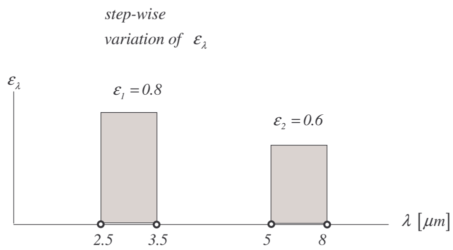
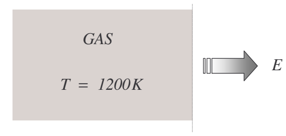
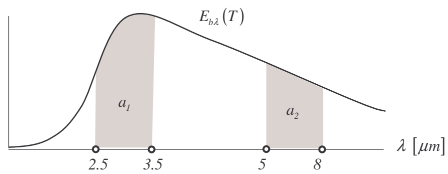
12.42







$$E = \int_0^\infty E_\lambda \, d\lambda$$

$$= \int_0^\infty \varepsilon_\lambda E_{b\lambda} \, d\lambda$$

$$= \varepsilon_1 \int_{2.5}^{3.5} E_{b\lambda} \, d\lambda + \varepsilon_2 \int_{2.5}^{3.5} E_{b\lambda} \, d\lambda$$

$$= \left[\frac{\varepsilon_1 \int_{2.5}^{3.5} E_{b\lambda} \, d\lambda + \varepsilon_2 \int_{2.5}^{3.5} E_{b\lambda} \, d\lambda}{E_b} \right] E_b$$

$$= \left[\varepsilon_1 F_{2.5\to 3.5} + \varepsilon_2 F_{5\to 8} \right] E_b$$

$$= \left[\varepsilon_1 \cdot \left(F_{0\to 3.5} - F_{0\to 2.5} \right) + \varepsilon_2 \cdot \left(F_{0\to 8} - F_{0\to 5} \right) \right] \cdot \left(\sigma T^4 \right)$$

$$= \left[0.8 \cdot (0.516 - 0.2732) + 0.6 \cdot (0.9054 - 0.7378) \right] \cdot (5.67e-8) \cdot \left(1200^4 \right)$$

$$= [0.29] \cdot (5.67e-8) \cdot \left(1200^4 \right)$$

$$= 34{,}660 \quad \left[\frac{W}{m^2} \right]$$

Geometrical sense of the total emissive power E:

$$E = \varepsilon_1 \overbrace{\int_{2.5}^{3.5} E_{b\lambda} \, d\lambda}^{a_1} + \varepsilon_2 \overbrace{\int_{2.5}^{3.5} E_{b\lambda} \, d\lambda}^{a_2} = \varepsilon_1 \cdot a_1 + \varepsilon_2 \cdot a_2$$

Total emissivity of the gas layer:

$$\varepsilon = \varepsilon_1 \cdot \left(F_{0\to 3.5} - F_{0\to 2.5} \right) + \varepsilon_2 \cdot \left(F_{0\to 8} - F_{0\to 5} \right) = 0.29$$