Laboratory Investigation Name _____

Physics@Frisch: Form L4.1A Date _____ Period _____

Newton's Laws

Problem

How can Newton's laws be observed?

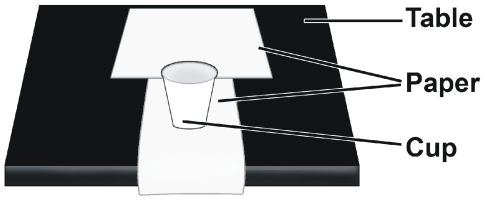
Introduction

Newton described the relationship between force and motion with three laws. Newton's First Law says if the net force on an object is zero, it maintains its state of motion. In other words, an object in motion will remain in motion at the same speed and in the same direction, while an object at rest will remain at rest. Newton's Second Law says the acceleration of an object is equal to the net force divided by the mass. In other words, the larger a mass is, the smaller the acceleration is that it gets from a given force. Finally, Newton's Third Law says forces always act in equal but opposite pairs. This means for every action force, there is an equal but opposite reaction force. In other words, if you press on an object, the object presses back on you. In this laboratory investigation, you will observe Newton's laws in action.

Materials (*per group*)

Copy paper (2); plastic cup; ruler; small balloon; weight

Procedure



1. Place a piece of copy paper on your table top hanging just a couple of centimeters over the edge. Place another sheet of paper on the table top flush with the top edge of the first sheet of paper to keep track of where the top edge is.

2. Put a small plastic cup on the first sheet of paper about a centimeter or two from the top edge. Using a ruler, measure the initial distance of the cup from the top edge. Record the result in the data table below.

3. As quickly as you can, pull the paper straight out from under the cup. Then measure the final distance the cup ends up from the top edge of the first sheet of paper. Record the result in the data table below.

4. Repeat steps 1–3 two more times for a total of three trials.

5. Place a weight in the cup and repeat the entire procedure (steps 1–4) for a total of three trials with the weighted cup.

6. Calculate the distance the empty cup and the weighted cup moved in each of the three trials by subtracting the initial distance from the final distance. Record the result on the next page. Then find the average separately for the empty cup and the weighted cup by adding the three trials together in each case and dividing by three.

7. Blow up a small balloon. Then let go and watch what it does.

Observations

Location of the Cup (Distance from the top of the paper)				
Trial	Empty Cup		Weighted Cup	
	Initial distance (cm)	Final distance (cm)	Initial distance (cm)	Final distance (cm)
1				
2				
3				

CALCULATIONS

Distance the Cup Moved (cm)		
Trial	Empty Cup	Weighted Cup
1		
2		
3		
Total		
Average		

CONCLUSIONS

1. How did the distance the cup moved in each case compare to the distance the paper pulled from beneath it moved. Which of Newton's laws does this illustrate? _____

_____

2. What force caused the cup to move? What force caused it to stop moving? _____

_____

3. Which cup moved further, the empty cup or the weighted cup? Why? Which of Newton's laws does this illustrate? _____

_____

_____

4. Describe the behavior of the balloon after you let it go. _____

_____

_____

5. What is causing the balloon to move? Which of Newton's laws does this illustrate? _____

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