

Planet Holloway - **Websheet 13.1**

AP Physics C - Chapter 13 Springs and Oscillations

You may print this out and write on it or work on your own paper.

**Show all work.**

Assume: ( $g_{\text{earth}} = 10 \text{ m/s/s}$ )

1. A 0.4 kg mouse is attached to a spring with a strength of 25 N/m and moves with simple harmonic motion (SHM) over a frictionless surface. At the moment the mouse is 4 cm from the equilibrium point, what is his acceleration?
2. If it takes 8 N to stretch a spring 24 cm and the spring is then cut in thirds, what force is required to stretch one of the thirds 12 cm?
3. Mr. H attaches a 3 kg pineapple to a spring and starts it oscillating with a frequency of 0.5 Hz and an amplitude of 15 cm. What is the strength of the spring? What is the max velocity of the pineapple?
4. Suppose Space Cat (8 kg) is placed in a spring cannon set to launch to space. If Spring Cat needs 11.2 km/s for escape velocity, what strength of spring should be used if we only can compress the spring 1 m max? (Ignore depression of spring from Space Cat sitting on it, and hold on to your mittens).
5. I hang a sock monkey from a spring, start it oscillating and measure the frequency of oscillation. I then add the entire sock monkey's family to the same spring (sextupling the mass) and repeat. How does the new frequency of oscillation compare to the original?
6. Oscar the ocelot likes to oscillate like an Australian Ostrich in autumn. If Oscar has motion described by  $x = (0.24) \cos(7\pi t/8)$ , then what is Oscar's frequency and max acceleration?

1. 2.5 m/s/s

6. 0.44 Hz, 1.81 m/s/s

2. 12 N

3. 29.6 N/m, 0.47 m/s

4.  $10^9$  N/m

5. 0.41 times the original