

DOWNHILL RACER

THE SLIDE

Go to a school or neighborhood playground. Do the following experiments on a slide.

ACTIVITY 1

THE STRAIGHT SLIDE

Procedure

- 1 Ride the slide from the very top all the way to the bottom.
- 2 Next, slide halfway down, then stop yourself by carefully grabbing the sides. Now let yourself slide the rest of the way down. Make sure you don't do any extra pushing.
- 3 How does your final speed in the first case compare to your final speed in the second?

MORE FUN STUFF TO DO

How Far Can It Go?

Try the same experiment with a smooth ball. First, start the ball at the top of the slide. See how far it rolls when it gets to the end of the slide. Next, start the ball at the middle of the slide. Compare the distance the ball traveled when it started near the middle to the distance it traveled when it started near the top of the slide. Are the distances the same?

ACTIVITY 2

THE CURVED SLIDE

Some playgrounds have slides that make a twisting curve on the way to the bottom. If you have a slide like that, try the next investigations as well.

Procedure

- 1 Go to the top of the straight slide with a marble or small ball.
- 2 Place the marble or ball so that it will roll down the middle of the slide. Let it go and watch what happens. Does the marble stay in the middle of the slide?
- 3 Do the same thing on the curved slide. What happens to the marble this time? Does it stay in the middle of the slide or move to one side?
Ride the slides yourself. Do you go faster or slower on the curved slide? Do you move to the inside or the outside of the slide as you go down?

Explanation

The slide provides a perfect illustration of the **law of conservation of energy**. This law states that energy can change from one form to another but cannot be created or destroyed.

At the top of the slide, you have a type of energy called **potential energy (PE)**, which is stored energy that can be used later. When you start down the slide, your movement comes from another type of energy, **kinetic energy (KE)**, which is energy that is being used, the energy caused by motion.

MORE FUN STUFF TO DO

Get Busy, Get Dizzy

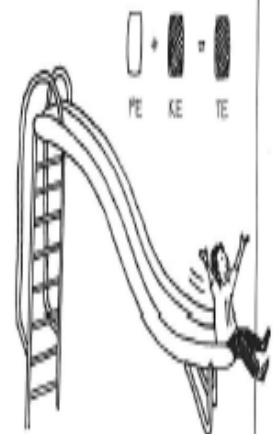
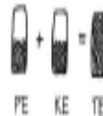
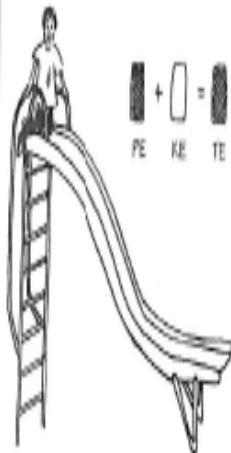
Try to go down the curved slide two or three times in a row. How do you feel? Do you get dizzy?

But where does kinetic energy come from? The law of conservation of energy states that energy can't be created from nothing, so it has to come from somewhere else. Kinetic energy comes from changing some of the potential energy into kinetic energy. The higher the slide, the more potential (stored) energy is converted into kinetic energy or motion. At the bottom of the slide, all the potential energy is changed into kinetic energy and so you go the fastest. The farther you slide, the faster you go.

The diagrams on the next page show the conversion of potential energy (PE) into kinetic energy (KE) during a slide ride. Potential energy is converted into kinetic energy, but the total energy (TE) remains the same. That's the law of conservation of energy.

On a curved slide, **centripetal force** comes into play. This is the force that causes an object to move in a circle. It literally means the "center-seeking" force. Gravity makes you go down the slide in a straight line, but because the slide curves, centripetal force makes you slide along the curve. You think you are being thrown to the outer edge of the slide, but gravity is just trying to make you go straight on a curved slide. (See "Spin Yourself Silly: The Merry-Go-Round," page 19, for another example of centripetal force.)

The ball or marble will behave in the same way. It will move faster if it is started near the top of the slide, and it will move to the outside edge of the curve.



Key

PE potential energy

KE kinetic energy

TE total energy

If you go down a curved slide many times, you may feel sick or dizzy. That's because the inner ear, which is responsible for balance, gets messed up by spinning around in a circle. After a short time it returns to normal.

❑ ACTIVITY 3

FRICION ON THE SLIDE

Try this next experiment on the slide as well.

Procedure

- 1 Ride the slide from the top to the bottom.
- 2 Ride the slide from the top to the bottom again, but this time ride on a piece of waxed paper or a nylon jacket.
- 3 Which ride was faster?

Explanation

Friction is a force that works in the opposite direction to an object that is moving along a surface. Friction can come in many forms, but it always resists motion. The amount of friction depends mainly on the materials involved. Waxed paper and a nylon jacket help to reduce friction. Can you think of any other way that you could decrease friction?

❑ MORE FUN STUFF TO DO ❑

Roll Away

You can design your own slide at home. Use a grooved plastic ruler for the slide and a marble for the rider. Do your own investigations. Try different degrees of steepness. Experiment with straight and curved slides.