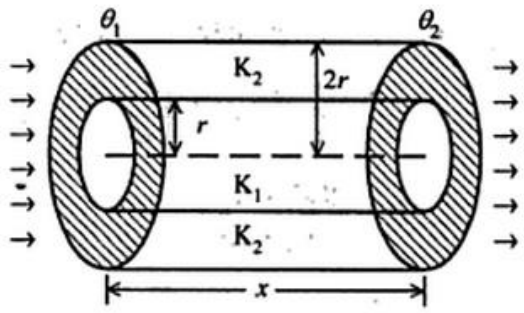
**Answer on Question #50847-Physics-Molecular-Physics-Thermodynamics**

A cylinder of radius r and of thermal conductivity $K_1$ is surrounded by a cylindrical shell of inner radius r and outer radius 2r made of a material of thermal conductivity $K_2$. The effective thermal conductivity of the system is?

**Solution**




Since two cylinders are in parallel, the equivalent termal resistance $R$ of the combination is given by

$$\frac{1}{R}=\frac{1}{R_1}+\frac{1}{R_2}$$

or

$$\frac{KA}{x}=\frac{K_1A_1}{x_1}+\frac{K_2A_2}{x_2}.$$

Here $A=\pi(2r)^2=4\pi r^2$, $A_1=\pi r^2$ and $A=\pi((2r)^2-r^2)=3\pi r^2$ and $x=x_1=x_2$.

Substituting these values in our equation, we get

$$4K=K_1+3K_2, or\ K=\frac{K_1+3K_2}{4}.$$

**Answer:** $\frac{K_1+3K_2}{4}$.