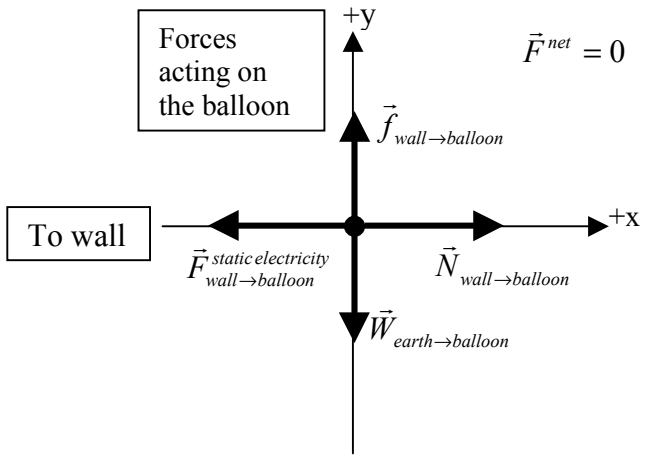
Physics 2048C Test 2 Solutions Dr. Jeff Saul
Fall 2001

Problem 2 (Estimation: 10 points)

Based on a student solution:



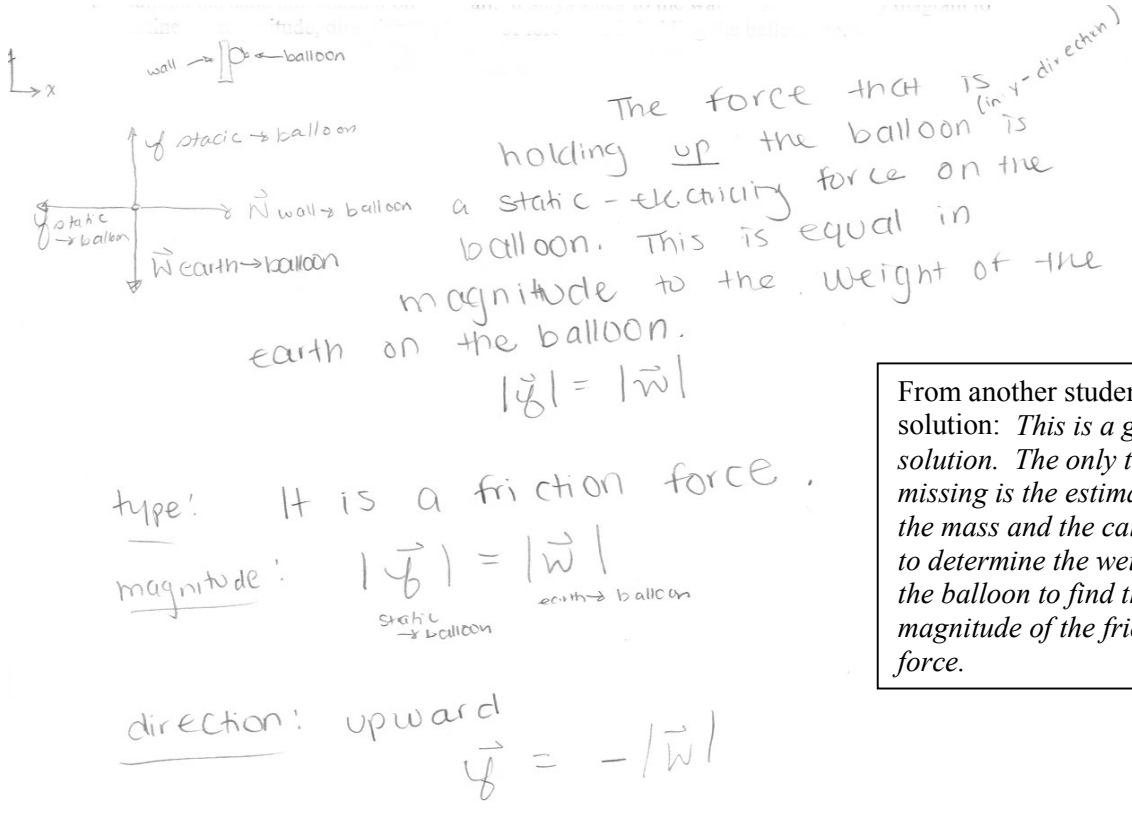
Comment: *Although the balloon is attracted to the wall by an electric force caused by static electricity, it is the friction force of the wall acting on the balloon that keeps the balloon from falling down. This problem is similar to the problem we did in class where we looked at what keeps a refrigerator magnet up.*

Desired unknown is the friction force between the wall and the balloon. This is what is keeping the balloon up.

Estimate a non-inflated balloon weighs 2 grams – full of air may mass 1 more gram
Total mass = 3g
3g = 0.003 kg

Thus $\vec{W} = mg = (0.003\text{ kg})(9.8\text{ m/s2})$
$\vec{W} = -0.0294N\,\hat{j}$ (downward)

Since net force is zero, the two vertical forces must be equal in magnitude and opposite in direction, so
$\vec{f}_{wall\to balloon} = -\vec{W}_{earth\to balloon} = -(-0.0294N)\hat{j}$
$\vec{f}_{wall\to balloon} = 0.03N\,\hat{j}$



From another student solution: *This is a good solution. The only thing missing is the estimation of the mass and the calculation to determine the weight of the balloon to find the magnitude of the frictional force.*