Charting Pendulum Motion

Apparatus

a pendulum with a felt tip pen or pencil attached, chart recorder or some other means of pulling paper along beneath the pendulum at steady rate

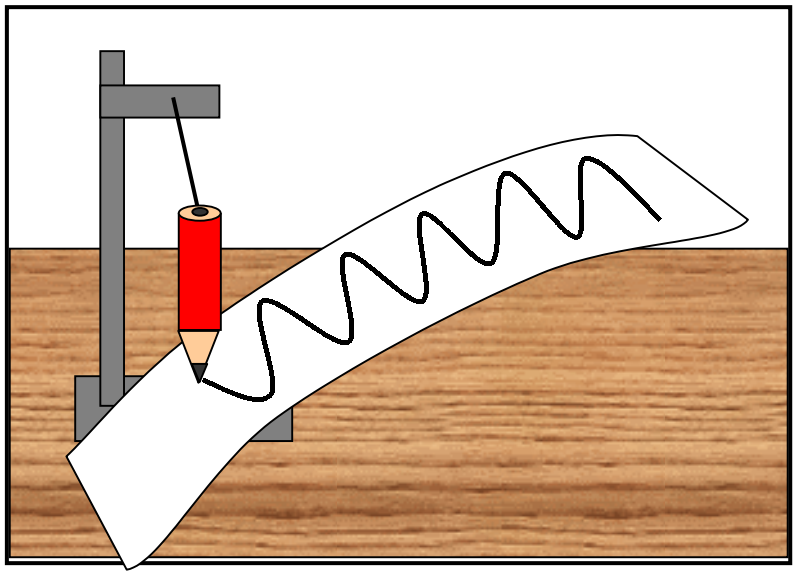
Note: the pendulum should only just touch the paper, so it is not pulled by it. A fairly heavy pendulum bob may be necessary.

Action

The students set the chart recorder going, or one of them carefully rolls the paper along so that it moves at constant rate below the pendulum. They then set the pendulum going and observe the trace left by the pendulum bob. They should be able to identify the resulting curve as a sinusoid.

The Physics

The pendulum undergoes simple harmonic motion (which is slightly damped). The line drawn is sinusoidal, and can be described by the equation $x = A\cos\omega t$, where A is the initial, and maximum, displacement, ω is the angular frequency of the motion and is equal to $2\pi f$ where f is the frequency of oscillation, t is the time, and x is the displacement at that time t. Note that due to damping the curve decays gradually in time.



Accompanying sheet

Charting Pendulum Motion

Set the paper moving along beneath the pendulum.

Now set the pendulum swinging **gently**.

What sort of curve does the pendulum draw?
Write an equation to describe this curve.
What sort of motion does the pendulum undergo?