Oscillations of a Spring-Mass System

Apparatus

a stand with a variety of different springs, and at least two identical springs, a selection of masses which can be hung from the springs, stopwatch

Action

The students hang the masses on the springs and use the stop watch to investigate the effects of mass on period of oscillation. They can also investigate the effect of spring constant and amplitude of oscillations.

Caution: students should be warned to not stretch the springs too far as masses can fly off.

The Physics

If two identical objects are attached to identical springs, they both have mass m attached to a spring with spring constant k, so the periods of oscillation of the two springs are the same and are equal to $T_1 = T_2 = 2\pi\sqrt{\frac{m}{k}}$ .If one of the springs has a bigger mass attached to it, the period will be longer; if $m_2 > m_1$ then $T_2 > T_1$. Changing the spring constant also changes the period, if $k_2 > k_1$ then $T_2 < T_1$

For simple harmonic motion the period is independent of amplitude, i.e. extension does *not* affect the period of oscillation, hence stretching the spring more to start with makes no difference to period.

Accompanying sheet

Oscillations of a Spring-Mass System

Two identical objects are attached to identical springs.
How do their periods compare?

If the mass of one of the objects is increased
will there be any difference in the periods of the two systems?

If one of the springs is replaced with one with a larger spring constant,
how will this affect the period of oscillation?

Does the extension (small or large amplitude) affect the period of oscillation?