

Answer on Question #62840, Chemistry / General Chemistry

Question

Calculate the energy of one photon of yellow light in J that has a wavelength of 425nm

Solution:

1. Convert the wavelength of 425nm to m:

$10^{-9}\text{m} = 1 \text{ nm}$, so:

$$425\text{nm} \times (10^{-9}\text{m}) = 4.25 \times 10^{-7}\text{m}$$

2. By the first Planck's equation:

$$E = h\nu,$$

where

E - energy

h - Planck's

ν - frequency

3. By the second Planck's equation::

$$c = \lambda\nu,$$

where

c - speed of light

λ - wavelength

ν - frequency

4. Then:

$$E = hc/\lambda$$

$$h = 6.62 \times 10^{-34} \text{ J x s}$$

$$c = 3 \times 10^8 \text{ m/s}$$

$$\lambda = 4.25 \times 10^{-7} \text{ m}$$

$$E = (6.62 \times 10^{-34} \times 3 \times 10^8) / 4.25 \times 10^{-7}$$

$$E = 4.67 \times 10^{-19} \text{ J}$$

Answer: $4.67 \times 10^{-19} \text{ J}$

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