Solutions

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

2.1

- simple-pendulum period:

$$T = 2\pi\sqrt{\frac{L}{g}} = 2\pi\sqrt{\frac{0.25\ \text{m}}{9.8\ \text{m s}^{-2}}}$$

- $T = \mathbf{1.0}$ s

2.2

- The distance from the pivot to the centre of mass

2.3

- No (mass cancels)

2.4

- About the pivot

3.1 B

- increasing the length increases the period

3.2 B

- the physical-pendulum formula

3.3

(a)

- physical-pendulum period with $I = \frac{1}{3}mL^2$ and $d = L/2$:

$$T = 2\pi\sqrt{\frac{I}{mgd}} = 2\pi\sqrt{\frac{\frac{1}{3}mL^2}{mg\,(L/2)}}$$

- the mass cancels:

$$T = 2\pi\sqrt{\frac{2L}{3g}}$$

(b)

- faster: $\sqrt{2L/(3g)} < \sqrt{L/g}$, so its period is shorter by a factor $\sqrt{2/3} \approx 0.82$

3.4

(a)

- simple-pendulum period:

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

- $T = \mathbf{2.0}$ s

(b)

- The period gets longer (smaller g)