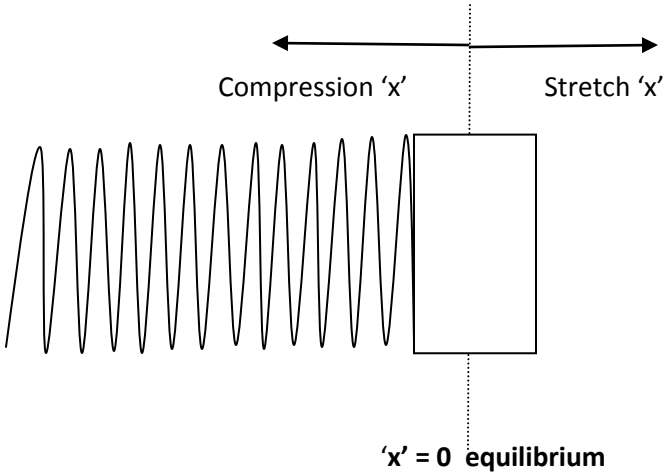
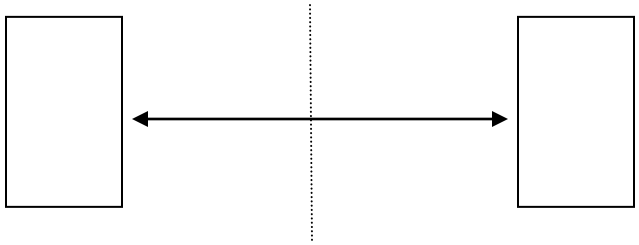
Simple Harmonic Motion (SHM) - 6.3



A block is attached to a spring and allowed to oscillate between a maximum stretch 'x' and a maximum compression 'x' where 'x' is the distance between equilibrium and the maxiumum stretch/compression. Equilibrium is where the middle of the block would be if there were no distortion to the spring. It is 'rest'.



maximum compression	x = 0 equilibrium	maximum stretch
Ee = max	Ee = 0	Ee = max
Ek = 0	Ek = max	Ek = 0

As the block oscilliates, the energy transforms between Elastic Energy (Ee) and Kinetic Energy (Ek). The **conservation of energy** states that the energy in this closed system (no friction luckily) stays constant. So, if you want to know how much energy is in the system, you would calculate the Ee at maximum stretch/compression or the Ek at equilibrium. $\mathbf{E_T}$ = **total energy**.

ie: A 2 kg block on a horizontal oscilliating spring passes equilibrium going 0.8 m/s and has a maximum stretch of 30 cm. What is the total energy of the system?

→You can't calculate Ee since Ee = $\frac{1}{2}$ kx2 and you know 'x' but not 'k'!

→ You can calculate Ek at equilibrium.

Ek = $\frac{1}{2}$ mv2 = $\frac{1}{2}$ (2) (0.8)(0.8) = 0.64 Joules

Now you know ET! E_T = Ek at equilibrium = 0.64 joules

→ You can calculate 'k' now.

ET = 0.64 joules = Ee at maximum compression

0.64 = $\frac{1}{2}$ kx2

0.64 = $\frac{1}{2}$ k (0.8)(0.8)

k = 2 N/m

HOMEWORK

Try p. 307 #1 and p. 314 #31, 32