Question #58596, Physics / Quantum Mechanics

The light from a highway sodium lamp has wavelength 589 nm. What is energy in ev of photon emitted from lamp?

Solution:

$\lambda = 589 \, nm = 5{,}89 \cdot 10^{-7} m;$

It is known that the energy photon is determined from the equation

$E = h\nu$, where $\nu = \frac{c}{\lambda}$.

$h = 4.135667662(25) \times 10^{-15} eV \cdot s \approx 4.14 \cdot 10^{-15} \, eV \cdot s$ - Planck constant and

$c = 299 \, 792 \, 458 \, m/s \approx 3 \cdot 10^{8} \, m/s$ -Speed of light.

Energy of photon in eV:

$$E = h\frac{c}{\lambda} = 4.14 \cdot 10^{-15} \, [eV \cdot s] \cdot 3 \cdot \frac{3 \cdot 10^{8} [m/s]}{5.89 \cdot 10^{-7} [m]} = 2.1 \, eV$$

Answer: $E = h\frac{c}{\lambda} = 2.1 \, eV$