Review Chapter 10 AP

SHM - MUST be moving!!

- Needs restoring force
- $x = A\cos\omega t \rightarrow x_{max} = A$
- $v = -A\omega \sin\omega t \rightarrow v_{max} = A\omega$
- $a = -A\omega^2\cos\omega t \rightarrow a_{max} = A\omega^2$
- True for circles, springs, and pendulums

Hooke's Law - NOT moving

- $F = -kx$
- x = displacement from equilibrium
- k = constant, cut in1/2 = ↑ k = more stiff
- works for any object that "behaves like spring"
- does not work if object/spring becomes deformed and cannot return to orginal state

Periods and frequencies

$T = 1/f$ → Hz

$\omega = 2\pi f$

Pendulums

$T_p = 2\pi\sqrt{L/g}$

more L = more time

Springs

$T_s = 2\pi\sqrt{m/k}$

more m = more time

more k = less time

If you FORCE and object to vibrate at its NATURAL frequency = **resonance** = ↑↑A

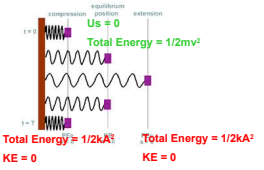
Conservation of Energy and Springs

Total Energy = $1/2kA^2$ (A = max x = amplitude)

Energy at equilibrium = center = all KE = $1/2mv^2$

Energy at ANY given time:

$1/2kx^2 + 1/2mv^2 + mgh = \frac{1}{2}kA^2$



note:
A = max x
x = ANY x

...so many times end center
$1/2kA^2 = 1/2mv^2$

Elasticity

Stress = F/A or P

Strain = change

Linear (Young's)

$F/A = Y(\Delta L/Lo)$

F ⊥ A

Sheer

$F/A = S(\Delta x/Lo)$

F // A

Bulk

$P = -B(\Delta V/Vo)$

P surrounds V