

Energy Skate Park

Mission: The skate park is designing a new ramp. Drop skaters from different heights, watch the energy bar graph, and find out what controls a skater's speed and why skaters eventually stop.

Big question: How do potential and kinetic energy change as a skater rides a ramp?

★ Warm-up: Would you rather?

Choose and explain with the word "energy".

Ride a sled down a tall hill or a short hill? ✓ **Tall hill: more potential energy becomes more speed.**

Where is a swing moving fastest? ✓ **At the bottom.**

Key vocabulary

Potential energy (PE)	Stored energy because of position, like height.
Kinetic energy (KE)	Energy of motion.
Thermal energy	Energy of moving particles, felt as heat.
Conservation of energy	Energy is not created or destroyed, only changed.
Joule (J)	The unit of energy.

1 Box 1

Energy swap

As the skater goes UP the other side, what happens?

☐ KE changes back into PE and the skater slows down ☐ PE and KE both grow ☐ Energy disappears

✓ **KE changes back into PE and the skater slows down**

2 Box 2

Predict

PREDICTION If you drop the skater from twice as high, the top speed will...

☐ double ☐ increase, but less than double ☐ stay the same

Height vs speed

Record the top speed for each drop height.

Drop height	Top speed (m/s)
2 m	6.3
4 m	8.9
8 m	12.5

3 Box 3

Find the pattern

You predicted: _____. Going from 2 m to 8 m (4 times higher), the speed...

☐ doubled (about 6 → 12.5 m/s) ☐ became 4 times faster ☐ stayed the same

✓ **doubled (about 6 → 12.5 m/s)**

4 Box 4

Heavier skater

In the simulator: Drop the **100 kg** skater from 4 m (friction off).

The heavier skater had twice the energy. What about the speed?

☐ The same speed: more mass means more energy, but the same speed ☐ Twice as fast ☐ Half as fast

✓ **The same speed: more mass means more energy, but the same speed**

5 Box 5

Turn on friction

In the simulator: Turn on **Friction** and drop the skater from 6 m. Watch until the skater stops.

With friction, where did the skater's energy go?

☐ It became thermal energy (heat) in the wheels and ramp ☐ It was destroyed ☐ It turned back into height

✓ **It became thermal energy (heat) in the wheels and ramp**

6 Box 6

Legend: total energy Legend only

A skater has 2,000 J of PE at the top. Halfway down, she has 800 J of PE and 150 J of thermal energy. How much KE does she have?

Answer: _____ J ✓ **1050**

Show your thinking:

7 Box 7

Ramp report (CER)

How do PE and KE change as a skater rides the ramp?

Claim

Look for: Names potential energy; Names kinetic energy; at least 8 words

Evidence

Look for: Uses speed data; a number from the simulator; at least 12 words

Reasoning

Look for: Explains energy changing form; Explains friction; at least 12 words

Exit ticket: answer the big question in your own words

How do potential and kinetic energy change as a skater rides a ramp?

Look for: At the top, the skater has the most gravitational potential energy (PE). Going down, PE changes into kinetic energy (KE), so the skater is fastest at the bottom. Without friction,

total energy stays the same. With friction, some energy becomes thermal energy, so the skater slows and stops.

Completion codes

Students see a code like **ABC-I3** when they finish. The first part must match below. The letter is the level (E = Explorer, I = Investigator, L = Legend), and the number at the end is how many stars they earned.

Level	Code starts with
 Explorer	J31-E
 Investigator	12D-I
 Legend	1GQ-L

Watch for these misconceptions

- "Cold moves into things." Heat moves; objects feel cold because heat leaves your hand.
- "Only moving things have energy." Stored (potential) energy counts too.
- "Radiation needs air to travel." Radiation crosses empty space, which is how sunlight reaches Earth.