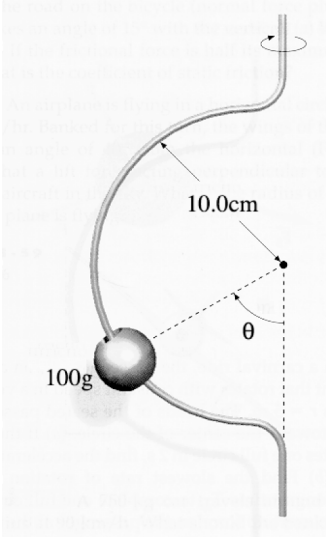
Name:_____

Solve the following problems in the space provided. Use the back of the page if needed. Each problem is worth 20 points. You must show your work in a logical fashion starting with the correctly applied physical principles which are on the last page. Your score will be maximized if your work is easy to follow because partial credit will be awarded.

1. Looking at the apples in the grocery store, the following questions enter your (physics obsessed) mind: (a)Which has a larger mass, an apple or a watermelon? (b)Which feels a larger gravitational force when dropped? (c)Which accelerates toward Earth at a higher rate? Fortunately, your instructor asks you to answer these very questions on exam. Unfortunately, he expects you to explain your answers and cite appropriate physical principles.

2. The device shown at the right consists of a 100g bead that is free to move along a frictionless wire bent in the shape of a circle of radius 10.0cm. The device is rotated at just the right rate so that the angle is 37.0°. Find (a)the magnitude of the force that the wire exerts on the bead and (b)the speed of the bead.



3. A top fuel dragster has a mass of 1000kg and it can accelerate from zero to 100mph (44.0m/s) in 0.840s. Find (a)the minimum amount of work done by the engine and (b)the average power output of the engine.

4. A 60.0kg person jumps off a 10.0m high platform. They leave with a speed of 7.00m/s at an angle of 60.0° above horizontal. Find (a)their speed that peak of their flight, (b)their maximum height, and (c)their speed when they strike the water below.

5. A person at the top of the first hill on a rollercoaster has a speed of essentially zero. Starting at this instant, their potential energy varies with time according to the graph shown below. Sketch the graphs of their kinetic energy and total energy versus time. Be sure to explain your thinking for full credit.