FORMULAS TO REMEMBER:

- FOR SHM, $F = -kx$

  or $a = -\omega^2 x$ so, $\omega = \sqrt{\frac{k}{m}}$

- EQUATION OF SHM - $x = A\sin(\omega t + \phi)$ $\phi \equiv$ INITIAL PHASE

- Time Period -> $T = \frac{2\pi}{\omega} = 2\pi\sqrt{\frac{m}{k}}$

- frequency -> $f = \frac{1}{T} = \frac{1}{2\pi}\sqrt{\frac{k}{m}}$

- $v = \frac{dx}{dt} = A\omega\cos(\omega t + \phi)$ $a = \frac{dv}{dt} = -A\omega^2\sin(\omega t + \phi)$

  $= -\omega^2 x$

FORMULAS TO REMEMBER:

1> $v = \omega\sqrt{A^2 - x^2}$, $a = -\omega^2 x$

2> Kinetic Energy : $KE = \frac{1}{2}k(A^2 - x^2) = \frac{1}{2}kA^2\cos^2(\omega t + \phi)$

Potential Energy: $PE = \frac{1}{2}kx^2 = \frac{1}{2}kA^2\sin^2(\omega t + \phi)$

Total Energy: $TE = \frac{1}{2}kA^2 \rightarrow$ constant.

$KE = PE = \frac{1}{4}kA^2$ at $x = \pm\frac{A}{\sqrt{2}}$

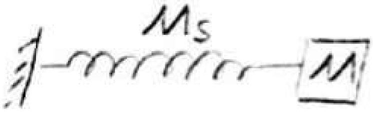
3> 

$T = 2\pi\sqrt{\frac{M}{k}}$, $v_{max} = \omega A$

4> 

$T = 2\pi\sqrt{\frac{M}{k}}$ $A = \frac{Mg}{K}$

5> When spring has mass



$$T = 2\pi\sqrt{\frac{M + \frac{M_s}{3}}{k}}$$

- FORMULAS TO REMEMBER

1> for physical pendulum/ rigid body oscillation

$$T = 2\pi\sqrt{\frac{I}{mgl}}$$

$I \equiv$ Moment of inertia about point of suspension

$l \equiv$ Distance between COM and point of suspension.

2> for Simple Pendulum

$$T = 2\pi\sqrt{\frac{l}{g}}$$

when accelerated frame ($\vec{a}$) use $g = g_{eff} = |\vec{g} - \vec{a}|$