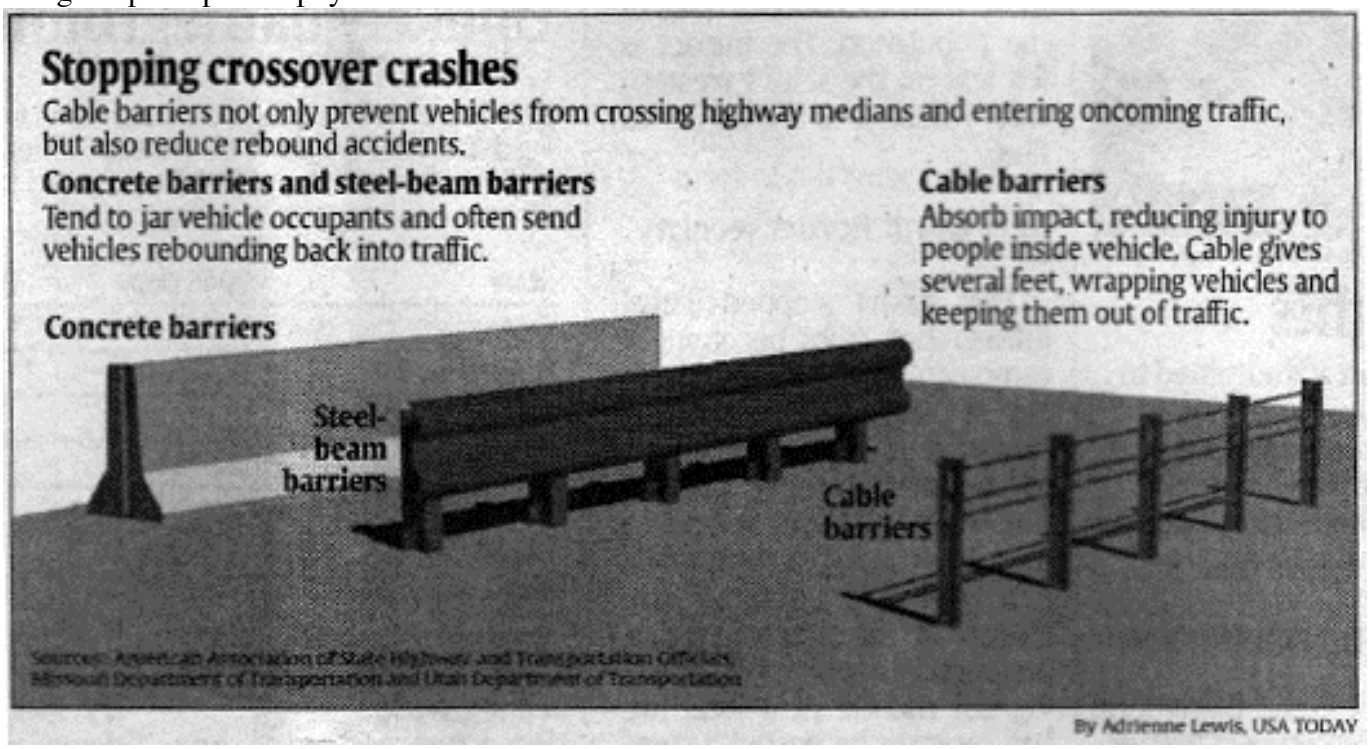
Name:_____

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. The equations you need are on the equation sheet. Your score will be maximized if your work is easy to follow because partial credit will be awarded.

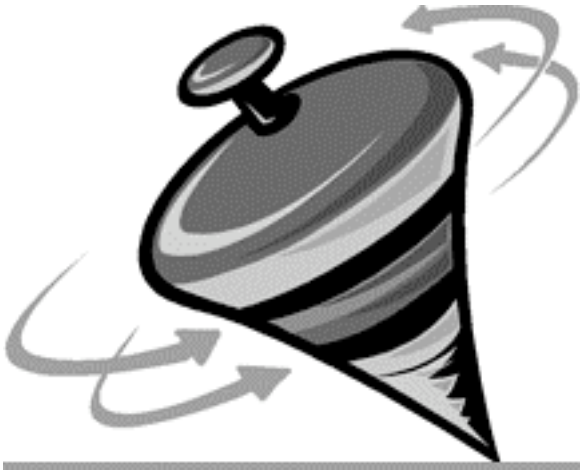
1. I saw the sketch below in the newspaper last summer. The author explained the benefits of using cable barriers instead of concrete on highways in simple terms. Now, you need to explain the same thing using the principles of physics.



2. A 75.0kg football player takes the ball and runs northward up the field at 5.00m/s. An 88.0kg tackler heading eastward across the field at 3.50m/s grabs the ball carrier. Find their combined speed and direction just as they collide.

3. A physics student is given a sphere and asked to determine whether it is hollow or solid. She makes a ramp 20.0cm high and lets the sphere roll from rest down the incline where she measures the final speed to be 1.53m/s. Find the type of sphere she was given.

4. The spinning top shown at the right is on a tabletop. There are two major forces acting on the top. (a)Name these forces. (b)Draw these forces where they act and clearly label them. (c)Describe the torque exerted by each force about the pivot point where the top touches the table. (d)Draw and clearly label the angular momentum vector for the top. (e)Explain why the top will precess and describe the direction of the precession.



5. A 50.0kg athlete about to do a push-up lies horizontally with only her hands and toes touching the ground. Her center of mass is 60% of the way from her toes to her head and her hands are 85% of the way. Find (a)the force that ground exerts on her hands and (b)the force that her hands must exert on the ground.