WOW sheet

Friction

Here is what 'friction' means in physical science:

> Friction is a force between two surfaces that prevents those surfaces from sliding or slipping across each other.

In other words, friction is the force exerted by the surface of one object as another object moves across it (or makes an effort to move across it). Friction is the force of resistance to the motion between the two surfaces moving over each other.

Here's an example

Take your hand and place it on your desk or table, with your palm down. Now, drag your arm back to your body. You can feel the desk's surface 'gripping' against your hand as you move it. That's friction between your hand and the desk!

Friction is a **contact force**.

Contact forces are forces that act between two objects that are physically touching each other. Because friction is a contact force, two surfaces must be in contact for there to be friction between the two objects.

Friction is also reliant on motion. Friction results from two moving surfaces being in contact with each other.

Friction and motion

Newton's first law tells us that an object in motion tends to stay in motion, traveling at a constant speed and in a straight line. However, in our daily lives, this is not what we see. We see objects slow down and eventually stop.

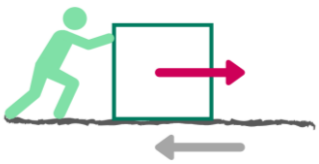
Here's an example

Imagine you are standing in gravel parking lot. There is a big box sitting on the ground near you. You shove the box hard and it starts to slide across the ground.

But it only slides for a little bit before it comes to a stop.

Newton's first law tells us that once the box was in motion, it should stay in motion unless an outside force acts on the box. You didn't touch it again. So why did the box stop?

The force of friction between the box and the surface of the ground below the box was acting on the box. Friction will stop motion if the moving force is not strong enough to overcome the contact between the surfaces. In our daily lives, friction is often the force that causes objects to slow down and stop.



Friction is caused by roughness on surfaces which prevents or impedes movement. Even surfaces that seem smooth have tiny imperfections that cause friction. The rougher the surfaces, the more friction there is. The type of material the surfaces are made of also impacts how much friction there is.

Here's an example

Let's try another friction experiment with your hand and your desk. This time, put a piece of paper that is at least as big as your hand in between your hand and your desk. Place your hand, palm down, on the paper. Then drag your arm back to your body. Did you notice that the desk's surface seemed to 'grip' against the paper less than it did against your hand?

The nature of the two surfaces, including the type of materials the surfaces are made out of, impacts the magnitude of the force of friction!

The magnitude of the force of friction (that is, how much friction there is) also depends on the degree to which the surfaces are pressed together.

Here's an example

Put your hand back on your desk again. This time, push your palm down into the desk. Now, drag your arm back to your body. Did you notice that the desk's surface seemed to 'grip' against your hand more than the first time?

Increasing the degree to which your hand and the desk are pressed together increased the force of friction between them!

Friction doesn't stop all motion

While friction is a force that *resists* movement, it doesn't stop all movement. In fact, friction helps us move!

Here's an example

When you walk, there is friction between your foot or your shoe and the ground. As you raise one foot and move it forward, the rear foot grips the floor. If it didn't, every time you lifted up one foot, the other would slip and you would fall! Friction lets you push against the floor's surface and move forward.

Another example is tyres. If it weren't for friction, wheels on a wheelchair, a car or a bicycle would just spin. Friction between the tyre and the ground stops this spinning and turns it into movement instead!

If the force of friction is greater than the force trying to cause movement, however, then friction will stop an object from moving.

Here's an example

Think back to the box on the ground.

On the gravel parking lot, friction stopped the box's movement after just a little bit. What if the box was sitting on ice instead?

Ice is much smoother than gravel so the same force will cause the box to slide quite a lot. And if you could make a surface that was completely frictionless, then the box would slide forever!