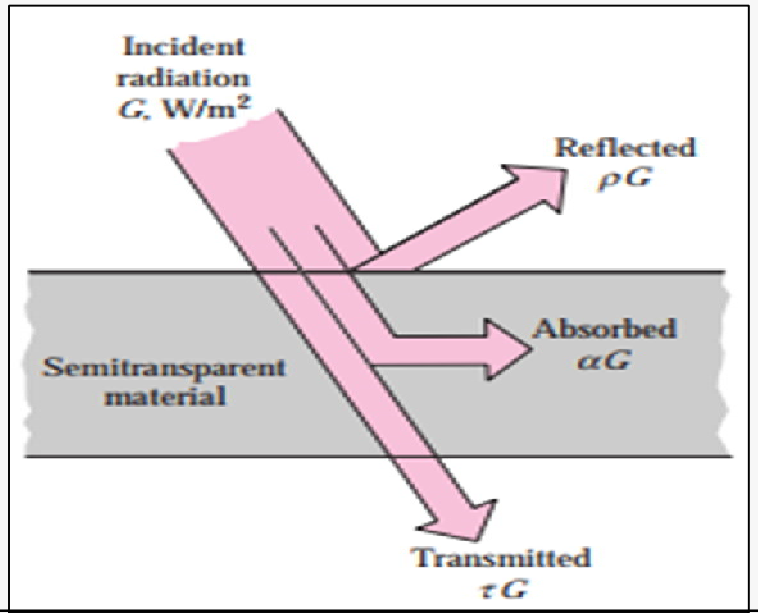


Spectrum of Electromagnetic Radiation



Irradiation Of Surface, *G*

Total Radiant energy received by per unit time per unit area from all directions at all wavelength. **"It is not a surface property……."**



$$\textit{Absorptivity:}\quad \alpha = \frac{\text{Absorbed radiation}}{\text{Incident radiation}} = \frac{G_{abs}}{G}, \qquad 0 \le \alpha \le 1$$

$$\textit{Reflectivity:}\quad \rho = \frac{\text{Reflected radiation}}{\text{Incident radiation}} = \frac{G_{ref}}{G}, \qquad 0 \le \rho \le 1$$

$$\textit{Transmissivity:}\quad \tau = \frac{\text{Transmitted radiation}}{\text{Incident radiation}} = \frac{G_{tr}}{G}, \qquad 0 \le \tau \le 1$$

$$\alpha + \rho + \tau = 1$$