

$$E = h \nu$$

$$\nu = E / h \dots\dots\dots (\text{Hz})$$

$$\nu = E / h c \dots\dots\dots(\text{cm}^{-1})$$

$$B = h / 8 \pi^2 I c$$

Example:

The first line in the rotation spectrum of carbon monoxide has a frequency of 3.8424 cm^{-1} , calculate the $^{12}\text{C}-^{16}\text{O}$ bond length in carbon monoxide .

Hint : (Avogadro's . No. 6.022×10^{23}) , The mass no. of C is 12 , for O is 15.9949 amu .

Solution: -

$$2B = 3.8424 \text{ cm}^{-1} \quad \therefore B = 1.9212 \text{ cm}^{-1}$$

$$I = m' r^2$$

$$m' = 12 \times 15.9949 / (12 + 15.9949 \times 6.022 \times 10^{23})$$

$$= 1.385 \times 10^{-23} \text{ gm}$$

$$B = h / 8 \pi^2 I c$$

$$B = h / 8 \pi^2 m' r^2 c$$

$$r^2 = h / 8 \pi^2 m' B c$$

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$$r = 1.131 \times 10^{-8} \text{ cm} = 1.131 \text{ \AA}$$