Optimized for use in Student-Paced mode

Speed and Energy

nearpod + PhET INTERACTIVE SIMULATIONS

ESSENTIAL QUESTION

How can we analyze the energy of an object?

Slideshow

LEARNING OBJECTIVE

By the end of this lesson, you will be able to explain and demonstrate that objects with greater speed hold greater energy.

1

2

WHY?

Your door is stuck! You push and push, but it won't budge. You get the bright idea to try getting a running start on your push. You step back a few paces and launch yourself at the door. It opens! Why did running help you move the door? How did the energy in your body affect the energy in the door?

1

2

TODAY'S LESSON

Today, we're going to go on a field trip to a laboratory to **experience** speed and energy. Then, we're going to do a virtual lab to **explore** speed and energy. We'll **explain** our observations as a class and **extend** our exploration by examining how energy is passed from object to object. Then, we'll take a quiz to **evaluate** what we've learned!

Let’s experience forces!

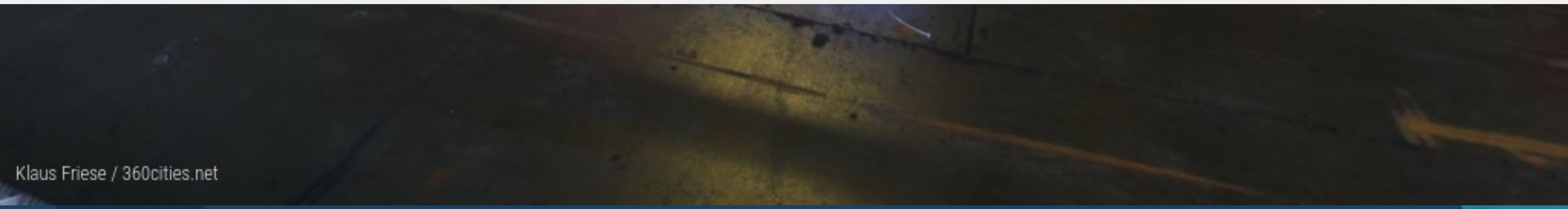
What's your favorite ride at an amusement park?

Collaborate!

GET READY TO OBSERVE!

On the next slide, you will go on an virtual field trip to a bumper cars ride. While you're there, think about the collisions between bumper cars.
What happens when the cars move slowly?
What happens when you drive fast?

https://cdn1.360cities.net/static_embeds/index.html?handle=bumper-car-on-the-hamburger-dom&username=nearpod&secret=390ee1952c959bd775b26f0dca95db1cbc665c7874559588512fcea279d1159b



Open Ended Question

Describe what you saw on the field trip. How do you think speed affects bumper car collisions?

