1. A CD player spins a disc at 4000 rpm. What is the linear velocity of a point 5 cm from the axis?

 A) 21 m/s   C) 8.4 km/s
 B) 200 m/s   D) 80 km/s

2. If a CD takes 3.0 seconds to slow from 4000 rpm to rest, what is its average angular acceleration?

 A) −22 rad/s^2 C) −1300 rad/s^2
 B) −140 rad/s^2 D) −12,000 rad/s^2

Useful equations:

$$a_r = \omega^2 \, r$$

$$\omega^2 = \omega_o^2 + 2\alpha(\theta - \theta_o) \qquad \alpha = d\omega/dt \quad a_t = \alpha \, r$$

$$\omega = \alpha t + \omega_o \qquad\qquad\qquad \omega = d\theta/dt \quad v = \omega \, r$$

$$\theta = (\tfrac{1}{2})\,\alpha t^2 + \omega_o t + \theta_o \qquad\qquad s = \theta \, r$$

$$I = \Sigma \, m_i \, r_i^2 \qquad\qquad \tau = \mathbf{r} \times \mathbf{F} \quad g = 9.8 \text{ m/s}^2$$

$$K = (\tfrac{1}{2})\,I\omega^2 \qquad\qquad \Sigma \, \tau = I\alpha$$

A centrifuge of radius 12 m spins with an angular velocity of 20 rev/min.

1. What centripetal acceleration does it produce?

   A) 0.14 g   C) 5.4 g
   B) 1.3 g   D) 490 g

2. If the centrifuge slows with a tangential acceleration of 1 g, how long does it take to stop?

   A) 0.21 s   C) 2.1 s
   B) 1.7 s   D) 2.6 s

Useful equations:

$$a_r = \omega^2\, r$$

$$\omega^2 = \omega_o^2 + 2\alpha(\theta - \theta_o) \qquad \alpha = d\omega/dt \qquad a_t = \alpha\, r$$

$$\omega = \alpha t + \omega_o \qquad\qquad\qquad \omega = d\theta/dt \qquad v = \omega\, r$$

$$\theta = (\tfrac{1}{2})\,\alpha t^2 + \omega_o t + \theta_o \qquad\qquad\qquad s = \theta\, r$$

$$I = \textstyle\sum m_i\, r_i^2 \qquad\qquad \tau = \mathbf{r} \times \mathbf{F} \qquad g = 9.8 \text{ m/s}^2$$

$$K = (\tfrac{1}{2})\, I\omega^2 \qquad\qquad \sum \tau = I\alpha$$

1. A ferris wheel of radius 8.5 m turns with an angular frequency of 2/3 rpm. What is the speed of its passengers?

    A) 8.2 mm/s   C) 0.59 m/s
    B) 7.8 cm/s   D) 5.7 m/s

2. A faster ride spins its passengers in a horizontal circle of radius 4.0 m with a centripetal acceleration of 2 g's. What is the angular velocity?

    A) 0.71 rad/s   C) 2.8 rad/s
    B) 2.2 rad/s   D) 8.9 rad/s

Useful equations:

$$a_r = \omega^2 \, r$$

$$\omega^2 = \omega_o^2 + 2\alpha(\theta - \theta_o) \qquad \alpha = d\omega/dt \qquad a_t = \alpha \, r$$

$$\omega = \alpha t + \omega_o \qquad\qquad\qquad \omega = d\theta/dt \qquad v = \omega \, r$$

$$\theta = (\tfrac{1}{2})\alpha t^2 + \omega_o t + \theta_o \qquad\qquad\qquad\qquad s = \theta \, r$$

$$I = \sum m_i r_i^2 \qquad\qquad\qquad \tau = \mathbf{r} \times \mathbf{F} \qquad g = 9.8 \text{ m/s}^2$$

$$K = (\tfrac{1}{2}) I\omega^2 \qquad\qquad\qquad \sum \tau = I\alpha$$