Potência emitida pelo Sol:

$$P_S = \sigma T_S^4 \, 4\pi R_S^2$$

Potência por unidade de área à superfície da Terra:

$$u_1 = \frac{P_S}{4\pi d_{TS}^2}$$

Potência recebida pela Terra: $P_{in} = u_1 \, \pi R_T^2$

$$P_{out} = \varepsilon \sigma T_T^4 \times 4\pi R_T^2 \,, \quad \varepsilon \approx 1$$

No equilíbrio: $P_{in} = P_{out}$

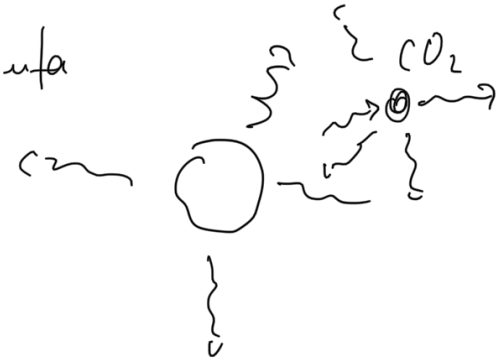
$$\cancel{\sigma} T_S^4 \, \cancel{4\pi} R_S^2 \times \underbrace{\frac{1}{\cancel{4\pi} d_{TS}^2}}_{u_1} \times \cancel{\pi} R_T^2 = \cancel{\sigma} T_T^4 \, \cancel{4\pi} R_T^2$$

$$\frac{T_S^4}{T_T^4} = 4 \frac{d_{TS}^2}{R_S^2}$$

$$T_T = T_S \left[\frac{1}{4} \left(\frac{R_S}{d_{TS}} \right)^2 \right]^{1/4}$$

$$T_T \approx 290 \text{ K}.$$

b) 1) Efeito de estufa



2) Reflexão de radiação pela atmosfera

115. a) $\lambda_{max} \cdot T = 2{,}989 \times 10^{-3}\ m \cdot K$

$\lambda_{Max} = \dots \approx 1\ mm$

b) $u = \sigma T^4$

120. $T_0 = 29^\circ C = 273 + 29 = 302\ K$

$A = 1{,}5\ m^2$, $T_1 = 33^\circ C = 273 + 33 = 306\ K$

$\varepsilon \approx 1$

a) $P = P_{out} - P_{in} = \varepsilon \sigma A (T_1^4 - T_0^4)$

$\simeq 38{,}2\ W$

b) $P_{in} + P_{met} = P_{out} + P_{conv.} \simeq 2 \times P_{out}$

$P_{met} = 2P_{out} - P_{in} = \sigma A (2T_1^4 - T_0^4)$

$\simeq 783{,}9\ W$

$E = P_{met} \times \Delta t = 783{,}9 \times 3600 \times 24$

$= 6{,}6 \times 10^7\ J \simeq 16{,}2\ kcal$ (?)

121. $A = 0.9\ m^2$

$\varepsilon \simeq 0{,}9$

a) $T_1 = 35^\circ C = 273 + 35 = 308\ K$

$\lambda_{Max} \cdot T = 2.898 \times 10^{-3}\ m \cdot K \simeq 9.41 \times 10^{-6}$ m

b) $T_2 = -5^\circ C = 273 - 5 = 268\ K$

$\dots^4 \dots 4)$

$$T = P_{out} - P_{in} = \varepsilon \sigma A (T_1 - T_2) \simeq 174{,}2\ W$$

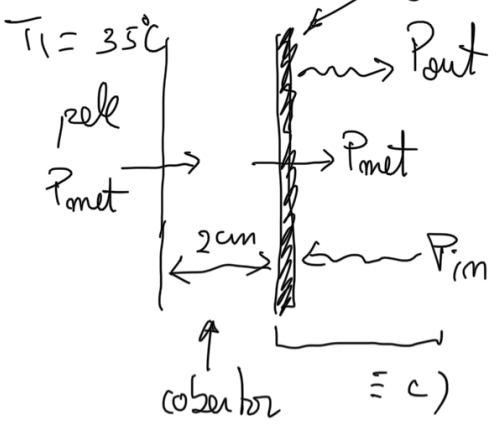
c) $P_{met} = 50\ W$

$$P_{in} + P_{met} = P_{out}$$

$$\varepsilon \sigma A T_2^4 + P_{met} = \varepsilon \sigma A T_0^4$$

$$T_0^4 = T_2^4 + \frac{P_{met}}{\varepsilon \sigma A} \rightarrow T_0 \simeq 281\ K = 8°C$$

d) $l = 2\ cm$ $\quad T_0 = 8°C$



$$\underbrace{\frac{dQ}{dt}}_{P_{met}} = -KA \frac{dT}{dx}$$

$$P_{met} = KA \frac{(T_1 - T_0)}{l}$$

$K = (\ldots) = 0{,}04\ W.m^{-1}.K^{-1}$