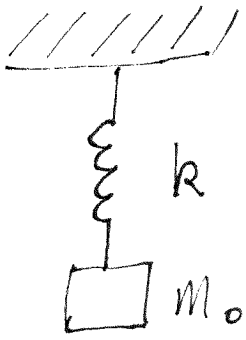
Chapter 15 — Problem 29



If a new mass of

$m_n = 9\, m_o$

is placed on the same spring,

What is the new frequency?

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now $\omega = \sqrt{\frac{k}{m}}$ and $f = \frac{\omega}{2\pi}$

so $f = \frac{1}{2\pi}\sqrt{\frac{k}{m}}$

$f_o = \frac{1}{2\pi}\sqrt{\frac{k}{m_o}}$

Now the new frequency is

$$f_n = \frac{1}{2\pi}\sqrt{\frac{k}{m_n}} = \frac{1}{2\pi}\sqrt{\frac{k}{9m_o}}$$

$$= \frac{1}{2\pi}\frac{1}{3}\sqrt{\frac{k}{m_o}} = \frac{1}{3}\left[\frac{1}{2\pi}\sqrt{\frac{k}{m_o}}\right]$$

$$\boxed{f_n = \tfrac{1}{3} f_o}$$

The new frequency is one Third of the original frequency.