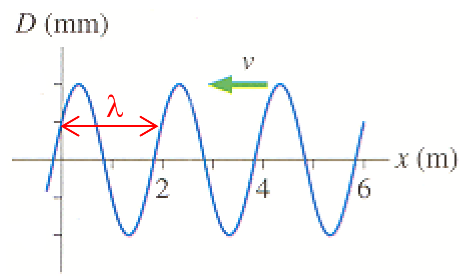
Q- Figure shows a snapshot graph at t = 0 s of a 30.0 Hz wave traveling to the left. Each interval on the vertical axis corresponds to 5 mm.



Snapshot graph at t = 0 s

From the graph, we get

A = two vertical intervals = 2*5 mm = 10 mm

The wavelength is the distance between two nearest points oscillating in same phase and is equal to

λ = two horizontal intervals = 2*1 m = 2 m

(a) What is the wave speed?

The wave speed is given by

$C = n*\lambda = 30*2 =$ **60 m/s**

(b) What is the phase constant of the wave?

The wave displacement of any particle of the medium is given by the equation

$D = A \sin (kx + \omega t + \phi)$

From the graph, at t = 0 and x = 0 the displacement of the particle is one vertical interval or A/2. Hence, we have

$A/2 = A \sin (0 + 0 + \phi)$

Gives the phase constant $\phi = \sin^{-1}(1/2) = 30^0$ or $\pi/6 = 0.5236$ rad

(c) Write the displacement equation for this wave. Use "x" for x and "m" for meters.

As we know that

$K = 2\pi/ \lambda = 2\pi/2 = 3.14\ m^{-1}$

And $\omega = 2\pi / T = 2\pi*n = 2*3.14*30 = 188.4$ rad/s

Thus, the equation for the wave can be written as

$D(x, t) = A \sin (Kx + \omega t + \phi)$

Substituting the values, we get the equation for the wave as

$D(x, t) = (10\ mm) \sin (3.14\ x + 188.4\ t + 0.5236)$