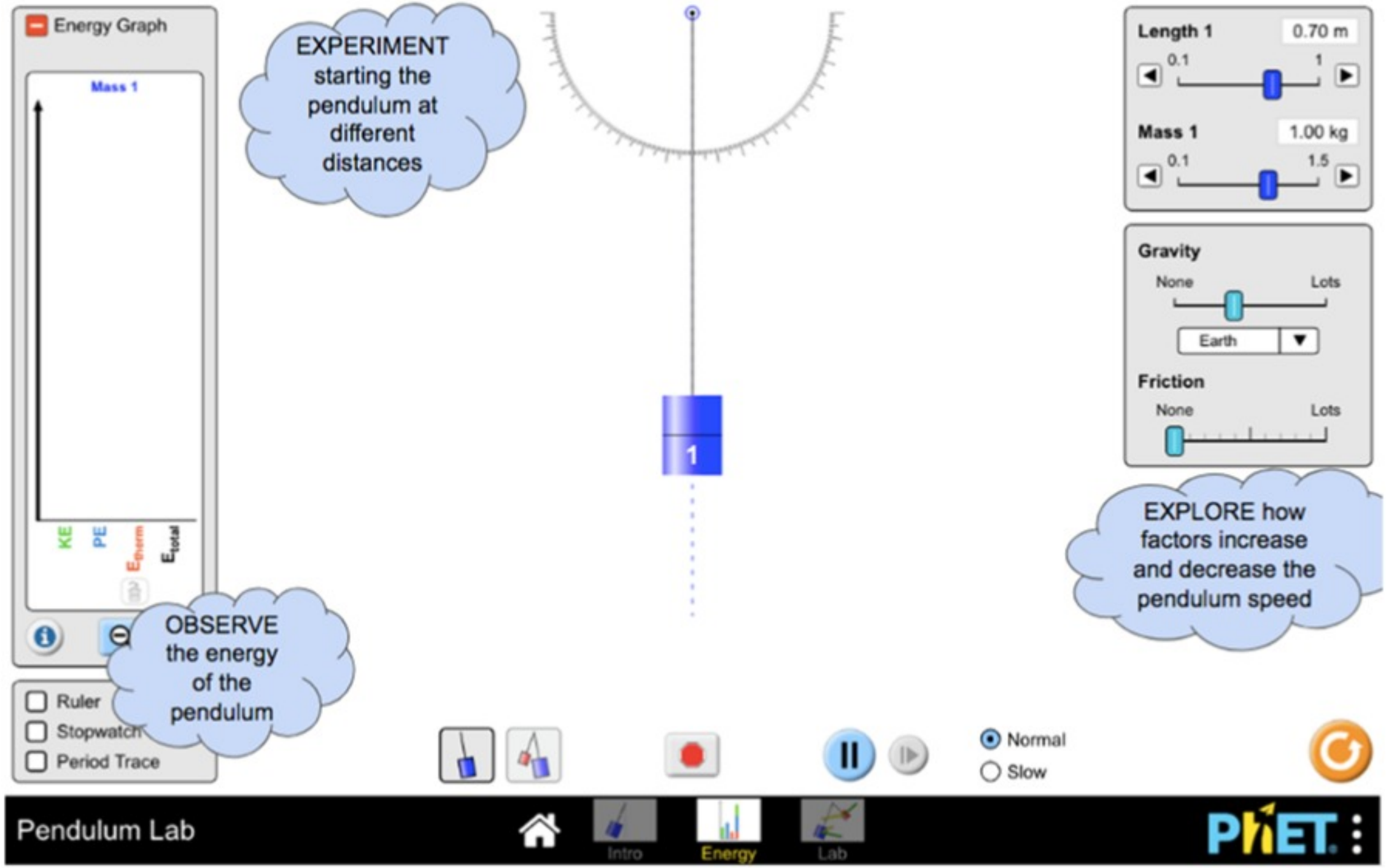
Please enter your answer here.

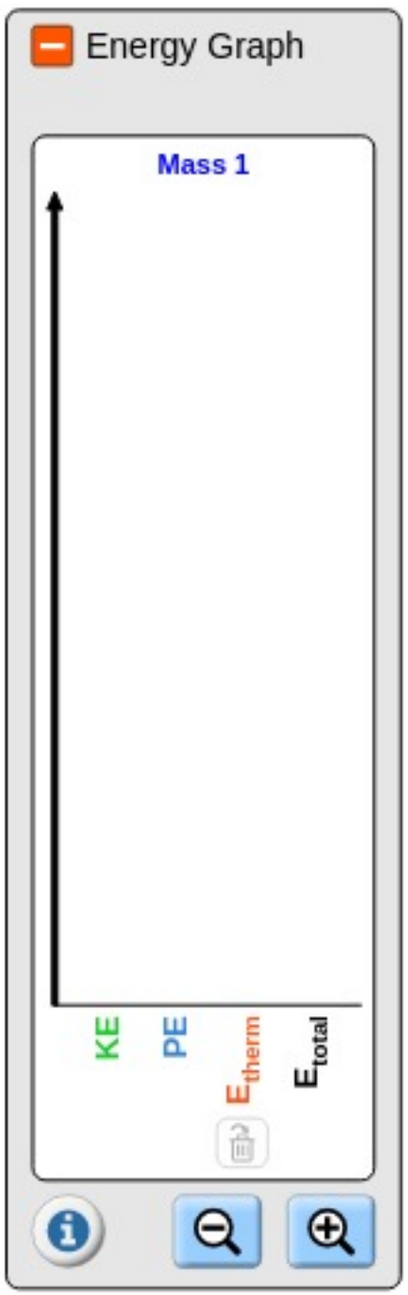
Let's explore!

