

Solutions

Each answer shows the steps, then the **result**.

2.1

- frequency is the reciprocal of the period:

$$f = \frac{1}{T} = \frac{1}{0.5 \text{ s}}$$

- $f = \mathbf{2 \text{ Hz}}$

2.2

- The period increases

2.3

- $T = 2\pi\sqrt{L/g}$, so $T \propto \sqrt{L}$:

$$\frac{T'}{T} = \sqrt{\frac{4L}{L}} = \sqrt{4}$$

- the period doubles: **2** times longer

2.4

- No

3.1 B

- the length and g

3.2 A

- $T = 2\pi\sqrt{m/k}$, so $T \propto \sqrt{m}$ and $\frac{T'}{T} = \sqrt{4} = 2$

3.3

(a)

- mass-spring period:

$$T = 2\pi\sqrt{\frac{m}{k}} = 2\pi\sqrt{\frac{0.2 \text{ kg}}{50 \text{ N m}^{-1}}}$$

- $T = \mathbf{0.40 \text{ s}}$

(b)

- $f = \frac{1}{T} = \frac{1}{0.40 \text{ s}} = \mathbf{2.5 \text{ Hz}}$

3.4

(a)

- simple-pendulum period:

$$T = 2\pi\sqrt{\frac{L}{g}} = 2\pi\sqrt{\frac{1.0 \text{ m}}{9.8 \text{ m s}^{-2}}}$$

- $T = \mathbf{2.0 \text{ s}}$

(b)

- No change (mass does not appear)