A)<u>The convective heat transfer</u>:

It is the process of the transfer of moving fluids through a surface, it is a heat transfer between a solid and a moving fluid

this is a combination of diffusion and bulk motion of molecules. Near the surface the fluid velocity is low, and diffusion dominates. At distance from the surface, bulk motion increases the influence and dominates.

To calculate the heat transfer:

$q = h_c A dT$

where

q = heat transferred per unit time (W, Btu/hr)

A = heat transfer area of the surface (m^2, ft^2)

h_c = convective heat transfer coefficient of the process ($W/(m^2{}^oC$, $Btu/(ft^2\ h\ {}^oF))$)

dT = temperature difference between the surface and the bulk fluid (^oC, F)

<u>B)Increasing the thickness of a single pane glass doesn't increase the total resisance?</u>

the glass resistance is much smaller than the convention between the air and glass resistance, so when the thickness of glass increases, its resistance sightly increases but it doesn't increase the total thermal resistance with a big difference.

C) **Consider a 0.8-m-high and 1.5-m-wide double-pane window consisting of two 6-mm-thick layers of glass(k=0.78 W/m°CC) separated by a 13-mm-wide stagnant air space(k=0.026 W/m°CC). Determine the steady rate of heat transfer through this double-pane window and the temperature of its inner surface.(Take the convection heat transfer coefficients on the inner and outer surfaces of the window to be h1 = 10 WW $mm2$°CC and h2 = 40 WW $mm2$°CC , which includes the effects of radiation.)**

Answer:

Rtotal=Rconv1+Rglass1+Rair+Rconv2+Rglass2

=0.0833+0.0064+0.4167+0.0208+0.064

=0.53 C/W

The steady rate of heat transfer through double-pane window:

$$\dot{Q} = \frac{T_{\infty 1} - T_{\infty 2}}{R_{total}}$$ =20-(-10)/0.53=56.25 W

The temperature difference:

$T1=T_{infinity1}-Q*R_{conv1}$=20-(56.25*0.0833)=15.3 C