20 July 2020: Physics I.

What important stuff we talked today:

1. *The phase of a wave, the definition of potential energy, kinetic energy, phase of a wave,*
2. *We have shown the graph of displacement, velocity, and acceleration with time (from the class note given to you in the classroom).*
3. *The graphs of kinetic energy and potential energy with time and position are also shown.*

What is phase:
At any instant of time, the position of the wave is called the **phase** of the wave.

Energy of SHO:

Potential energy : Energy due to a position. (gravitational force)
Kinetic energy : Energy due to velocity **(Joule)**

Now, How to measure:

The potential energy is defined as the work done due to change in position. So,

$$U(x) = \int F.dx \text{ } \textbf{Joule} \qquad \text{--- --- --- (i)}$$

We know that $F = -kx$ for a SHO, using the value of F in equation (i) we get,

$$U(x) = \int (-kx).dx$$
$$= -k \int x.dx$$
$$= -k\, x^{1+1}/1+1 + c \quad \text{(integrating)}$$
$$= -(½)kx^2 \quad \text{(we conside c = 0)}$$
$$= -½.k.[A\cos(kx-\omega t)]^2$$

--- --- --- --- (ii)

Now we can find the kinetic energy of the SHO

$$K.E\,(v) = ½.\, M.v^2 \qquad \text{--- --- --- --- (iii)}$$

We know that $v = \omega A\sin(kx-\omega t)$

$KE. = \frac{1}{2}.m.[\omega A\sin(kx-\omega t)]^2$

$= \frac{1}{2}.m.k/m.A^2\sin^2(kx-\omega t)$

$= \frac{1}{2}.kA^2\sin^2((kx-\omega t)$ --- --- --- --- --- (iv)

HOME TASK:

Now find, KE + U(x) = ?

We can write the same question with different words below,

Show, that the sum of KE and U(x) = eto+eto

Prove that, the sum of KE and U(x) = xxxxxxxx

Exercise:

Draw all the graphs that were discussed in the class today yourself. Identify the axes properly. Tag the curves.