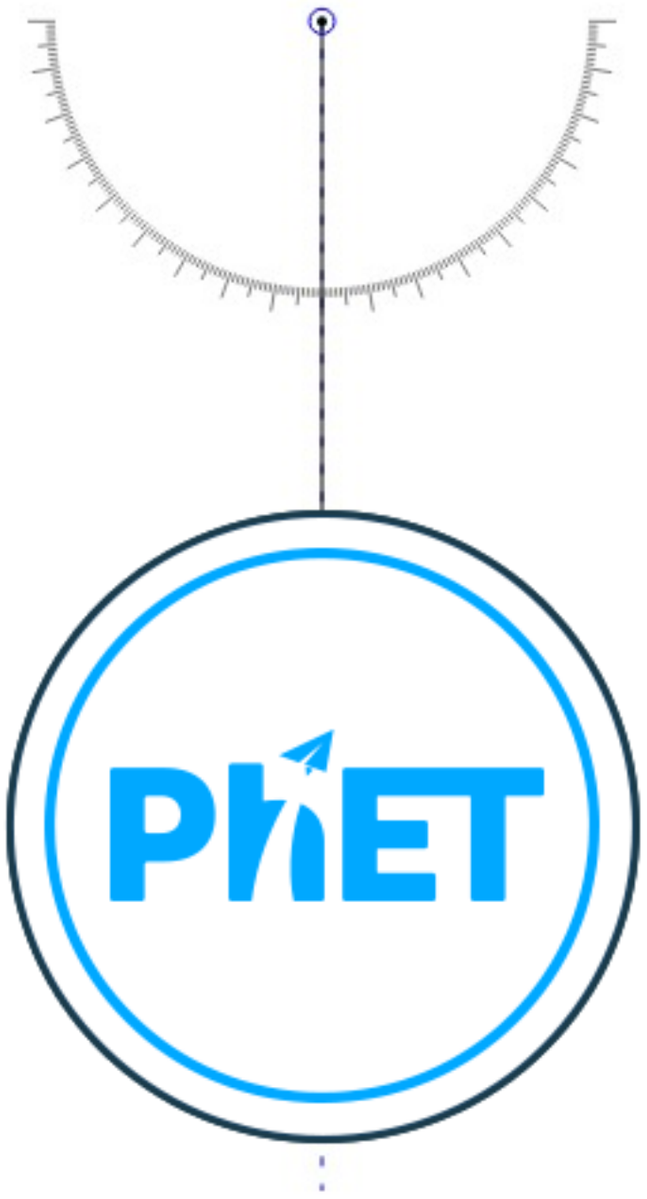
SPEED

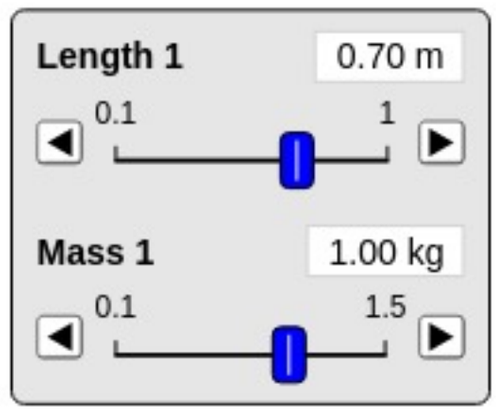
When you use the swings on a playground, you push yourself high up and kick off so you can reach a high altitude and gain speed. Then, you use that speed and energy to swing back and forth. When you have more speed, you also have more energy!

