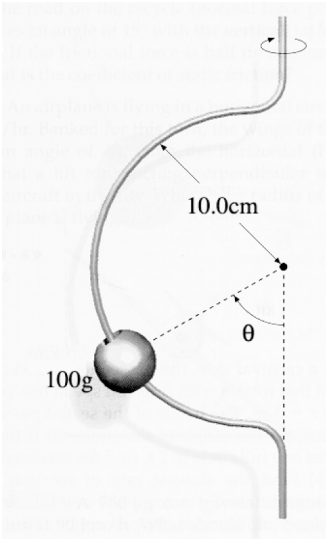
Name:_____ Posting Code ____ ____ ____
(only if you want your grade posted on the web.)

Solve the following problems in the space provided. Use the back of the page if needed. Each problem is worth 10 points. You must show your work in a logical fashion starting with the correctly applied physical principles shown on the last page. Your score will be maximized if your work is easy to follow because partial credit will be awarded.

1. In 1940, Emanuel Zacchini set the record for distance by a "human cannonball" at 53.0m. His initial speed was 24.0m/s and he was launched at 30.0° above horizontal. Find (a)the time he spent in the air and (b)his maximum height above the ground.

2. 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 your final exam. Unfortunately, he expects you to explain your answers.

3. . 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 angular speed of the bead.



4. A 60.0kg nut-case jumps off a 45.0m high bridge attached to a bungee-cord. The unstretched length of the cord is 25.0m. Find the minimum spring constant of the cord so that the jumper does not collide with the ground.

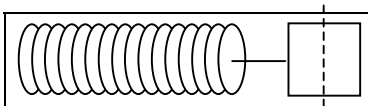
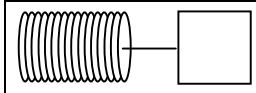
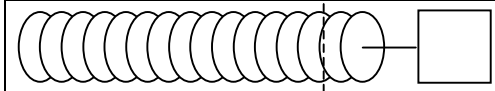
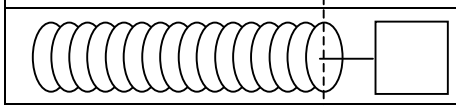
5. It turns out that neutrons are not stable particles. A neutron will decay into a proton and an electron. The mass of a proton is 1833 times the mass of an electron. Suppose a neutron, initially at rest, breaks apart into an electron and a proton. Find (a)the net momentum of the electron and the proton as a system and (b)the ratio of kinetic energy of the electron to the kinetic energy proton.

6. In lab you examined the collision of a 75.0g ball with a catching device that had a rotational inertia of 0.0150kg·m^2. The ball was caught 30.0cm below the pivot point. As a result, the arm and ball took off with an angular speed of 8.00rad/s. Find the initial speed of the ball.

7. Find the period of orbit for the moon using the data on the equation sheet.

8. The pendulum of any grandfather clock is roughly 1.00m long. Explain.

9. Shown below is a mass, m, is oscillating at the end of a spring with spring constant, k with an amplitude, A. For each time shown, fill in the missing information. Explain your reasoning for full credit.

	x	v	U	K	E
	0				
		0			$\frac{1}{2}kA^2$
		0			
	$\frac{1}{2}A$				

10. A1000kg boulder with a volume of $0.700m^3$ rests on the bottom of a lake. Draw a sketch showing the forces that act on the boulder and find the magnitude of each one.