Q1- A particle moves in simple harmonic motion with a frequency of 1.80 Hz and amplitude of 6.00 cm. What is it maximum speed of the particle?

The maximum speed of a particle in a SHM is given by

$V_{max} = A\omega$

Here A is the amplitude and ω is the angular frequency given by 2π*frequency

Now $\omega = 2\pi$*frequency = 2*3.14*1.80 = 11.3 rad/s.

Hence the maximum speed will be

V_{max} = A ω = (6.00 cm)*(11.3radians/s) = **67.8 cm/s**

Q2- A transverse wave on a string is described by the following wave function.

y = (0.115 m) sin (3.14*x/8 + 12.56 t)

(a) Determine the transverse speed and acceleration of an element of the string at t = 0.280 s for the point on the string located at x = 1.80 m.

y = (0.115 m) sin (3.14*x/8 + 12.56 t)

So v(x,t) = dy/dt = (0.115 m) cos (3.14*x/8 + 12.56 t) * 12.56

Or v = 12.56 (0.115) cos (3.14*x/8 + 12.56 t) ---------- (1)

Substituting the values of x and t in equation (1) we have

v = 12.56*0.115*cos [(3.14*1.80/8)+(4*3.14*0.280)]

Or v = 1.44 cos (4.22 rad) = 1.44*cos 242.1^0

Or **v = - 0.674 m/s**

And the acceleration is given by

a = dv/dt = 12.56 (0.115 m) [- sin (3.14*x/8 + 12.56 t)] *12.54 using equation (1)

Or a = - 157.7 (0.115 m) sin (3.14*x/8 + 12.56 t) ---------- (2)

Substituting the values in equation 2 we get

a = - 157.7*0.115 sin (4.22 rad)

Or a = - 18.1 sin 242.1^0 = 16 m/s^2.

(b) What are the wavelength, period, and speed of propagation of this wave?

The general form of transverse wave equation is given by

y = A sin (kx - ωt)

Here K is the wave constant given by k = $2\pi/\lambda$ and ω is angular frequency.

Thus comparing with our wave equation

the force constant k = $2\pi/\lambda$ = 3.14/8 Gives λ =16 m

And angular frequency ω = 12.56 Gives period T = 2 π/ω = ½ sec.

And the speed of propagation c = λ/T = 32 m/s