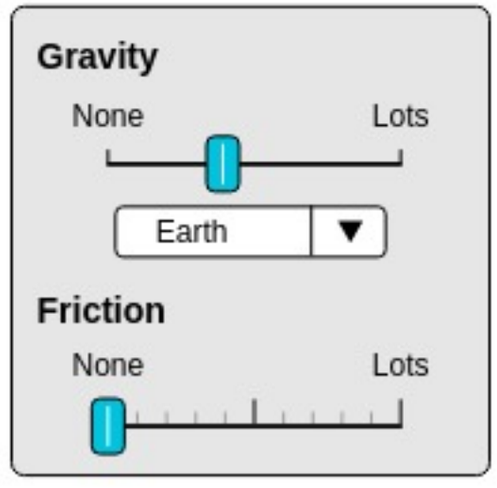
On the next slide, we'll review directions for how to explore a simulation that demonstrates speed and energy. Then, you'll explore on your own!


Energy Graph
Mass 1
KE
PE
E_therm
E_total
Ruler
Stopwatch
Period Trace
EXPERIMENT starting the pendulum at different distances
OBSERVE the energy of the pendulum
1
Length 1
0.70 m
0.1
1
Mass 1
1.00 kg
0.1
1.5
Gravity
None
Lots
Earth
Friction
None
Lots
EXPLORE how factors increase and decrease the pendulum speed
Normal
Slow
Pendulum Lab
Intro
Energy
Lab
PhET









https://phet.colorado.edu/sims/html/pendulum-lab/latest/pendulum-lab_en.html?screens=2

Period Trace

Slow

Pendulum Lab — Energy

Open Ended Question

Explain two ways you changed the pendulum. How did it affect the pendulum's speed? How did it affect the pendulum's energy?

Please enter your answer here.

Draw It

Using the drawing tools, show how an object's energy changes when it is moving faster. Then, show how its energy changes when it is moving slower.

Let’s explain what we observed!

Slideshow

1
2
3

SPEED

How quickly an object changes position from one place to another.

1
2
3

KINETIC ENERGY

How much energy an object has while it is in motion.

