

- A cook uses a microwave oven to heat up a meal. The wavelength of the radiation is 0.012 m. Calculate the frequency and energy of a photon of this radiation.

Marks
2

The wavelength, λ , is related to the energy and the frequency, ν , by the equations:

$$E = h\nu = \frac{hc}{\lambda} \text{ and } \nu = \frac{c}{\lambda}$$

Therefore with $\lambda = 0.012 \text{ m}$:

$$\nu = \frac{(2.998 \times 10^8)}{(0.012)} = 2.5 \times 10^{10} \text{ s}^{-1}$$

$$E = \frac{(6.626 \times 10^{-34}) \times (2.998 \times 10^8)}{(0.012)} = 1.7 \times 10^{-23} \text{ J}$$

(As the wavelength is given to two significant figures, this limits the accuracy of the answers to also being two significant figures).

Frequency: $2.5 \times 10^{10} \text{ s}^{-1}$

Energy: $1.7 \times 10^{-23} \text{ J}$

ANSWER CONTINUES ON THE