5. Two spherical stars A and B emit blackbody radiation. The radius of A is 400 times that of B and A emits 10^4 times the power emitted from B. The ratio $\left(\frac{\lambda_A}{\lambda_B}\right)$ of their wavelengths λ_A and λ_B at which the peaks occur in their respective radiation curves is

Answer: We know that in black body Power emitted $P = \sigma A T^4$

Therefore $\frac{P_A}{P_B} = \frac{\sigma T_A^4 A_A}{\sigma T_B^4 A_B}$

$$or\ \frac{10^4 P_B}{P_B} = \frac{\sigma T_A^4 (R_A)^2}{\sigma T_B^4 (R_B)^2}$$

$$or\ 10^4 = \frac{T_A^4 (400R_B)^2}{T_B^4 (R_B)^2}$$

$$or\ \frac{T_A^4}{T_B^4} = \frac{10^4}{(400)^2}$$

$$or\ \frac{T_A}{T_B} = 2 \rightarrow (1)$$

We know by Wein's displacement law: $\lambda_A T_A = \lambda_B T_B$

Therefore $\left(\frac{\lambda_A}{\lambda_B}\right) = \frac{T_A}{T_B} = 2$

Answer: 2