

5.2 - Thermal Conduction

PJ Gibson - Peace Corps Tanzania

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- (1999) What is the coefficient of thermal conductivity of a material?
- (1999) The temperature difference between the inside and outside of a room is 25°C . The room has a window of an area 2 m^2 and the thickness of the window material is 2 mm. Calculate the heat flow through the window if the coefficient of thermal conductivity of the window material is 0.5 SI units.
- (2000) Define the thermal conductivity of a material
- (2000) Give one major similarity and one major difference between heat conduction and wave propagation.
- (2000) Deep bore holes into the earth show that the temperature increases about 1°C for each 30 m depth. How much heat flows out from the core of the earth each second for each square metre of surface area.
- (2007) Explain why in cold climates, windows of modern buildings are double glazed, ie: There are two pieces of glass with a small air space between them.
- (2010) A cylindrical element of 1 kW electric fire 1 s 30 cm long and 1.0 cm in diameter. If the temperature of the surroundings is 20°C , estimate the working temperature of the element.
- (2013) Compare the law governing the conduction of heat and electricity pointing out the corresponding quantities in each case.
- (2013) A Lagged copper rod is uniformly heated by a passage of an electric current. Show by considering a small section dx that the temperature θ varies with distance x along a rod in a way that, $k \frac{d^2\theta}{dx^2} = -H$, where k is a thermal conductivity and H is the rate of heat generation per unit volume.
- (2015) Define coefficient of thermal conductivity.
- (2015) Write down two characteristics of a perfectly lagged bar.
- (2015) A thin copper wall of a hot water tank having a total surface area of 5.0 m^2 contains 0.8 cm^3 of water at 350 K and is lagged with a 50 mm thick layer of a material of thermal conductivity $4.0 \times 10^{-2} \text{ W/mK}$. If the thickness of copper wall is neglected and the temperature of the outside surface is 290 K ,
 - Calculate the electrical power supplied to an immersion heater.

- If the heater were switched off, how long would it take for the temperature of hot water to fall by 1 K?
- (2016) Identify two factors on which the coefficient of thermal conductivity of a material depend.
- (2016) A brass boiler of base area 1.50×10^{-1} and thickness 1.0 cm boils water at a rate of 6.0 kg/min when placed on a gas Stove. Estimate the temperature of the part of the flame in contact with the boiler.
- (2019) A closed metal vessel containing water at 75°C , has a surface area of 0.5 m^2 and uniform thickness of 4.0 mm. If its outside temperature is 15°C , calculate the head loss per minute by conduction.