The goal of the Progressive Insurance Automotive X PRIZE is to inspire a new generation of viable, safe, affordable and super fuel efficient vehicles that people want to buy. $10 million in prizes will be awarded in September 2010 to the teams that win a rigorous stage competition for clean, production-capable vehicles that exceed 100 MPG energy equivalent (MPGe). Visit progressiveautoxprize.org for more information.

High school teams from across the country competed to design, describe and pitch the dashboard of the future. The three finalists are DASH Tech from Dearborn, Michigan, EDV Technologies from Santa Barbara, California and Harker Innovation Team from San Jose, California. Visit fuelourfuturenow.com to cast your vote for the winner!

Under the Hood activities are designed by the Saint Louis Science Center to help visitors understand the science and engineering factors that affect a car's fuel-efficiency and the changes being considered to improve cars of the future. You won't be able to get 100 miles per gallon like the X PRIZE cars, but you can improve your fuel efficiency with good maintenance and driving behavior. For information about activity instructions and supplies, email jboxer@slsc.org.

This cart includes activities on the following topics:

1. Brakes and Friction
2. Gears
3. Filters
4. CO2
5. Aerodynamics
6. Batteries and Electricity
7. Biofuels

AERODYNAMICS

Experiment with the different cars on the track. What happens when you add weight? What if you tape a folded index card to the top like a luggage rack? Use the hairdryer to simulate the force of the air against the car as it moves forward. You can also adjust the track to different angles to simulate going up and down hill.

What's Going On? When you drive, air pushes against your car, creating resistance. A car that is aerodynamic (in a stream-lined shape) is more fuel-efficient because it slides through the air more easily. A light-weight car is more fuel-efficient than a heavy car. If you put a luggage rack on your roof (like the index card) your car becomes less aerodynamic and, therefore, less fuel-efficient.

Supplies: toy cars, track (made from 2 yardsticks),
hair dryer, small washers
or weights,
index cards, tape

UNDER THE HOOD

PROGRESSIVE AUTOMOTIVE XPRIZE

U.S. DEPARTMENT OF ENERGY

BIOFUELS

Seal ½ cup of soybeans in the bag, place it between layers of newspapers, and pound it with the hammer until the beans are crushed. What do you see inside the bag? Put the crushed soybeans in the jar of hot water and observe.

What's Going On? Scientists are experimenting with making fuels from corn, algae and soybeans. Using renewable biofuels helps decrease our reliance on fossil fuels. Crushing the soybeans produces oil which can be separated out using hot water.

Supplies: soybeans, gallon resealable plastic bag, newspaper, hammer, clear jar, hot water

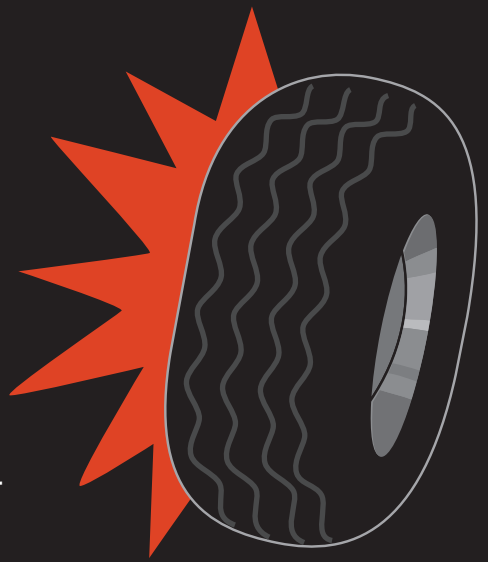
UNDER THE HOOD

PROGRESSIVE AUTOMOTIVE X PRIZE

U.S. DEPARTMENT OF ENERGY

BRAKES and FRICTION

Experiment with the brake on a scooter and with the friction created by an inflated tire or a flat tire. Measure the difference in surface area with the road between the two tires. Turn the scooter upside down and observe how its brakes work.



What's Going On? Brakes work by creating friction with the tires, which is transferred to the road and slows the car down. If you apply your brakes too often, your car becomes less fuel-efficient because it has to use more gas to overcome the friction and keep moving forward. If you don't keep your tires inflated you create too much friction between the tire and the road, which also slows you down.

Supplies: inflated tire, flat tire, "Razor" scooter, ruler

UNDER THE HOOD

PROGRESSIVE AUTOMOTIVE X PRIZE

U.S. DEPARTMENT OF ENERGY

CO_2

You can create CO2, carbon dioxide, using baking soda and vinegar, or observe how yeast produce it when they grow. Even though it's invisible, you can tell it's there. To start the yeast growing in the first bottle, mix 1 T. dry yeast with ¼ c. warm water. Seal the top of the bottle with a balloon. To start the chemical reaction in the second bottle, put 1 T. baking soda in the bottom of the bottle and add vinegar. Quickly seal the second bottle with another balloon. What happens to the balloons?

