Physics 140 Discovery Room #5

4.1 Dynamic and Static stability; **7.1** thermal energy, heat, temperature, convection, conduction, radiation

Name_____ **Date/Time_____**

Bicycle Gears

Place the bicycle in a high gear (make the crank sprocket bigger than the freewheel sprocket). Turn the pedals and remember how hard it was to get the pedals to turn. Now place the bicycle in a low gear and turn the pedals.

1. How does the force needed to turn the pedals compare to when the bike was in the high gear? Larger? Smaller? The same? Why?

2. How does the work you do going up a hill in one pedal rotation compare when you are in the high gear and in the low gear? Remember: Work = force × distance. What is the relevant distance for one pedal rotation?

Dynamic and Static Stability

Gyroscope

1. Change the orientation of the gyroscope wheel so that the axis of rotation is parallel to the floor (and the wheel looks like a bicycle wheel standing upright). Is the gyroscope wheel statically stable in this configuration? Why or why not?

2. Now spin the gyroscope wheel keeping it in this orientation (like a bicycle wheel). Is the gyroscope wheel dynamically stable? Why or why not? Hint: try pushing the wheel over…what happens?

Ladybug

3. Stand the wooden block on its larger end. Is it statically stable? Why?

4. Now, place the ladybug on top of the block. What happens? Why?

Thermal Conductivity and Rods in Liquid Nitrogen

Dip the rods into the liquid nitrogen.

1. Which of the rods is the best thermal conductor? How do you know?

2. What is being transferred between the rods and liquid nitrogen? Which direction is this being transferred?

Properties of Various Cooled Materials

Take an inflated balloon and place it in the liquid nitrogen.

1. What happens to the balloon? Why?

2. Is there a transfer of heat? If so, in which direction is this transfer taking place? What type of heat transfer (convection, conduction, radiation) is at work?

Radiometer

Turn on the lamp and observe the fan.

1. What happens when the lamp shines light on the enclosed fan? Why does this occur?

2. Where does it get the energy needed for this? How does this energy cause the fan to move?

Using the margins of this sheet of paper, write down a question regarding a topic, concept, or example you do not understand from this week in PHYS140.