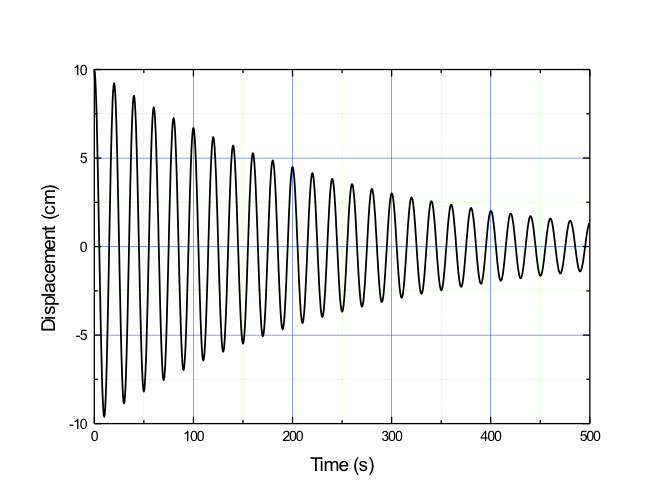
**Worksheet 16 damped harmonic oscillator Name:**

Relevant textbook sections covered: 14.7



1) The graph above shows simple harmonic motion with damping.

The initial amplitude at t = 0 is 10 cm.

1. What is the frequency? Does it change throughout the graph?

(b) What is the time constant τ ?

equation for damped amplitude: A(t) = Amax e-t/2τ ; τ = m/b

2) A damped harmonic oscillator consists of a block (m = 2.0 kg) and a spring (k = 10.0 N/m). Initially the mass oscillates with an amplitude of 0.25 m. Due to damping, its amplitude decreases to ¼ of its original value after 4 oscillations.

(a) What is the period of the oscillator?

(b) Determine the damping constant, b.

Equation: A(t) = Amax e-bt/2m

*HINT: What time t can you plug into the equation?*

(c) What is the oscillator’s energy at *t = 0*?

(d) What is the oscillator’s energy after four cycles? How much energy has been lost after four cycles (percent)?

**GOOD PRACTICE:** A 350 g block hangs from a spring with constant k = 23 N/m. The block is pulled down some distance *A* from equilibrium and then released. If the block loses half of its initial energy in 3.5 minutes, what is the damping constant of the system?