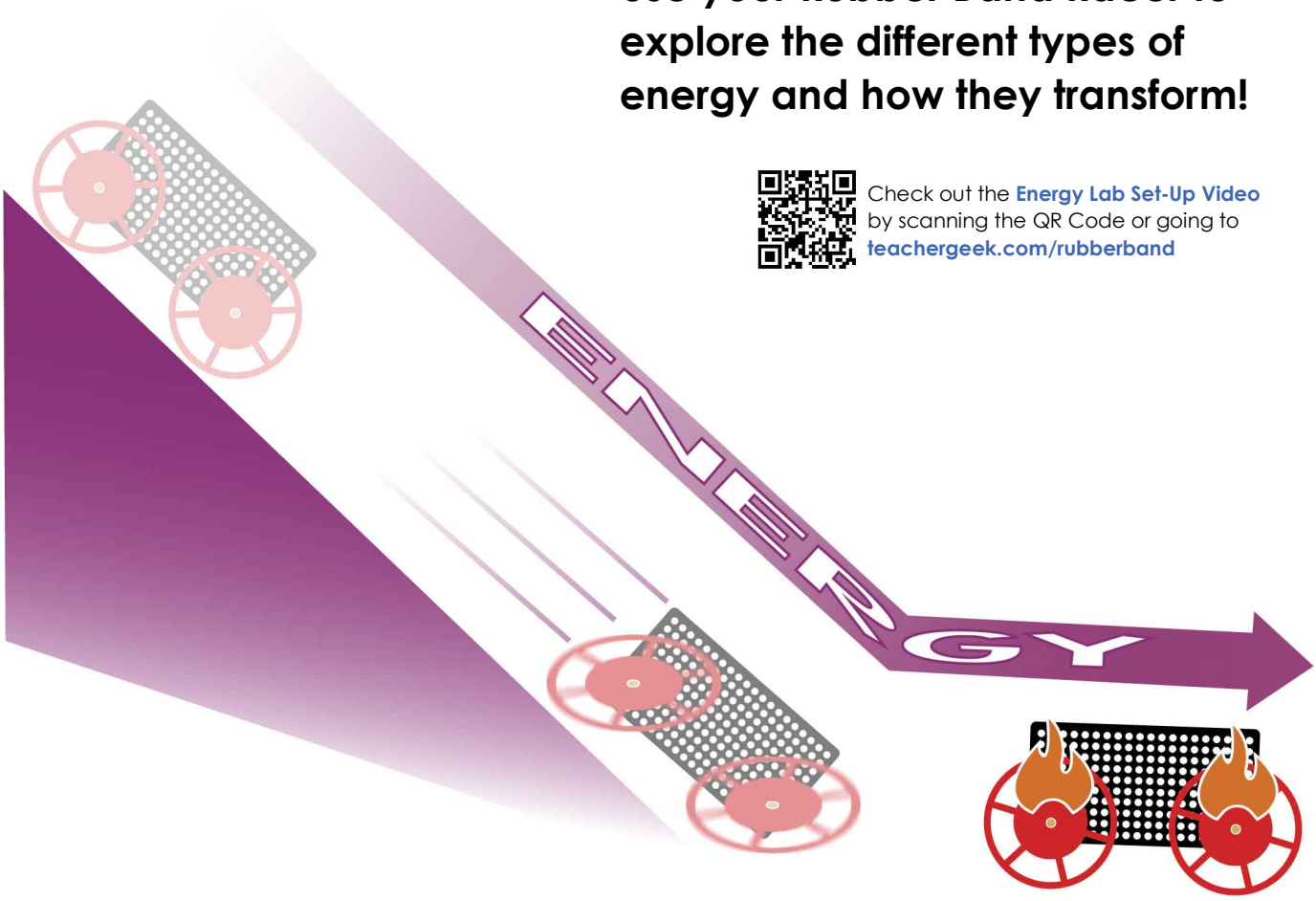
ENERGY LAB

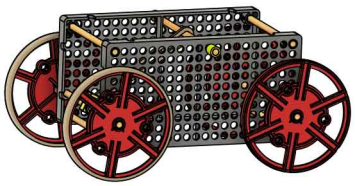
RUBBER BAND RACER

Use your Rubber Band Racer to explore the different types of energy and how they transform!

