Physics
Centripetal Force and Acceleration,
Form: A

Name: _____
Date: _____
Period: _____
Primary Peer Reviewer: _____

+1	0	-1	Σ

Section 1. Multiple Choice

Formulas:

$d = s = r\theta$ $\quad v = r\omega$ $\quad a = r\alpha$ $\quad \vec{\omega} = \frac{\vec{\theta}}{t}$ $\quad \vec{\alpha} = \frac{\vec{\omega_f} - \vec{\omega_i}}{t}$

$\vec{\omega_{avg}} = \frac{\vec{\omega_i} + \vec{\omega_f}}{2}$ $\quad \vec{\omega_f} = \vec{\omega_i} + \vec{\alpha}t$ $\quad \vec{\theta} = \vec{\omega_i}t + \frac{1}{2}\vec{\alpha}t^2$ $\quad \vec{\omega_f}^2 = \vec{\omega_i}^2 + 2\vec{\alpha}\vec{\theta}$

For Each question, choose the best answer.

1. Horses that move with the fastest linear speed on a merry-go-round are located
   (a) Near the center
   (b) Near the outside
   (c) Anywhere, because they all move at the same linear speed.
2. Your pet gerbil sits on a record player that spins at a constant angular speed, ω, and her linear speed is v. If she moves to a point twice as far from the center, what will her new angular and linear speeds be?
   (a) Angular: 2ω Linear: $2v$
   (b) Angular: ω Linear: $2v$
   (c) Angular: 2ω Linear: v
   (d) Angular: ω Linear: v

The following information is for questions 3-4:
Billy-Bob has a yo-yo that has a center shaft with a 0.5 cm radius, and a string is attached to the center shaft of the yo-yo. He holds the end of the string stationary. Starting from rest, the yo-yo accelerates away from it at a rate of 1.5 m/s^2.

3. What is the angular acceleration of the yo-yo?
   (a) $7.5 \times 10^{-3} rad/s^2$
   (b) $3.33 \times 10^{-3} rad/s^2$
   (c) $3 rad/s^2$
   (d) $300 rad/s^2$
4. What is the angular displacement of the yo-yo after 0.75 seconds?
   (a) 0.422 rad
   (b) 0.5625 rad
   (c) 84.375 rad
   (d) 112.5 rad
5. A riverboat has a paddle-wheel attached to the back. Starting from rest, the wheel accelerates to a rate of 4π rad/s as it makes 10 complete rotations. What is the final angular velocity of the wheel?
   (a) 15.853 rad/s
   (b) 39.738 rad/s
   (c) 44.374 rad/s
   (d) 1579.137 rad/s

Section 2. Free Response

6. A fisherman hooks a big fish that swims away from the boat pulling the fishing line from his fishing reel. The boat stays at rest, and the fishing line begins to unwind from the reel at a radius of 4.50 cm from its axis of rotation. The reel is given an angular acceleration of 110 rad/s^2 for 2 seconds.

   (a) What is the final angular velocity of the reel?

   (b) At what (linear) speed is fishing line leaving the reel after 2.00 s elapses?

   (c) How many revolutions does the reel make?

   (d) How many meters of fishing line come off the reel in this time?

   (e) The fisherman has 300 meters of fishing line. Assuming the acceleration of the fish remains constant and the reel's radius does not change significantly, how long will it take for the entire line to unwind?

Answer Key for Exam A

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$d = s = r\theta$ $\quad v = r\omega$ $\quad a = r\alpha$ $\quad \vec{\omega} = \frac{\vec{\theta}}{t}$ $\quad \vec{\alpha} = \frac{\vec{\omega_f} - \vec{\omega_i}}{t}$

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