

EX 3.22



40 Watt incandescent bulb

at 3300 K act as blackbody radiator

a) Wien displacement law $\Rightarrow \lambda_{\max} T = 2.898 \times 10^{-3} \text{ m}\cdot\text{K}$

$$\lambda_{\max} = 88 \mu\text{m}$$

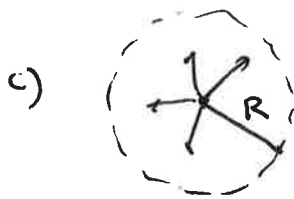
$$f_{\max} = 3.4 \text{ e}19 \text{ Hz}$$

b) how many photons per second are emitted?

$$\frac{\# \text{ photons}}{\text{second}} = \frac{\left(\frac{\text{energy}}{\text{second}} \right)}{\left(\frac{\text{energy}}{\text{photon}} \right)} = \frac{40 \text{ Watts}}{hf}$$

$$= \frac{40 \text{ Watts}}{(6.626 \times 10^{-34}) (3.4 \text{ e}19)}$$

$$= 1.8 \times 10^{20} \text{ photons/second}$$



They are distributed over the area of any sphere surrounding the bulb.

So the photon flux at a distance of

$$R = 5 \text{ meters is } \frac{1.8 \times 10^{20}}{4\pi R^2} = 5.6 \text{ e}17 / \text{m}^2$$

If your pupil area is $5 \text{ e}-6 \text{ m}^2$, then $\frac{2.8 \text{ e}12}{\text{second}}$ enter your eye