Answer on Question#69479 – Chemistry – General chemistry

Question: Deduce de Broglie relation for photons, using Planck's equation and Einstein's equation?

Answer:

Einstein's equation: $\mathbf{E = mc^2}$, where $\mathrm{E} = \text{energy}, \mathrm{m} = \text{mass}, \mathrm{c} = \text{speed of light}$.

Planck's equation: $\mathbf{E = h\nu}$, where $\mathrm{E} = \text{energy}, \mathrm{h} = \text{Plank's constant}, \nu = \text{frequency}$.

Two energies would be equal: $\mathbf{mc^2 = h\nu}$

It is known that $\boldsymbol{\nu = \frac{c}{\lambda}}$, where $\lambda = \text{wavelength}$

$$\mathbf{mc^2 = h\frac{c}{\lambda}}$$

$$\boldsymbol{\lambda = \frac{hc}{mc^2} = \frac{h}{mc}} - \text{de Broglie relation for photons.}$$