Physics Lesson plan Date: Tuesday, 2/12/13\_\_\_ Unit: Circ. Motion

**Class:**

* Regents
* Honors

**NYS Standard 4 Performance Indicators:**



Standards: Unbalanced force causes mass to accelerate (5.1k); centripetal force (5.1n); Weight is gravitational force that planet exerts on mass (5.1n);

**Student Learning Outcome(s)** (By the end of this lesson students will be able to…)

1. Understand that centripetal force is net force acting on object.
2. Draw and compare tangential velocity, angular velocity, centripetal acceleration and centripetal force for different types of centripetal motion.
3. Calculate conditions necessary for artificial gravity and alterations based on moving around artificial gravity habitat.

**Instructional strategies:** □ Skill building □ Laboratory activity □ Lecture/Discussion □ Assessment □ Interactive Lab Demo □ Problem-based learning □ Simulation □ Content literacy

□ Estimation activity □ Cooperative Learning □ Think/Pair/Share □ Case study

□ Clicker activity □ White-boarding □ Content writing □ Concept map

**Plan:**

* Write Agenda on Board
  + Reminder: turn in your Kepler quiz today! (from Friday)
  + Goal for today: Understand artificial gravity
  + Side trip to vertical circles: flying water and roller coasters
  + Artificial gravity thought experiments
  + Finish practice exam.
* Write on board: “Honors: Get a whiteboard, a marker and sit in groups of 2-3.”
* Have 2001 playing as students come in and follow instructions on board.
  + “Our goal today is to understand the forces involved in this artificial gravity and how that runner, or Dylan, affects the amount of gravity.”
* Series of questions for whiteboard
  + Draw the Earth and moon system, indicating tangential velocity, angular velocity, centripetal acceleration and centripetal force. (Follow-up question: What is the angular velocity of the moon around the Earth?)
  + “We were talking about artificial gravity. The video indicated that a rotating object causes artificial gravity. We don’t have a huge satellite to rotate, BUT we do have a piece of wood, some string, and a cup of water!” Do cup on plate demo.
    - “What is keeping water in the bucket?”
    - “What direction does the water feel that gravity is in?”
    - Erase boards and draw this system, indicating tangential velocity, angular velocity, centripetal acceleration, and centripetal force.
    - Indicate the forces on the cup of water at the top and bottom, as well as the centripetal force.
  + Show video of roller coaster (<https://www.youtube.com/watch?v=f-4nB4h3rTU>) and ask students to draw a diagram on white boards indicating the gravity, normal and centripetal forces at the top, middle, and bottom.
  + More whiteboard problems
    - Ferris wheel
    - Dylan skiing
* So we’ve explored more about centripetal motion and learned about vertical circles along the way. Now let’s move on to artificial gravity.
  + “Barrel of fun” slide
    - We think of normal force as opposing gravity, so this is how we have artificial gravity. How big would the normal force have to be to make her feel like she in artificial gravity?
      * Mg
  + Whiteboard space station calculation
  + Questions about sleeping and gravity?
* We will have some more review activities tomorrow, and don’t forget to finish your practice exam.
  + Java physics this afternoon!

**Preparation:**

* **Write agenda on board**
  + **Remember to pause and review where we are at for each step in the lesson**
* Resources
  + <https://www.youtube.com/watch?v=Otmg0-knGtE> for ideas on discussing artificial gravity