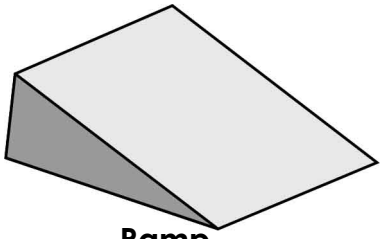
Check out the **Energy Lab Set-Up Video** by scanning the QR Code or going to **teachergeek.com/rubberband**



LAB SUPPLIES



"Built" Rubber Band Racer

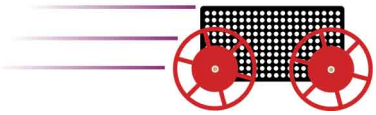


Ramp

Need help building a ramp? Check out the **Ramp Build** at **teachergeek.com/rubberband**

GOOD ENERGY

Kinetic Energy

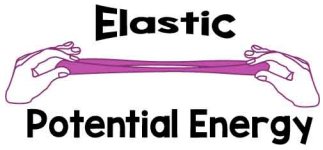


When your car is moving, it contains kinetic energy – the energy of motion. The faster your car moves, the more energy it has.

Potential Energy

Potential Energy is stored energy that can be converted to Kinetic Energy and make objects move. Here are two types of Potential Energy:

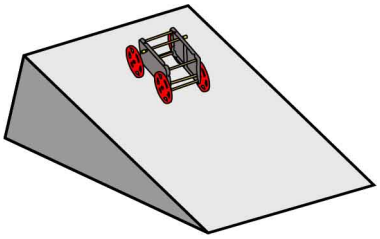
When you lift your racer off the ground, energy is stored in the gravitational field.



When you wind up your racer, energy is stored in its rubber bands.

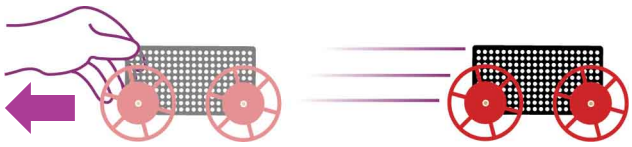
TEST IT OUT!

1. Roll your car down the ramp to convert Gravitational Potential Energy to Kinetic Energy.



How can you control the amount of energy stored by gravity?

2. Wind up your car and release it to convert Elastic Potential Energy to Kinetic Energy.



How can you control the amount of energy stored in the rubber bands?

WHERE'D THE ENERGY GO?

3 According to Newton's Laws, your racer should roll forever. What force do you think makes it stop?

Newton's Law of Inertia

An object in motion keeps moving the same speed and direction unless there is an external force on the object.

4 What do you think happens to the kinetic energy when the racer is stopping? Energy can't be destroyed, so where does it go?

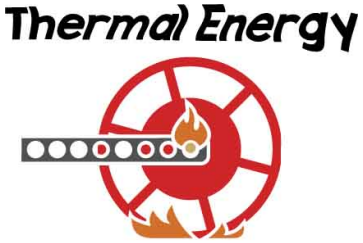
(Hint: you can feel where it goes if you rub your hands together really fast!)

Conservation of Energy

Energy cannot be created nor destroyed; it can only change forms.

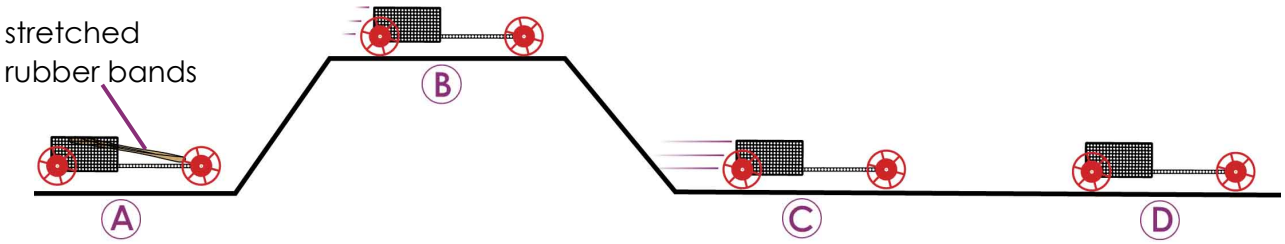
BAD ENERGY

Friction makes your car slow down and heat up – transforming kinetic energy into thermal energy. The hotter an object is, the more energy it has.



