Physics 200 Name: _____

Rotational Motion

Predicting Rubber Band Car Velocity and Acceleration Distance

1. How much normal force will be exerted by the floor against your car's drive wheels?
2. What is your estimation of the wheels' coefficient of static friction?
3. What is the maximum backward force that your drive wheels can exert against the floor without slipping (i.e. what is your predicted maximum force of static friction)?
4. What is the maximum torque (without the drive wheels slipping) of your drive wheels and axle?
5. What is the maximum string tension force that can be applied (without the drive wheels slipping) to the 0.00397m radius drive axle?
6. How far will your rubber bands be stretched as you wind the car?
7. How much work will you have to do as you stretch the rubber bands that far? [This will be based on your rubber band force curve.]
8. How much of that energy (from the work you did) do you think your rubber bands will return when they propel the car? [Requires a prediction of % efficiency]
9. How many times will the drive axle rotate as the string unwinds?
10. Through how many radians will the drive axle rotate s the string unwinds?
11. Based on the axle friction torque that you calculated in class, how much energy will be lost to axle friction as your string unwinds? [This is the work done by friction ($W = Fd = T\Theta$).]
12. Do you anticipate any additional energy loss aside from axle friction?
13. Based on the energy input and predicted energy loss, what is your prediction of your car's overall KE when it reaches its top speed?
14. What is your prediction of your car's overall mass?
15. What is the predicted moment of inertia of your car's rear axle?
16. What is the predicted moment of inertia of your car's front axle?
17. What is your prediction of your car's maximum velocity?
18. What is your prediction of your car's acceleration distance?