1) Convection heat transfer is the movement of heat in fluids with a change in their temperature. Convective heat transfer occurs when the surface temperature differs from that of surrounding fluid.

   When molecules are heated in a fluid, the molecules with a higher temperature expand and they occupy the resulting heated space which is less dense compared to the cooler spaces. The heated, less dense fluid rises to replace the denser, cooler fluid which sinks into the warmer areas. The repeated rising and falling of warming and cooling fluids or gas results into the convection heat transfer.
   The convective heat transfer is dependent upon the physical properties of the fluid and the physical situation. In addition some variables such as the surface geometry, the nature of fluid motion, the properties of the fluid, and the fluid velocity influence convection.

   Increasing the thickness of a single pane glass doesn't increase the resistance because glass as a material has a low thermal conductivity which is not affected by the thickness of glass resulting into a very minimal significance on its resistance.

1) Unfortunately I can't answer this question because I missed this class because I was working on my residence permit papers. I humbly apologise for this.

3) $A = \ 0.8 * 1.5 = 1.2\text{m2}$

	L_{glass} = 6mm K_{glass} = 0.78W/m ^{0}C L_{airgap} = 13mm k_{airgap}= 0.026W/m 0C

$$R_{g_1} = R_{g_2} = \frac{L_g}{\left(K_g \times A\right)} = \frac{0.006\text{m}}{0.78 * 1.2} = 0.0064\,{}^{\circ}\frac{C}{W}$$

$$R_{airGap} \ = \frac{L_{airGap}}{\left(K_{airGap} \times A\right)} = \frac{0.013}{0.026 * 1.2} = 0.417 \ {}^{\circ}C/W$$

$$R_{conv_1} \ = \frac{1}{h_1 \times A} = \frac{1}{(10 * 1.2)} = 0.0833\,{}^{\circ}C/W$$

$$R_{conv_2} \ = \frac{1}{h_2 \times A} = \frac{1}{(40 * 1.2)} = 0.0208\,{}^{\circ}\frac{C}{W}$$

$$R_{tot} \ = \ R_{conv_1} + R_{conv_2} \ + 2 \times R_g + R_{airGap}$$

$$= 0.0833 + 0.0208 + (2 * 0.0064) + 0.417 = 0.534\ \text{C/W}$$

$$\dot{Q} = \ \frac{\Delta T}{R_{Tot}} = \frac{30}{0.534} = 56.18\,W$$

$$\dot{Q} = \frac{T_{inff_1} - T_{s_1}}{R_{conv_1}} = \rightarrow 56.18 = \frac{20 - T_{s_1}}{0.0833}$$

T_{s1}= 15.32 ^{0}C

We have optimal range when the thickness of the airgap is 13mm because the resistance to heat transfer is at its highest point and at this point convection can take place. However, decreasing or increasing the air gap thickness results into a low resistance to heat transfer thus no convective heat transfer can take place.