

Name: _____

Date: _____

Block: _____

Chapter 4
Hooke's Law
(Elastic Force)

1. When a 5.00 kg mass is hung on the end of a certain spring, it stretches 0.260 m. What is the force constant of the spring (in N/m)?

(3.00 marks)

Given Information:

Equations Used



$$F = kx \quad \Sigma F = ma \text{ where } a = 0$$

$$F - mg = 0 \rightarrow F = mg$$

$$kx = mg \rightarrow k = \frac{mg}{x}$$

$$k = \frac{(5.00 \text{ kg})(9.80 \text{ m/s}^2)}{0.260 \text{ m}} = 188 \text{ N/m}$$

Answer $188 \text{ N/m} (3)$

2. A spring of force constant 45 N/m is used to pull a block along a level surface at constant speed. The spring is observed to stretch 12.0 cm while supplying this force. How much force is applied?

(3.00 marks)

$$k = 45 \text{ N/m} \quad x = 0.120 \text{ m}$$

$$\Sigma F = ma \text{ where } a = 0$$

$$F_A - F = 0 \rightarrow F_A = F$$

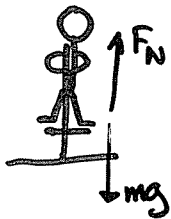
$$F_A = kx = (45 \text{ N/m})(0.120 \text{ m}) = 5.4 \text{ N}$$

$F =$ 5.4 N (3 marks)

3. How much does a 55 kg girl compress the spring in a pogo stick when she stands on it? You are given that the spring constant is 78 N/cm.

(3.00 marks)

$$m = 55 \text{ kg} \quad k = 78 \text{ N/cm}$$



$$\Sigma F = ma \text{ where } a = 0$$

$$F_N - mg = 0 \rightarrow F_N = mg$$

$$F_N = kx = mg \rightarrow x = \frac{mg}{k} = \frac{(55 \text{ kg})(9.80 \text{ m/s}^2)}{78 \text{ N/cm}} = 6.9 \text{ cm}$$

$x =$ 6.9 cm (3 marks)

4. How much force must be applied to a spring ($k = 1400 \text{ N/m}$) in order to extend it by 0.10 m?

(3.00 marks)

$$F = kx = (1400 \text{ N/m})(0.10 \text{ m}) = 140 \text{ N}$$

$$=$$
 $1.4 \times 10^2 \text{ N}$