

PHYSICS 1050: Assignment #11

DUE: Monday April 4, 2016
NOTE THE CHANGE TO MONDAYS!

Readings:

- Chapter 5 of Franklin et al.
- Chapter 6 of Franklin et al.
- Chapter 7 of Franklin et al.
- Chapter 8 of Franklin et al.

Problems:

- include name or PIN;
- staple your assignment;
- show all your work;
- all answers are to have three significant figures unless stated otherwise.

1. **Problem 5.3 on page 53**

2. **Problem 5.6 on page 53**

3. **Problem 5.8 on page 53**

4. **Walk or run?**

It is 5.0 km from your home to the Physics lab and your car is out of gas. You could run that distance at 10 km/h, which uses up energy at the rate of 700 W; or you could walk it leisurely at 3.0 km/h, which uses energy at 300 W.

- Calculate how much energy both choices would burn up.
- The conversion between energy units is: 1 Cal (food calorie) = 1 kcal (kilocalorie) = 1000 cal (thermochemical calorie) = 4184 J (joules). Calculate how much energy both choices would burn up in units of J, cal and Cal.
- Which choice would burn up more energy?
- Explain your result.

5. **Dancing at the zoo**

You are at the zoo and try your 'gravitational attraction' on the dance floor. You start spinning at 72 rpm about an axis through your center with your arms outstretched. The typical distribution of mass in a human body from biomedical measurements are; head = 7.0%, both arms = 13%, and trunk and legs = 80.0%. Using this information plus length measurements on your own body, calculate

- (a) your moment of inertia about the axis of rotation using the tables in the class lecture notes; and
- (b) your rotational kinetic energy.

6. **Runaway wheel**

A person thought it would be a good idea to change a tire on the side of a hill. The tire has a width of $W = 0.30$ m and a radius of $R = 0.40$ m. The inside of the wheel is empty, but the wheel is solid from a radius of $R/2$ to R with uniform density. The density of the material is 2000 kg/m³.

- (a) What is the mass, weight and moment of inertia of the wheel?
- (b) If the wheel starts from rest and rolls down a 4.00 m ramp, 30.0° relative to the horizontal, what is the wheel's speed at the bottom of the ramp?
- (c) What average torque do you need to apply to stop it at the bottom of the ramp in one revolution?

7. **Long range danger**

Consider the record throws for the javelin,

[men $98.48m$ (Zelezny, 1996, $0.800kg$) and women $72.28m$ (Spotakova, 2008, $0.600kg$)],
the discus,

[men $74.08m$ (Schult, 1986, $2.00kg$) and women $76.80m$ (Rensch, 1989, $1.00kg$)],

and the shotput,

[men $23.12m$ (arnes, 1990, $7.26kg$) and women $22.63m$ (Lisovskaya, 1987, $4.00kg$)].

- (a) Find the minimum initial kinetic energies for the six throws.
- (b) For which events does air resistance apparently play the largest and smallest roles?