ENERGY TRANSFER

5 What type of energy is greatest for each of the racer's positions?



A _____

B _____

C _____

D _____

Word Bank

Thermal Energy
Kinetic Energy
Gravitational Potential Energy
Elastic Potential Energy

DESIGN FOR ENERGY

Changes you make to your design affect your racer's energy transfers. The best racers store lots of elastic potential energy and turn it into kinetic energy. They are also designed to reduce friction, which steals good energy and makes it thermal energy.

POTENTIAL ENERGY

You want your car to store as much energy as possible so it can change it into Kinetic Energy and go even faster!

Store more energy with more rubber bands. Add them in series or parallel to change their strength.

Series

Parallel

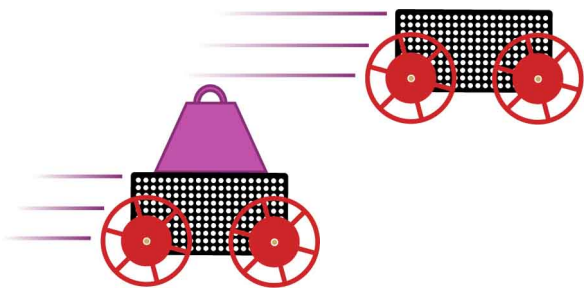
Make sure rubber bands can be stretched all the way so they can store more energy.

If a rubber band runs out of room or is wrapped around the axle, it stores less energy.

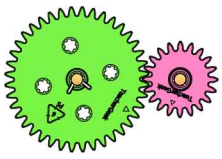
KINETIC ENERGY

This is where you want your energy! Generate as much Kinetic Energy as possible, and keep it as long as you can, to maximize your speed and distance.

Reduce your car's mass. If two cars are moving with the same Kinetic Energy, the lighter car will be moving faster.



Use gears, levers, and series/parallel rubber bands to control energy delivery.

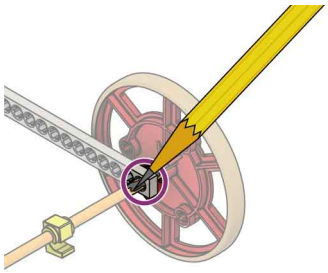


If going for speed, you want kinetic energy as quickly as possible.

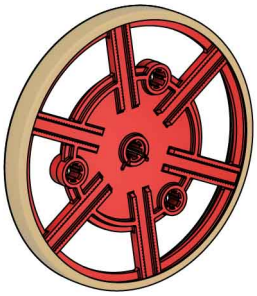
If going for distance, it's better to build kinetic energy slowly and steadily.

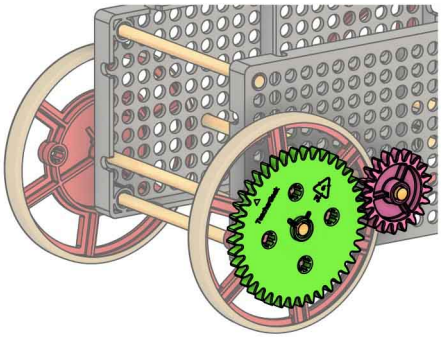
THERMAL ENERGY

Friction can steal your racer's kinetic energy and turns it into thermal energy. But friction can be helpful when it gives you traction, letting your car push off the ground and go faster!



Decrease axle friction by lubricating with graphite (pencil lead). If you reamed the axle holes, make sure the holes are reamed completely.





Gears, pulleys, and levers can help you control the force of your rubber bands, but they also add more friction.

Tire rubber bands add traction to your wheels, helping you convert Potential Energy to Kinetic Energy… But they also increase friction called rolling resistance.

6 Describe one design change you want to make and how it will impact the energy stored or transferred in your racer.