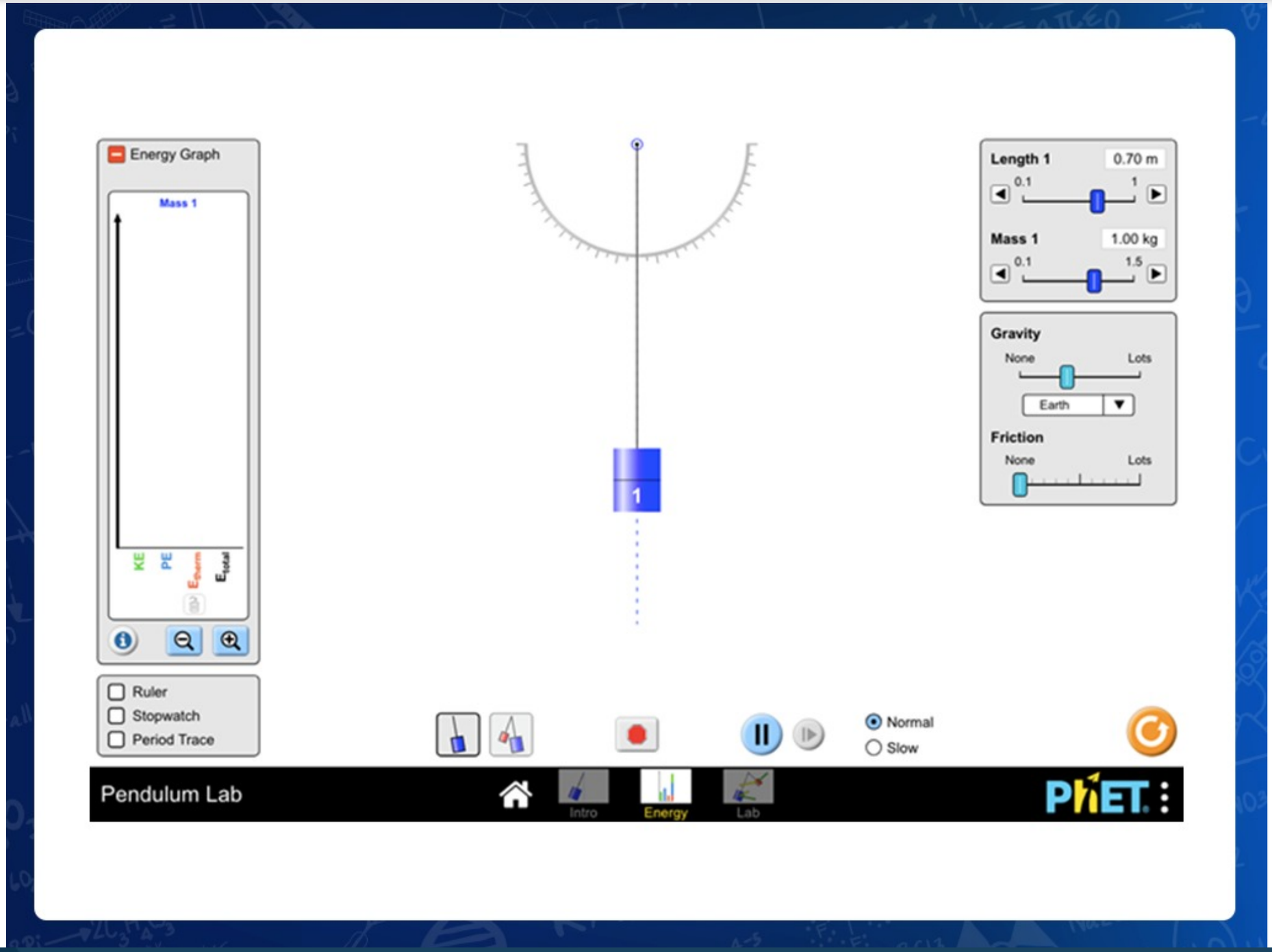
1
2
3

SPEED AND KINETIC ENERGY

When an object has a greater speed, it has more kinetic energy. When an object moves more slowly, it has less kinetic energy.

Draw It

Show one way we could increase the kinetic energy of our pendulum.



