Phys101 Assignment Cover Sheet

First Name:_____ Last Name:_____ Mark: _____

Student ID:_____ Date: _____

Phys101 Written Assignment #5

Due Wed/Thur. March 2/3, 2011, at the end of tutorial

Textbook (Giancoli, 6th edition) page 222 problem #61.

61. A person of mass 75 kg stands at the center of a rotating merry-go-round platform of radius 3.0 m and moment of inertia $920\,\text{kg}\cdot\text{m}^2$. The platform rotates without friction with angular velocity $2.0\,\text{rad/s}$. The person walks radially to the edge of the platform. (*a*) Calculate the angular velocity when the person reaches the edge. (*b*) Calculate the rotational kinetic energy of the system of platform plus person before and after the person's walk.

PH101 WRITTEN ASSIGNMENT #5

61) A person of mass 75 kg stands at the center of a rotating merry-go-round platform of radius 3.0 m and moment of inertia 920 $kg\,m^2$. The platform rotates without friction with angular velocity 2.0 rad/s. The person walks radially to the edge of the platform.

a) Calculate the angular velocity when the person reaches the edge.

$L_i = L_f$

$I_{PLAT_i}\omega_{PLAT_i} + I_{PER_i}\omega_{PER_i} = I_{PLAT_f}\omega_{PLAT_f} + I_{PER_f}\omega_{PER_f}$

$920(2) + 0 = 920(\omega_{PLAT_f}) + \underbrace{75(3^2)}_{mr^2}(\underbrace{\omega_{PLAT_f}}_{=\omega_{PER_f}})$

$1840 = 1595\,\omega_{PLAT_f}$

$1.15\ rad/s = \omega_{PLAT_f}$

b) Calculate rotational kinetic energy of the system of platform plus person before & after person's walk.

BEFORE: $K_{ROT} = \frac{1}{2} I_{PLAT_i}\omega^2_{PLAT_i} + \frac{1}{2} I_{PER_i}\omega^2_{PER_i}$

$= \frac{1}{2}(920)(2^2)$

$= 1840\ J$

AFTER: $K_{ROT} = \frac{1}{2} I_{PLAT_f}\omega^2_{PLAT_f} + \frac{1}{2} I_{PER_f}\omega^2_{PER_f}$

$= \frac{1}{2}(920)(1.15)^2 + \frac{1}{2}(75)(3^2)(1.15)^2$

$= 608 + 446$

$= 1054\ J$