

Solutions

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

2.1

- Zero (constant ω)

2.2

- constant angular acceleration from rest:

$$\omega = \omega_0 + \alpha t = 0 + (2 \text{ rad s}^{-2})(5 \text{ s})$$

- $\omega = \mathbf{10 \text{ rad s}^{-1}}$

2.3

- $2\pi \text{ rad}$

2.4

- decelerating, so $\alpha = -2 \text{ rad s}^{-2}$:

$$\omega = \omega_0 + \alpha t = 10 \text{ rad s}^{-1} + (-2 \text{ rad s}^{-2})(3 \text{ s})$$

- $\omega = \mathbf{4 \text{ rad s}^{-1}}$

3.1 B

- angular acceleration

3.2 A

- angular acceleration is the rate of change of ω :

$$\alpha = \frac{\Delta\omega}{\Delta t} = \frac{20 \text{ rad s}^{-1}}{4 \text{ s}} = 5 \text{ rad s}^{-2}$$

3.3

(a)

- from rest, $\omega_0 = 0$:

$$\omega = \omega_0 + \alpha t = 0 + (4 \text{ rad s}^{-2})(3 \text{ s})$$

- $\omega = \mathbf{12 \text{ rad s}^{-1}}$

(b)

- angle turned from rest:

$$\theta = \omega_0 t + \frac{1}{2}\alpha t^2 = 0 + \frac{1}{2}(4 \text{ rad s}^{-2})(3 \text{ s})^2$$

- $\theta = \mathbf{18 \text{ rad}}$

3.4

(a)

- angular acceleration is the rate of change of ω :

$$\alpha = \frac{\omega - \omega_0}{t} = \frac{0 - 30 \text{ rad s}^{-1}}{6 \text{ s}}$$

- $\alpha = \mathbf{-5 \text{ rad s}^{-2}}$

(b)

- Negative – it is decelerating (slowing the spin)