

Everything You Have Ever WANTED To Know About FRICTION

Chapter 5 Lect 4
Section 3

This is also titled....

SLOW DOWN
YOU MOVE TOO FAST!

19. Bill Nye Science Friction Theatre

Science
Friction
Theatre

The
Lucky
Cow...

- In this animation, the driver of the car applies the brakes to avoid hitting the cow.
- But how does this cause the car to slow down and stop?
- The brakes cause the wheels to stop turning and to slide on the road surface.
- This action produces a force that resists the forward movement of the car.
- This force is called **Friction**

•Friction is a force...

- that acts to resist the motion of one object sliding over another.
- You may be used to seeing moving objects slow down and stop once the force pushing or pulling the objects is removed.

•For example a wagon will stop moving once you stop pulling it.

•And in this case: A ball will stop moving once it is caught.

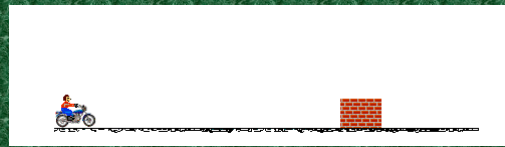


Friction is a force...



- What you may not realize is that there are many forces acting upon objects that affect movement.
- Friction is one of these.
- Friction occurs when two objects are rubbed together.
- The bumps of one surface catch and hook into the bumps of the other surface.

20. Bill Nye Friction Finger



- When the surfaces stick together, the motion between the objects slows down and stops.

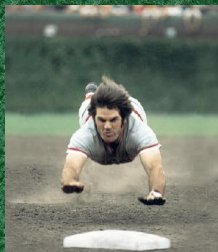
- Frictional forces make it possible for us to walk, hold balls, open jars, and ride bikes.



- Lots of friction helps keep things in place (cleats on soccer shoes help the shoes grip the ground),
- while little friction can make motion easy (moving over a smooth surface like a slide).



- Most motion on earth involves friction.
- A ball rolling on a level floor will eventually stop because the floor pushes against the ball and creates friction.
- When you play baseball and slide into a base, you stop because of friction between you and the earth.
- If there were no friction you would slide right on over the base.



- It is the force of friction that opposes an object moving.
- Many people think that it is a nuisance because it has caused us to apply a greater force to move an object.
- But in fact, it is of great help to us.

Pushing a Crate Across the Floor—
A Demonstration of the Relationship
Between Static and Kinetic Friction



21. Myth Busters

Discovery

- If there is no friction, then cars cannot move on the road and we can hardly even walk.



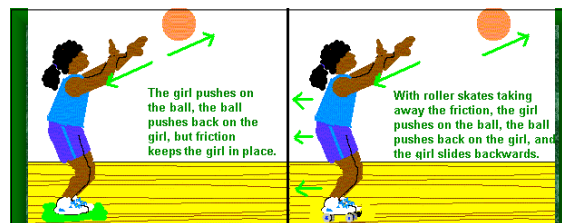
- Imagine when you go skiing, is it very hard to walk on ice?
- How 'bout those penguins?

4 types of Friction: know these!

- Static
- Sliding
- Rolling
- Fluid

22. 4 types of Friction (review)

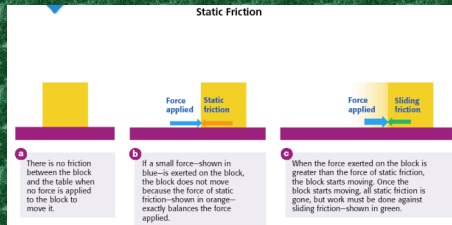
Go Home to Auto Your Car



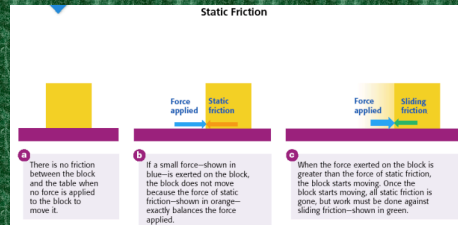
- Frictional forces act along the common surfaces between two bodies in contact so as to resist the relative motion of the two bodies.
- The frictions involved form an action-reaction pair.

• Static Friction

- In this figure, a horizontal force is applied to a body with an intention to move it to the right-side. (note: if the force applied is too small the "static friction is greater and the block will not move.)



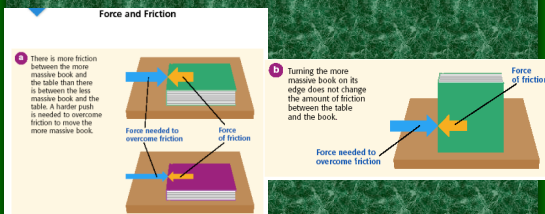
- As long as the body is at rest, the frictional force is equal to the applied force and directs to the left-side (opposite direction of motion) resisting the motion.
- The friction is static as there is no motion.



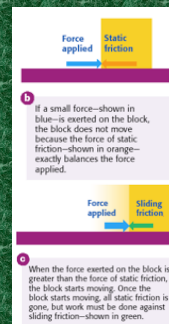
Greater Mass Creates More Friction

(write this at the top of the next page)

A greater push is needed to overcome the greater mass which has greater (static) friction



Static Friction



- If applied force is increased, the frictional force will also increase until it reaches the **limiting frictional force**.
- As the applied force increases further, the body will begin to move.
- The limiting frictional force is independent of the applied force but depends on the nature of the surfaces and the normal contact force.

What is Net force?

- Combining all forces exerted on an object

Draw this at the bottom Of the page!

APPLIED FORCES	NET FORCE

Calculating net force:

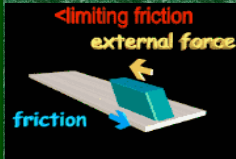
Combining all forces exerted on an object

- Forces in the **same** direction
- Add** forces together

APPLIED FORCES	NET FORCE

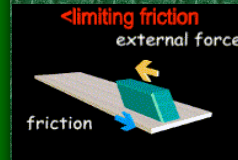
- Forces in the **opposite** direction
- Subtract** smaller force from the larger force

Static Friction



- This figure shows that object begin to move if the applied force is larger than the limiting friction.
- Before that, the frictional force increased with the applied force.

•Static Friction continued:



- Once the body starts to move, the frictional force would fall to a smaller value compare with the static frictional force.
- This frictional force remains constant even though the applied force is increased further.

- A plane and it's friction experience with "Sliding Friction"



Sliding friction = HEAT



•Rolling Friction

- The friction between the wheels and the ground is an example of rolling friction.
- The force of rolling friction is usually less than the force of sliding friction



Rolling Friction

Figure 13 Comparing Sliding Friction and Rolling Friction



•Fluid Friction

- Fluid friction opposes the motion of objects traveling through a fluid
- Remember that fluids include liquids & gases, water, milk and air are ALL fluids



Figure 14 Swimming provides a good workout because you must exert force to overcome fluid friction.

23. FRICTION SONG...

