GIANCOLI READING ACTIVITY
Section(s) 8-1 to 8-3

1. Big Idea(s):

    a. Big Idea 3: The interactions of an object with other objects can be described by forces.

    b. Big Idea 4: Interactions between systems can result in changes in those systems.

2. Enduring Understanding(s):

    a. A force exerted on an object can cause a torque on that object.

    b. A net torque exerted on a system by other objects or systems will change the angular momentum of the system.

3. Essential Knowledge(s):

    a. Only the force component perpendicular to the line connecting the axis of rotation and the point of application of the force results in a torque about that axis.

        i. The lever arm is the perpendicular distance from the axis of rotation or revolution to the line of application of the force.

        ii. The magnitude of the torque is the product of the magnitude of the lever arm and the magnitude of the force.

        iii. The net torque on a balanced system is zero.

    b. The presence of a net torque along any axis will cause a rigid system to change its rotational motion or an object to change its rotational motion about that axis.

        i. Rotational motion can be described in terms of angular displacement, angular velocity, and angular acceleration about a fixed axis.

        ii. Rotational motion of a point can be related to linear motion of the point using the distance of the point from the axis of rotation.

        iii. The angular acceleration of an object or rigid system can be calculated from the net torque and the rotational inertia of the object or rigid system.

    c. A torque exerted on an object can change the angular momentum of an object.

        i. Angular momentum is a vector quantity, with its direction determined by a right-hand rule.

        ii. The magnitude of angular momentum of a point object about an axis can be calculated by multiplying the perpendicular distance from the axis of rotation to the line of motion by the magnitude of linear momentum.

        iii. The magnitude of angular momentum of an extended object can also be found by multiplying the rotational inertia by the angular velocity.

        iv. The change in angular momentum of an object is given by the product of the average torque and the time the torque is exerted.

d. Torque, angular velocity, angular acceleration, and angular momentum are vectors and can be characterized as positive or negative depending upon whether they give rise to or correspond to counterclockwise or clockwise rotation with respect to an axis.

4. Learning Objective(s):

   a. The student is able to use representations of the relationship between force and torque.

   b. The student is able to compare the torques on an object caused by various forces.

   c. The student is able to estimate the torque on an object caused by various forces in comparison to other situations.

   d. The student is able to design an experiment and analyze data testing a question about torques in a balanced rigid system.

   e. The student is able to calculate torques on a two-dimensional system in static equilibrium, by examining a representation or model (such as a diagram or physical construction).

   f. The student is able to make predictions about the change in the angular velocity about an axis for an object when forces exerted on the object cause a torque about that axis.

   g. The student is able to plan data collection and analysis strategies designed to test the relationship between a torque exerted on an object and the change in angular velocity of that object about an axis.

   h. The student is able to predict the behavior of rotational collision situations by the same processes that are used to analyze linear collision situations using an analogy between impulse and change of linear momentum and angular impulse and change of angular momentum.

   i. In an unfamiliar context or using representations beyond equations, the student is able to justify the selection of a mathematical routine to solve for the change in angular momentum of an object caused by torques exerted on the object.

   j. The student is able to plan data collection and analysis strategies designed to test the relationship between torques exerted on an object and the change in angular momentum of that object.

   k. The student is able to describe a representation and use it to analyze a situation in which several forces exerted on a rotating system of rigidly connected objects change the angular velocity and angular momentum of the system.

   l. The student is able to plan data collection strategies designed to establish that torque, angular velocity, angular acceleration, and angular momentum can be predicted accurately when the variables are treated as being clockwise or counterclockwise with respect to a well-defined axis of rotation, and refine the research question based on the examination of data.

5. Read section(s) 8-1 to 8-3 in your textbook.

6. Use the Cornell Notes system to take notes on the lesson material. You have the following options:

   a. You can print multiple copies of one of the forms on the following pages of this document and handwrite your notes.

   b. You can use the MS Word form supplied below and type your notes.

      i. You can then print your work and submit a hardcopy, or

      ii. If you submit the assignment electronically, you must use a filename in the format, "LastnameFirstinitialPerXAsgnmtName". For example, "SmithKPer4ReadActT9-3"

   c. You can take notes on notebook paper using the Cornell Notes format and submit the hardcopy.

7. When using this form, remember the **Five R's of Notetaking**:

    a. *Record* – the most important or emphasized information

    b. *Reduce* – and synthesize information wherever possible, making it as concise as you can

    c. *Recite* – read your notes out loud

    d. *Reflect* – and consider how this information is connected to your personal experiences and what you already know

    e. *Review* – look over your notes more than once

8. As a minimum, you must include notes on the following topics:

    a. rigid object

    b. purely rotational motion

    c. axis of rotation

    d. radian

    e. angular displacement

    f. angular velocity

        i. average angular velocity

        ii. instantaneous angular velocity

    g. angular acceleration

        i. average angular acceleration

        ii. instantaneous angular acceleration

    h. tangential acceleration

    i. frequency

    j. period

    k. constant angular acceleration

    l. rolling motion (without slipping)

9. Answers may be typed or neatly printed. You do not need to include this page of instructions with your assignment.

10. *Note: The following computer skills should be practiced:*

    a. *Use Microsoft Equation to type any equations.*

    b. *Drawings may be freehand, but try to make use of the 'Shapes', 'Insert Picture' or 'Insert Clipart" functions of MS Word.*

    c. *A reading assignment may contain drawings that would be useful in your notes. If you have scanning capability, you should practice scanning pictures and inserting them into documents. As you prepare for college, you should consider investing in a desktop printer-scanner-copier.*

    d. *Just remember that for formal reports you have to cite any images that you insert into your document. You don't have to cite scanned images for this exercise unless you use a source other than the textbook.*

CORNELL NOTES and the 5 R's

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Name:

Date:

Topic:

Questions/Key Points	Notes

SUMMARY:

Name _____

Date _____

CORNELL
NOTES

Topic _____

Questions/key points	Notes

Summary