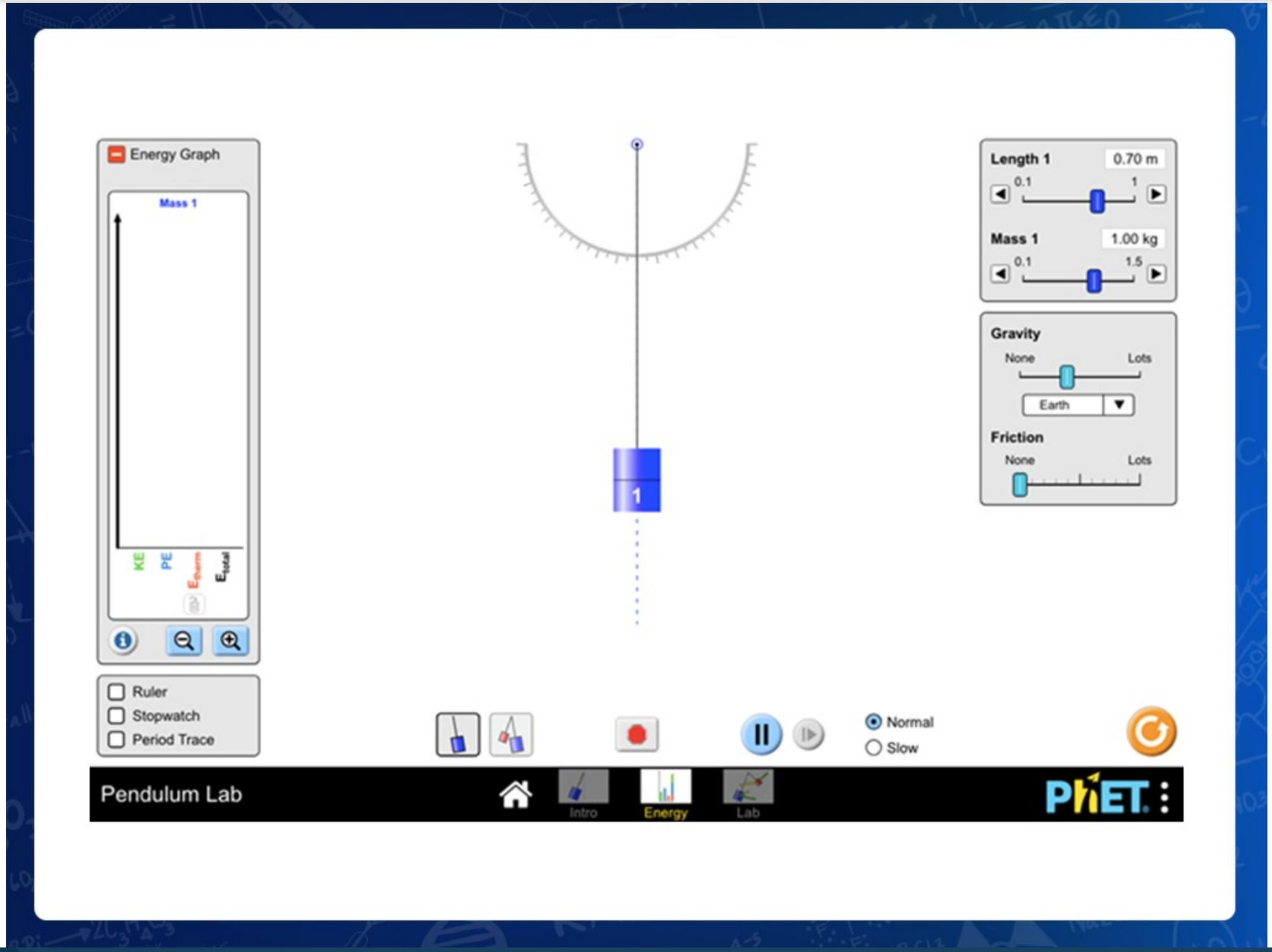
Quiz

In this question, we...

- increased the speed.
- decreased the speed.
- kept the speed the same.

Draw It

Show another way we could increase the kinetic energy of our pendulum.



Open Ended Question

In this question, did we increase or decrease the speed of the pendulum? Explain how you know.

Please enter your answer here.

Quiz

Kinetic energy is...

- **the way an object moves.**
- the energy an object has when it's in motion.
- **when an object is energetic and swings a lot.**

When the pendulum moves faster, it has

- more kinetic energy.
- less kinetic energy.
- no kinetic energy.

Kory and Jiya are racing. Kory uses a skateboard, and Jiya walks. Kory arrives at the finish line first. Who had more kinetic energy?

- Kory
- Jiya
- They had the same energy.

Nico is a cautious biker and uses his brakes as he goes down hills. Rico is reckless and never uses his breaks. When they both go down a hill, Nico has...

- more kinetic energy than Rico.
- less kinetic energy than Rico.
- the same amount of kinetic energy as Rico.

Let’s elaborate on what we’ve learned!

TRANSFERRING ENERGY

We know that when an object moves faster, it contains more kinetic energy. Let's think back to the bumper cars from our field trip. When you move faster, your crashes are bigger! That's because when an object in motion collides with another object, it can transfer some of its energy to another object. On the coming slides, we'll explore some examples of this.

TRANSFERRING ENERGY

On the next slide, you'll watch a video. As you watch, notice how each object in motion affects objects that are not moving. How is an object affected if it's hit by something moving faster? What about if it's moving slower?

https://www.youtube.com/embed/qybUFnY7Y8w

Open Ended Question

What did you observe in this video? Share some examples of how one object transferred its energy to another object.

Please enter your answer here.

Let’s evaluate what we’ve learned!

Higher kinetic energy

Lower kinetic energy

0 mph

Matching Pairs

Quiz

You’re on the merry go round at a playground. You kick off the ground until you’re spinning REALLY fast. Which is true?

- Your kinetic energy increased
- Your kinetic energy decreased
- Your kinetic energy stayed the same

You’re sledding down a hill, and you want to slow down so you put your hands out. As you slow, you are…

- increasing your kinetic energy.
- decreasing your kinetic energy.
- making no change to your kinetic energy.

Open Ended Question

Your family is on a trip and the car runs out of gas - it won't move! You need to push it to the side of the road. What could you do to push it over faster? Why?

Please enter your answer here.

Poll

How well do you understand speed and energy?

- Very well, I could teach someone else!
- Pretty well, I need more practice.
- Not that well, I need to learn some more.

Thank you!