What's Going On? When fossil fuels (like the gas in your car) are burned to produce energy, they also give off carbon dioxide, an invisible gas, as part of that chemical reaction. Animals (like us) give off carbon dioxide when we breathe. Plants use carbon dioxide in photosynthesis. But too much carbon dioxide in the atmosphere contributes to climate change. According to the Department of Energy, burning fossil fuels accounts for 98% of carbon dioxide gas emissions.

Supplies: two 2-liter bottles, warm water, dry yeast, sugar, baking soda, vinegar, balloons

UNDER THE HOOD

PROGRESSIVE AUTOMOTIVE X PRIZE

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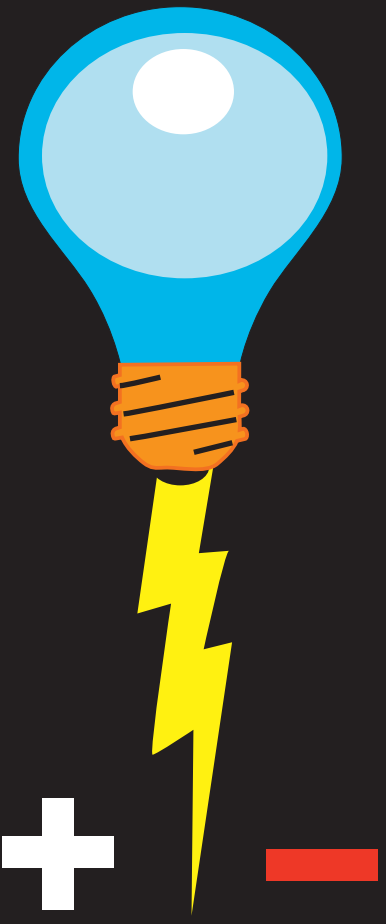
BATTERIES and ELECTRICITY

Complete a simple circuit using a battery, wires and bulb. Try different combinations until you get the bulb to light. Use the kit to see what's happening inside a battery.

What's Going On? After a battery is used for a while, the energy stored there decreases because electric current flows out of the battery to operate a car, cell phone or whatever the battery powers. A battery charger sends electric current into a battery and restores the chemical reaction and the charge stored there. An electric car or a Segway needs to be plugged in after use, to restore its charge.

Supplies: batteries, wires, bulbs, rechargeable batteries, battery charger, phone charger, kit to make a battery



UNDER THE HOOD

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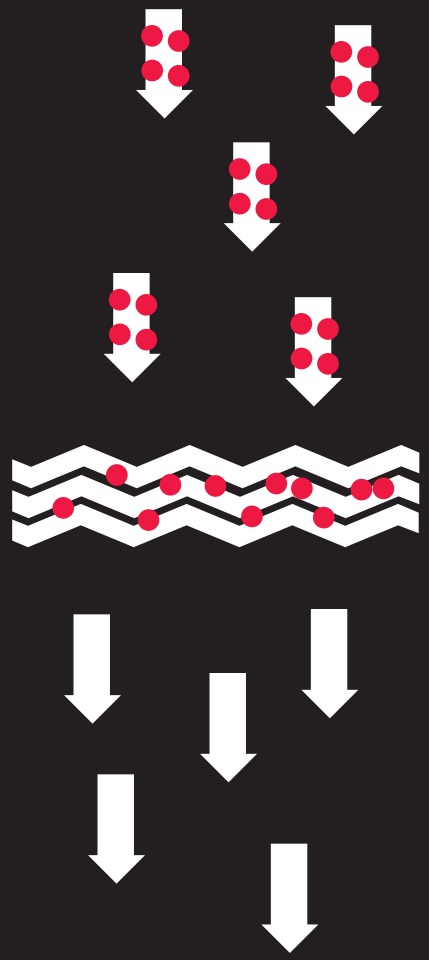
FILTERS

Compare the dirty and clean car air filters. Examine filters with the magnifier to see how they work.

What's Going On? Filters help keep air flowing through your car by collecting dirt from the air so that dirt doesn't get mixed in with the fuel. If your filter is too dirty, dirt gets through into your fuel system and decreases your fuel efficiency. That's why you need to check your air filter and change it regularly. You can find filters in your dryer, your fish tank and other places around your house too.



UNDER THE HOOD

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GEARS

Connect the gears in different patterns, using both small and large gears. Observe the difference in how fast they turn.

What's Going On? Gear ratios allow a car or bike to reach a high rate of speed or climb a steep hill. When you connect a larger gear to a smaller one, the smaller gear turns faster, giving you more speed. That's why when you shift to a higher number (smaller) gear on your car or bike, you go faster. If you need power to go up a hill, you shift back down to the lower (larger) gear.

Supplies: interlocking gears of different sizes

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