714.

Problem 49.32 (RHK)

Under ideal conditions the normal human eye will record a visual sensation at 540 nm if incident photons are absorbed at a rate as low as 100 s^{-1}. We have to find the power level to which it corresponds.

Solution:

Energy of a photon of wavelength 540 nm is

$$\varepsilon = \frac{hc}{\lambda} = \frac{6.6 \times 10^{-34} \times 3 \times 10^{8}}{540 \times 10^{-9}} \text{ J}$$
$$= 3.6 \times 10^{-19} \text{ J.}$$

As eye is able to record a visual sensation when 100 photons are absorbed per second, the power level of the eye is

$$P = 3.6 \times 10^{-19} \times 100 \text{ J s}^{1}$$
$$= 3.6 \times 10^{-17} \text{ W.}$$