1. A bicycle with 60 cm wheels is traveling at 15 m/s.
   a. What is the angular velocity of the tire? [ω=50rad/s]
   b. If it takes 14.5 s to come to a complete stop, what is the angular acceleration? [α=-3.45 rad/s^2]
   c. How many revolutions does the wheel turn before coming to rest? [362.3 radians=57.7 rev]

2. A uniform disk of radius 15 cm and mass of 6 kg rotates around an axle of radius 5 cm as shown in figure 1. If there is a friction force of 1.5 N at the axle, what force F must you exert on the rim of the disk to accelerate it at the rate of 2π radians/s^2. *(Note: rpm means <u>revolutions or turns</u> per minute)* (I_{disk} = 1/2 MR^2) [F =3.33 N]

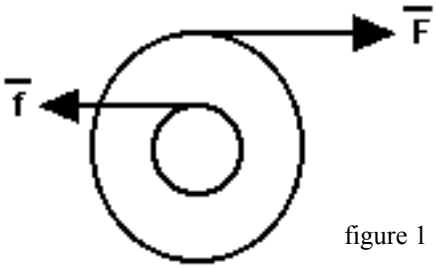
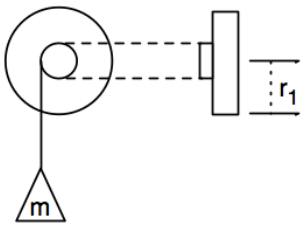


figure 1

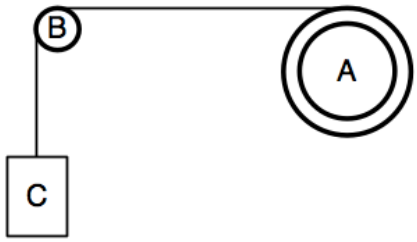
3. A pottery wheel primarily consists of a motor and a heavy platter to turn the clay while it is molded. The motor is rated at 0.5 hp. The maximum speed of 270 RPM can be reached in 2.9 seconds. The mass and diameter of the disc are 40 kg and 60cm respectively. Determine:
   a. the net torque while motor is on. [1082 J]
   b. the amount of work done by the motor including frictional energy losses.[17.6 Nm]
   c. What is the frictional energy? [H=-362.5 J]
   d. the amount of the friction torque needed to stop the wheel in 5 s after the motor is turned off. [τ_f=-10.82 Nm]

4. A motor exerts a torque of 10 N·m on a flywheel of moment of inertia 80 kg·m^2. If there is a friction torque of 1.5 N·m on the wheel:
a. how fast will it be rotating after 1 minute? [6.375 rad/s]
b. At that time what is the flywheel's KE? [162.2 J]
c. If the motor is turned off, how long will it take for the wheel to turn off? [340 s]

5. Assuming it is a uniform sphere, what is the rotational kinetic energy of the earth? (M_e = 5.98 x 10^{24} kg, R_e = 6.37 x 10^6 m, $I_{solid\ sphere}$ = 2/5MR^2) [2.57 x 10^{23} N]



6. A flywheel is made up of two uniform disks rotating together: a large one with a radius of 30 cm(r_1) and a mass of 20 kg and a small one of radius 10 cm and a mass of 5 kg. If a 10-kg block is attached to a string wrapped around the small disk and the system is let go without friction, what will be the tension in the string and the accelerations of the block and the wheel?
[a = .956 m/s^2, α = 9.56 radians/s^2, T = 88.4N]



7. What are the accelerations of the wheels and the block in the following system: Wheel A is a thin ring of mass 20 kg with outside radius 50 cm and inside radius of 49 cm. Wheel B is a uniform disk of mass 10 kg and radius 10 cm. block C has a mass of 5 kg. Assume no slipping between wheel B and the string and no friction on the wheels. What are the accelerations of the ring, disk, & mass?

8. It is said that the earth is slowing down and will come to a complete stop in 50 billion years due to the friction caused by the tides. What is the value of that friction force? (M_e = 5.98 x 10^{24} kg, R_e = 6.37 x 10^6 m, $I_{solid\ sphere}$ = 2/5MR^2) [F = 7.04 x 10^8N]

9. A pottery wheel primarily consists of a motor and a heavy platter to turn the clay while it is molded. The motor is rated at 0.5 hp. The maximum speed of 270 RPM can be reached in 2.9 seconds. The mass and diameter of the disc are 40 kg and 60cm respectively. Determine:
a. the amount of work done by the motor.
b. the amount of the friction force in the system if the negative torque is positioned an average distance of 1.0 cm from the center
c. find the total torque of the system (including the frictional torque).

10. A motor exerts a torque of 10 N·m on a flywheel of moment of inertia 80 kg·m2. If there is a friction torque of 1.5 N·m on the wheel:
a. how fast will it be rotating after 1 minute?
b. What is the flywheel's KE?
c. If the motor is turned off, how long will it take for the wheel to turn off?