Name _____ Science Course_____

Pre Lab Due _____ Post Lab Due _____ Grade _____

Is Friction Good or Bad?

Have you ever had a carpet burn after someone pulled you across the floor? Have you ever felt how hot the end of a nail is after using the hammer claw to remove it from a block of wood? Why is it you can warm up your hands, if you rub them together? Even without electricity when two surfaces rub against each other, it causes friction, with a by-product of heat.

Friction is a force that is always working against motion.

The balance between friction and motion is important in many situations. For example, racecar drivers must have tires that will keep the car from slipping on the track, but they don't want so much friction that it takes more of the car's energy to move the car forward. They must find the "perfect" friction level to have the best performance.

There are entire companies built around this concept of friction. There are engineering corporations who specialize in testing road safety by doing both field and laboratory testing. The "Safety Direct America" is a company that specializes in the friction of floors. They offer services such as sustainable slip resistance testing and periodic slip test monitoring. Their employees make site visits, use equipment to run tests to gather data. This provides them with numbers to find coefficient of friction mathematical calculations. Think about all the airport floors, mall floors, museum floors, and floors within businesses—safety of the consumer is important, or law suites will prevail! Other companies also have a focus on friction. Some experiment and chemically produce synthetic lubricants used on all kinds of machines.

In some situations, we want friction, (like on roads and floors) but friction includes a loss of energy (as unusable heat), and therefore is one of the biggest enemies of designing efficient machines. Test your knowledge of products designed to overcome friction by matching the description with the product.

1. Greasy substance (stored in a spray can) used to reduce squeaks on metal objects.
2. Spherical structures placed between two objects to ease the movement between two moving surfaces.
3. Specialized machine used to cut stone, bricks, and tile.
4. Lubricant used in woodworking that doesn't stain wood.
5. A carbon-based dry lubricant mixed with liquid base that allows it to be painted on leaving the friction reducing substance behind.

A. liquid graphite
B. Wet Saw
C. WD-40
D. ball bearings
E. Silicone Spray

Friction Demo

Trial #				
1				
2				
3				

PreLab Questions

A. List some ways that friction can be reduced. Think about anything mechanical, how can you reduce the amount of heat and make it run more efficiently?

B. Think about a surface where increased friction dictates safety. List some ways that friction can be increased.

The universal friction challenge--Find a way to reduce heat and the amount of energy it takes to move two surfaces past one another.

Friction is caused by the interference of the atoms or molecules of each object sliding over each other. A rough surface will produce more friction than a smooth surface. No matter how smooth surfaces may appear, they are rough on an atomic level, and when they rub, friction always produces some amount of heat which is lost as unusable energy.

Two types of friction: The first is static friction, which is friction between two objects that aren't moving. Then there's dynamic (sometimes called kinetic) Friction, or the friction between two moving objects.

Your Challenge: Design a Friction Experiment

Design a friction experiment. Think of a way to improve a product, make a machine work more efficiently or some other application where friction is key. Therefore, in your experiment you will be collecting data to either increase, or decrease friction. Using simple materials design a way to measure the differences in friction so you can test your idea.

You'll need a way to compare your trials using measurement. If you study kinetic friction, you might design a method to drag something across a flat surface and measure how far it travels. If you want to study static friction, your method might include an object in which you put weight, and then measure how much weight it takes to overcome the friction.

My Idea:	
Independent Variable (the ONE change you are testing)	Constants: (All the ways you will keep the experiment the same so you know your independent variable is the only thing influencing your results.)
Dependent Variable (the way you will measure changes)	
My Hypothesis: (Make a prediction of which group will perform the "best.")	

Possible Materials you may consider as you design a way to measure friction

- small box
- pennies or pebbles
- string
- water (or other liquids)
- small plastic bag
- pencils, rods, or dowels
- marbles
- rubber bands
- liquid graphite
- vegetable oil
- WD-40
- balance (measure in grams)
- ruler (measure in cm)
- surfaces of different roughness
    - sandpaper
    - marble
    - wood
    - plastic
    - felt/fabric
    - aluminum foil
    - wax paper

Play Time

Using your gathered materials, play with the items until you are happy with your procedure. As you work, ask yourself these questions:

- Is this accurately measuring changes in friction?
- Does my procedure provide a measurement that can be compared? (Think about constants that should remain the same for each group to make them comparable.)
- Is the procedure easily replicated so that someone else would get similar results?

- Will doing multiple trials help me to get more accurate data? Should I conduct multiple trials (then calculate central tendencies—mean or mode)?
- Does my procedure allow me to compare my independent variable fairly?

Write out your step-by-step procedure below:

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.
13.
14.
15.

Data: Design a data table below, using the rows below as your starting point. Make as many columns as you need, being sure to label the contents of each column.

PostLab Questions

1. What are some things (extraneous variables) that may have influenced your results?

2. How could you modify your experiment to make it better?

3. Were you testing static or kinetic energy? How do you know?

4. Describe how you could change your procedure to remove one of the extraneous variable.