

Circular Motion - quiz - 12-16-02

A grinding wheel is rotating at 1800 revolutions per minute. It is then turned off and slows at -7.25 rad/s^2 . (a) What is its angular velocity in rad/s 15 seconds later? (b) How long does it take to stop? (c) When it comes to rest, what total angle in radians has it turned through?

$$\omega_i = 1800 \frac{\text{rev}}{\text{min}} \left(\frac{2\pi \text{ rad}}{1 \text{ rev}} \right) \left(\frac{1 \text{ min}}{60 \text{ s}} \right)$$

$$\omega_i = 188 \frac{\text{rad}}{\text{s}}$$

$$a = -7.25 \frac{\text{rad}}{\text{s}^2}$$

$$t = 15 \text{ s}$$

$$\omega_f = 0 \frac{\text{rad}}{\text{s}}$$

$$\omega_f = \omega_i + at$$

$$t = \frac{\omega_f - \omega_i}{a}$$

$$= \frac{0 \frac{\text{rad}}{\text{s}} - 188.5 \frac{\text{rad}}{\text{s}}}{-7.25 \frac{\text{rad}}{\text{s}^2}}$$

b) $t = 26.0 \text{ s}$

$$\omega_f = \omega_i + at$$

$$= 188.5 \frac{\text{rad}}{\text{s}} - 7.25 \frac{\text{rad}}{\text{s}^2} (15 \text{ s})$$

a) $\omega_f = 79.8 \frac{\text{rad}}{\text{s}}$

$$\Delta \theta = \omega_{\text{av}} t$$

$$= \left(\frac{\omega_f + \omega_i}{2} \right) t$$

$$= \left(\frac{0 \frac{\text{rad}}{\text{s}} + 188.5 \frac{\text{rad}}{\text{s}}}{2} \right) 26 \text{ s}$$

c) $\Delta \theta = 2450 \text{ rad}$