Heat Transfer Questions & Answers

Question by Student 201327132

Dear, professor. I have a question for calculate temperature unit. How to calculate

$$\frac{K}{°C}$$

I confuse that relation.

I don't understand what you mean. Please explain better.

Question by Student 201327132

Dear Professor. Sorry to my poor explanation. I have no idea how to calculate in assignment 4, question 5, Biot number.

$$\frac{hR}{3k} = \frac{3[W/m^2K] \times 0.0245[m]}{0.147[W/m°C] \times 3} = 0.167[\frac{K}{°C}]$$

So I don't understand that relationship.

$$0.167[\frac{-272°C}{°C}] or [\frac{K}{274K}]$$

Which one is correct? I can't find any solution this relationship. Thank you.

In this case, the Kelvin degrees used for h can be written as Celcius degrees because convection heat transfer is function of temperature difference only and a difference in Kelvin is exactly the same as a difference in Celcius degrees.

Question by Student 201427115

Professor, I have a question about finding thermal Diffusivity. In table of Properties, I can find α directly. But when I use $\alpha = \frac{k}{\rho c}$ I get different answer. Which one should I use?

If you use k, ρ or c elsewhere in your problem, then to be consistent you should compute $\alpha = k/\rho c$ and not take it from the tables.

Question by Student 201327132

Dear professor. I wonder about insulated cable design problem(inner radius as small as possible). At previous assignments, we directly use $P_{elect} = S_{gen}$. But this example, Even though we know P_{elect}, we calculate

$S_{gen} = R_{elect} \times (\frac{P_{elect}}{V}^2 \times L/2\pi r_i^2)$. *I don't know difference of two relations. Thank you.*

Hm I think I explained this in class. I am not sure what you don't understand. Tell us what exactly is confusing you..

Question by Student 201427115

Professor, I have a question about insulation. At the surface insulated, heat transfer is zero. But in assignment 1 problem #1, even the wall has insulation layer, it has heat transfer inside the insulation part. What's the difference between two? Thank you.

If an insulation layer is specified without a thermal conductivity, then assume its conductivity is zero (and hence there is no conduction heat transfer). If the insulation layer has a given thermal conductivity, then the heat transfer through the insulation layer will not be zero. 1 point bonus.

Question by Student 201327132

Dear Professor. Today, We learned about Thermal layer. I have a question

$$\frac{\mu}{\rho c}(\frac{\partial u}{\partial y})^2 = \frac{\mu}{\rho c}\frac{(u_\infty - 0)^2}{\delta_t^2}$$

I think that we can't use $(u_\infty - 0)$. Because Boundary layer is longer than Thermal layer. So If we use δ, $(u_\infty - 0)$ is reasonable. But, If we use δ_t, The velocity at the point have some difference with u_∞. Is it because assume very small difference? Thank you.

Here we were doing an order of magnitude analysis. As long as δ and δ_t are within the same order of magnitude (and as will be shown later, they are), the analysis is correct. 1 point bonus.