Answer on Question #64473-Physics-Other

1. Radio waves from an FM station have a frequency of 103.1 MHz. If the waves travel with a speed of 3.00 x 108 m/s, what is the wavelength?

Solution

The wavelength is

$$\lambda = \frac{v}{f} = \frac{3.00 \cdot 10^8}{103.1 \cdot 10^6} = 2.91\ m.$$

2. A spring (k = 790 N/m) has a length of 48 cm when zero net force is applied to it. What will its length be when 230 N of force is applied to stretch it?

Solution

$$l' = l + \Delta l$$

$$\Delta l = \frac{F}{k}.$$

$$l' = l + \frac{F}{k} = 0.48 + \frac{230}{790} = 0.77\ m = 77\ cm.$$

3. If 320 J of work is done on a spring with a spring constant of 720 N/m, how far will it stretch?

Solution

$$W = \frac{kx^2}{2}$$

$$x = \sqrt{\frac{2W}{k}} = \sqrt{\frac{2 \cdot 320}{720}} = 0.943\ m.$$

4. A pendulum clock is taken to another planet's moon (g = 3.6 N/kg). How long must the pendulum be in order for the clock to continue keeping accurate time (1 second/cycle)?

Solution

$$T = 2\pi\sqrt{\frac{g}{l}}.$$

$$\sqrt{\frac{g'}{l'}} = \sqrt{\frac{g}{l}}$$

$$T = 2\pi\sqrt{\frac{g'}{l'}}$$

$$l' = g'\left(\frac{2\pi}{T}\right)^2 = 3.6\left(\frac{2\pi}{1}\right)^2 = 142\ m.$$

5. How much work must be done on a spring (k = 730 N/m) to stretch is by 2.5 m?

Solution

$$W = \frac{kx^2}{2} = 730\frac{(2.5)^2}{2} = 2281.25\ J.$$

6. A string vibrates with a standing wave that has a wavelength of 1.2 m. What is the length of the string?

Solution

$$L = \frac{1}{2}\lambda = \frac{1.2}{2} = 0.6\ m.$$