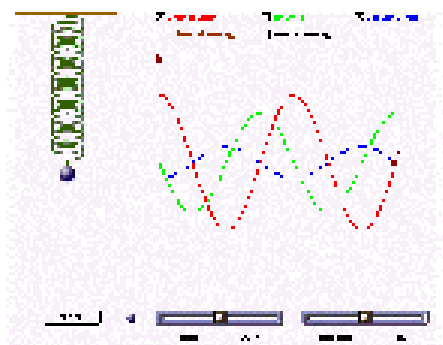


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## WORKSHEET : SPRING TIME

Play, tweak and try to deduce the relations between the graphs.

- How does the frequency of the energy graphs compare with the displacement, velocity or acceleration graphs? Can you show this relation mathematically?
- Why is it that the period of the oscillations affects the maximum value of the energies? Can you (again) verify that mathematically?
- Why is it that pure simple harmonic motion is so rare?
- How will the graphs differ if there is friction involved? Sketch in cases of light, heavy and critical damping.
- How is the equation of the graph related to the starting conditions? What does a cosine graph indicate about the starting conditions?
- What assumptions must we make about the spring for the motion of the ball to be entirely simple harmonic?
- Can you derive the relation between the period of the spring to its spring constant? What is the analogous equation for the simple pendulum?
- For any value of the displacement, there are two possible values of the velocity. How do you show that from your graphs plotted? How do you reconcile that with the physical situation? Can you write down an equation relating velocity and displacement to illustrate this?
- If the total energy graph is to be plotted, how will it look like? How will it be different if there is damping?
- In cases of viscous drag, energy needs to be supplied to maintain oscillations. How should one input the energy so that oscillations have as large an amplitude as possible? What is this phenomenon known as? Can you sketch how the amplitude of the oscillations depend on the frequency of the driving force? Sketch cases with varying degrees of damping.



Bugs? Comments?  
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