

PHYS-2010: General Physics 1
Dr. Luttermoser's Classes
Sample Problems for Exam 3

1. A 242 kg merry-go-round has a radius of 1.75 m sits at rest. A rope is attached to the circumference of this merry-go-round and is pulled with a force of 24.6 N tangentially for 7.82 s. After this time, the rotation is iniform. (a) What is the angular acceleration of the merry-go-round during the time the rope is pulled? (b) What is the angular speed of the merry-go-round at 10.0 s? (c) What is the rotational kinetic energy at this time? (d) How many revolutions does the merry-go-round complete in 10.0 s? (Note that $I = MR^2/2$ for a disk rotating about its center.)

2. A spherical object has a mass of 36.6 kg and a radius of 22.2 cm. When submerged in a fluid, it has a weight of 246 N. (a) What is the weight of the object in air? (b) What is the density of the object in air? (c) What is the density of the fluid?

3. An aluminum block has a mass of 16.2 kg and has a temperature of 130 °C. It is placed in 3.24 liters of water at 24.2 °C. What is the equilibrium temperature after the aluminum is placed in the water? ($\rho_w = 1000 \text{ kg/m}^3$, $c_w = 4186 \text{ J/(kg } ^\circ\text{C)}$, $c_{Al} = c_b = 900 \text{ J/(kg } ^\circ\text{C)}$).

4. A rectangular window in a house is 2.42 m wide, 1.02 m high, and 4.42 mm thick. How much heat is lost through the glass over a 1.00 hour time period if the internal temperature in the house is 68.2°F and the outside temperature is 20.2°F ? (The thermal conductivity of the glass is $0.803 \text{ J}/(\text{s m }^{\circ}\text{C})$.)