

Answer on Question #68142 - Chemistry - General Chemistry

Question:

What is the energy of a mole of photons of red light with a wavelength of 632 nm?

Solution:

Photon energy is described by the following equation:

$$E = h * c / \lambda,$$

Where

E – photon energy, J;

h – Planck constant, $6.63 * 10^{-34}$ J*s;

c – speed of light in vacuum, $3.00 * 10^8$ m/s

λ – photon wavelength, m.

Note that 1 nm = 10^{-9} m.

Do the calculation:

$$E = 6.63 * 10^{-34} \text{ J*s} * 3.00 * 10^8 \text{ m/s} / 632 * 10^{-9} \text{ m} = 3.15 * 10^{-19} \text{ J}.$$

The mole of photons contains $6.02 * 10^{23}$ photons. Than total energy is:

$$3.15 * 10^{-19} \text{ J} * 6.02 * 10^{23} = 189630 \text{ J}$$

Answer:

189630 Joules

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