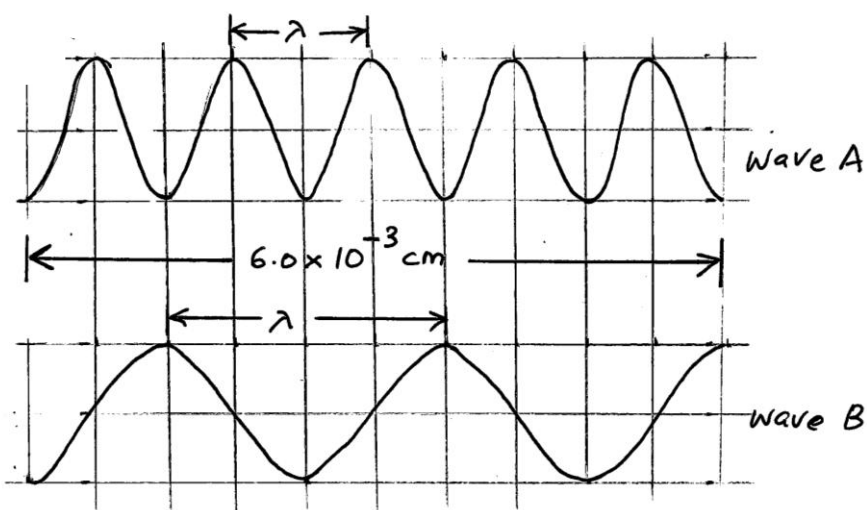Review Questions:

Q₁ • Convert all these wavelength, λ to frequency, Hz.

(i) $\lambda = 397 \, \text{Å}$ (ii) $\lambda = 355 \, \text{cm}$ (iii) $\lambda = 550 \, \text{nm}$

Q₂ • Convert frequency, Hz to wavelength, λ (Å)

(i) $\nu = 1.21 \times 10^3 \, \text{MHz}$ (ii) $\nu = 300 \, \text{Hz}$ (iii) $\bar{\nu} = 2500 \, \text{m}^{-1}$

Problem-solving Example 3

Wave A

6.0×10^{-3} cm

Wave B

a) Determine the wavelength, λ, wave number, $\bar{\nu}$ and the frequency, ν of wave A ?

b) Determine the wavelength, λ, wave number, $\bar{\nu}$ and the frequency, ν of wave B ?

Solution

Solution :

a) For wave A :

There are 5 wavelength (5 cycle-full)

Thus, $\lambda = \dfrac{(6.0 \times 10^{-3})(10^{-2})m}{5} = 1.2 \times 10^{-5} m$

$\bar{\nu}$ (wave number) $= \dfrac{1}{\lambda}$

$\therefore \bar{\nu} = \left(\dfrac{1}{1.2 \times 10^{-5}m}\right) = 8.33 \times 10^{4} m^{-1}$

Frequency, $\nu = \dfrac{c}{\lambda}$

$= \dfrac{2.998 \times 10^{8} m s^{-1}}{1.2 \times 10^{-5} m}$

$= 2.5 \times 10^{13} s^{-1}$

$= 2.5 \times 10^{13} Hz$ (Ans)

b) For wave B :

There are $2\frac{1}{2}$ wavelength (ie $2\frac{1}{2}$ full cycle)

Thus, $\lambda = \dfrac{(6.0 \times 10^{-3})(10^{-2}m)}{2\frac{1}{2}} = 2.4 \times 10^{-5} m$ (Ans)

$\bar{\nu}$ (wave number) $= \dfrac{1}{\lambda} = \dfrac{1}{2.4 \times 10^{-5}m}$

$= 4.2 \times 10^{4} m^{-1}$ (Ans)

ν (frequency) $= \dfrac{c}{\lambda} = \dfrac{2.998 \times 10^{8} m s^{-1}}{2.4 \times 10^{-5} m}$

$= 1.3 \times 10^{13} s^{-1}$

$= 1.3 \times 10^{13} Hz$ (Ans)

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