Angular Momentum, Inertia and Angular Velocity Practice

Answer the questions below on a piece of paper. ***Be neat. Due end of class Thursday.***

Angular Momentum Basics

1. Describe in simple terms what angular momentum is.
2. Generally speaking, angular momentum provides _____ _____ and is used to _____ objects.
3. Give a real life example of a technology that involves angular momentum.
4. What two variables (really three) affect angular momentum?
5. Which object has a larger angular momentum, a spinning bike wheel or car tire (assume same force was applied to each and that each spins with same velocity)
6. What variable (not unit) is used to represent angular momentum? angular velocity? inertia?
7. What is the standard metric unit for angular momentum? standard English unit?

Inertia Basics

8. Describe in simple terms what inertia is.
9. How is inertia of a spinning object different than the inertia of an object that's moving in a straight line?
10. Why is an overall knowledge of inertia important in car racing?
11. Does the shape of an object affect its inertia?
12. How do the formulas for the inertia of a solid sphere vs. an thin-walled hollow cylinder support your answer from Q#11? (i.e. show their formulas)
13. What is the standard metric unit for inertia? Standard English unit for inertia?
14. In order for the inertia of a spinning object to change what two properties of the object needs to change?
15. Which one of the two properties you identified in Q#14 is more likely to change? Explain why?

Angular Velocity Basics

16. Angular velocity refers to the velocity of _____ objects.
17. "Angular" means…..
18. 1 radian is equivalent to how many degrees?
19. Convert the following using an online conversion tool:
    a) 560 rpm to rad/s
    b) 38rad/s to rpm
    c) 24rad/s to rpm
    d) 1200rpm to rad/s

20. What does rpm stand for?

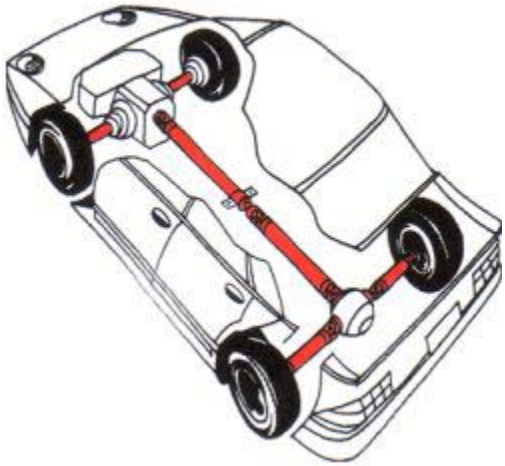
Problem Solving using GFS

21. Your SRC car wheel axle is considered a slender rod. What formula would be used to calculate its inertia?

22. If the axle in Q#21 is .056kg and its radius is .005m determine its inertia.

23. If the axle in Q#21 rotates with an angular velocity of 148rad/s determine the angular momentum of the axle.

24. The rotating drive shaft on a car spins at 195rad/s. If it has a radius of 0.2m and a mass of 10960g what angular momentum does it spin with?



25. Which object has the greater angular momentum, the axle in Q#21 or the drive shaft in Q#24? Does this make sense? Why or why not?

26. Examine the picture of the lawn tractor starter motor below. Complete the following:

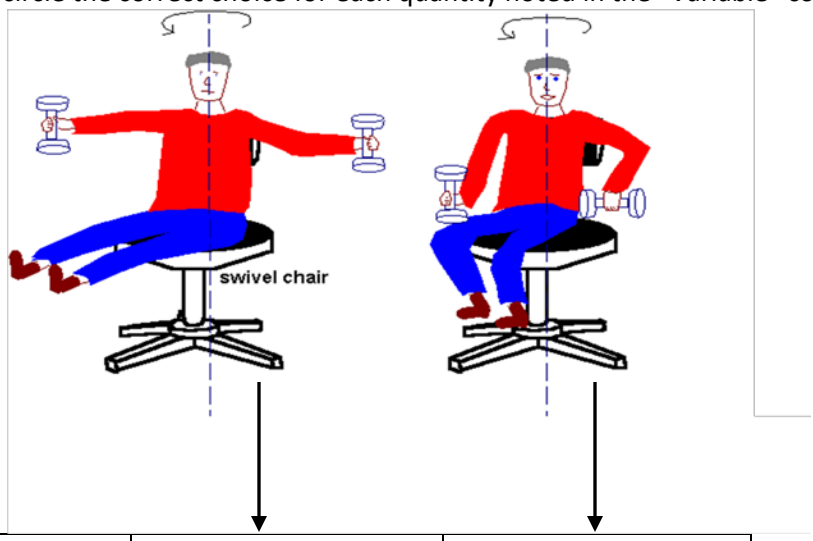
    a) Measure the radius of the motor shaft in cm and then convert to m.
    b) Calculate the inertia of the shaft if its mass is 0.5kg
    c) Calculate the angular momentum of the shaft if it was spinning at 25rad/s

27. An SRC car wheel has an angular momentum of 48lbft^2/s, a radius of 3inches, and a mass of 0.05lb. Assuming the inertia of the tire can be calculated using $I=mr^2$ find the angular velocity of the tire. **Hint:** Two step problem.

28. You are in charge of making the tire selection for your next SRC race which is an endurance race (car that lasts the longest on one battery charge wins).

    a. Is it better to have a car with tires that increase or decrease angular momentum for this type of race? Why?
    b. Based on your answer to "a" what features of the tires will allow you to increase/decrease your car's angular momentum? (hint: $L_{mom}=I\omega$)

29. Study the situation pictured below. Then, using the table, for both the BEFORE and AFTER situations circle the correct choice for each quantity noted in the "Variable" column. (8pts)



Variable	BEFORE (Arms out)	AFTER (Arms in)
r	Large Small Same	Large Small Same
ω	Large Small Same	Large Small Same
I	Large Small Same	Large Small Same
L_{mom}	Large Small Same	Large Small Same