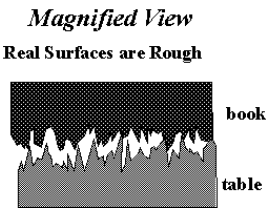
Name _____ Period ____ Date _____

Friction Lab



Introduction

Imagine that your lab group is competing in a four person tug of war match with the group next to you. We clear all of the tables away from the center of the room and break out the rope. If everyone is perfectly matched on both sides of the rope there will not be any movement. When all the forces acting on an object cancel out, we say that they are **balanced**. If the forces are balanced than a stationary object remains stationary and a moving object keeps on moving at the same speed and in the same direction. For example, a book resting on a table has balanced forces. The pull of gravity acting downwards on the book is balanced by the upward force on the book provided by the table. Because the forces are balanced, the book just sits there.

Think back to our tug of war match. What would happen if the teams were not matched up fairly? What if Mr. LaBare helped on one side? Then the forces on the rope would be uneven and the other team would fall on their faces in defeat!! When all the forces acting on an object do not cancel out, we say they are **unbalanced**. If the forces are unbalanced a stationary object begins to move in the direction of the unbalanced force. An unbalanced force will make a moving object speed up, slow down or change direction depending on the direction of the unbalanced force.

Friction is the "evil" of all motion. No matter which direction something moves in, friction pulls it the other way. Move something left, friction pulls right. Move something up, friction pulls down. It appears as if nature has given us friction to stop us from moving anything. Friction is actually a force that appears whenever two things rub against each other. Although two objects might look smooth, microscopically, they're very rough and jagged. As they slide against each other, their contact is anything but smooth. They both kind of grind and drag against each other. This is where friction comes from. But friction is not all bad. In fact, it has a lot to do with life as we know it here on Earth. Without it, we wouldn't be able to walk, sit in a chair, climb stairs, or use a mouse to surf the web. Everything would just keep slipping and falling all over the place.

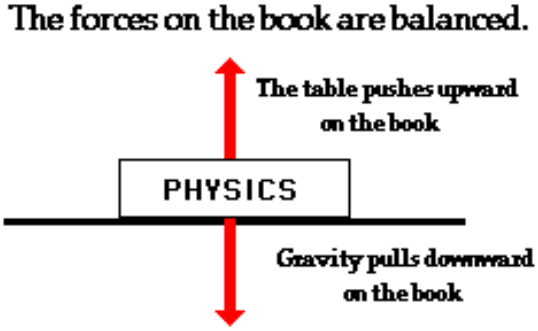
☐ **Balanced Forces :** Do not cause a change in motion. They are equal in size and opposite in direction.

☐ **Unbalanced Forces :** Always cause a change in motion. They are not equal and opposite.

☐ **Friction :** The force that opposes motion. Friction acts in a direction opposite to the object's direction of motion. Without friction an object would continue to move at a constant speed forever.

Materials Needed

- Pen/pencil
- Science books (2)
- Wood ramp
- Toy car
- Meter stick
- Wax paper
- Aluminum foil
- Fabric
- Sand paper
- Calculator



Procedures

1. Get into groups of three or four.
2. Collect the required materials to do this lab.
3. Set up your track by stacking the science books and placing the wood ramp on top of the books (see figure below).
4. Now pick one of the surfaces provided and place one edge under the bottom of your track.
5. Observe the surface, feel it, and write a short description in the table below.
6. Place your car at the top of the race track and release it.
7. Measure the distance from the bottom of the ramp to the point where the car's front wheels stopped. Record your observations in the data table below.
8. Repeat steps 4 through 7 two more times on the other surfaces. (Make sure that the car runs in as straight a line as possible.)
9. Average your test results for each surface.
10. Rank the surfaces that you tested in order, from the greatest (1) to the least (5) distance traveled.
11. Answer the questions below.

Data and Observations

Surface Type	Description of Surface	Distance (cm)				Ranking
		Trial 1	Trial 2	Trial 3	Average	
Wax Paper						
Aluminum Foil						
Fabric						
Sand Paper						
Desk						

Analysis and Conclusions

1. What effect did a smooth surface have on the car's motion?

   _____
   _____

2. What effect did a rough surface have on the car's motion?

   _____
   _____

3. Which surface had the greatest friction? Which had the lowest amount of friction?

   _____
   _____