$c = \lambda \cdot \nu$

c = speed of light (3.00×10^8 m/s)

λ = wavelength (meters, m)

ν = frequency (hertz, Hz or 1/s)

Examples

(1) Blue light has a wavelength of 5.30×10^{-7} m, calculate its frequency.

$c = \lambda \cdot \nu$

$\frac{3.00 \times 10^8 \text{ m/s}}{5.30 \times 10^{-7} \text{ m}} = \frac{(5.30 \times 10^{-7} \text{ m}) \cdot \nu}{5.30 \times 10^{-7} \text{ m}}$ $\quad \frac{m}{s} \cdot \frac{1}{m}$

$5.66 \times 10^{14} \text{ 1/s} = \nu$

(2) Violet light has a frequency of 7.50×10^{14} 1/s, calculate its wavelength.

$c = \lambda \cdot \nu$ $\quad \lambda$ $\quad c = 3.00 \times 10^8$ m/s

$\frac{3.00 \times 10^8 \text{ m/s}}{7.50 \times 10^{14} \text{ 1/s}} = \frac{\lambda \cdot (7.50 \times 10^{14} \text{ 1/s})}{7.50 \times 10^{14} \text{ 1/s}}$

4.00×10^{-7} m $= \lambda$

or

.000000400 m

$\frac{m}{s} \cdot \frac{s}{1}$

(3) Green light has a frequency of 1.50×10^{14} 1/s, calculate the wavelength:

$c = \lambda \cdot \nu$ $\quad c = 3.00 \times 10^8$ m/s

$$E = h \cdot \nu$$

- E: energy (Joules, J)
- h: Planck's constant 6.626×10^{-34} J·s
- ν: frequency (1/s)

Examples

(4) Blue light has a frequency of 5.66×10^{14} 1/s. How much energy does a blue photon have?

$E = h \cdot \nu \quad h = 6.626 \times 10^{-34}$ J·s

$E = (6.626 \times 10^{-34}\ \text{J}\cdot\text{s}) \cdot (5.66 \times 10^{14}\ 1/\text{s})$

$J \cdot s \cdot \frac{1}{s}$

$E = 3.75 \times 10^{-19}$ J

(5) Green light has a frequency of 1.50×10^{14} 1/s, how much energy (E) does a green photon have?

$E = h \cdot \nu$

$E = (6.626 \times 10^{-34}\ \text{J}\cdot\text{s}) \cdot (1.50 \times 10^{14}\ 1/\text{s})$

$E = 9.94 \times 10^{-20}$ J

↑ 1 photon

How much energy does a trillion (1×10^{12}) green photons have?

$E_{\text{trillion}} = E_{1\ \text{photon}} \times \text{trillion}$

$= (9.94 \times 10^{-20}\ \text{J}) \cdot (1 \times 10^{12})$

$= 9.94 \times 10^{-8}$ J