

Energy & Force

Amazing Earth - 5th

Quick-Start Notes for Parent Presenters:

• **Visual Action Cues:** Highlighted in **[BOLD AMBER BRACKETS]** so you know exactly when to click to advance slides or play videos.

• **Student Participation:** Questions to ask the class are highlighted in **[BLUE CALLOUT BOXES]** along with answer keys and guidance.

VISUALS	SPOKEN SCRIPT + CLASS INTERACTION + ACTION

SLIDE 01: Energy & Force

(On-Screen: Roller coaster navigating a loop)



You have been learning about energy and force in science class this quarter, and today we are going to test those concepts with two hands-on experiments!

Remember what you learned in class:

A **force** is any push or pull that can cause an object to move, stop, change its shape, or change its speed or direction.

Work happens when a force acts upon an object, causing that object to move in the direction of the force.

Energy is the ability to do work or to cause change.

Now let's investigate how force and energy work in real life!

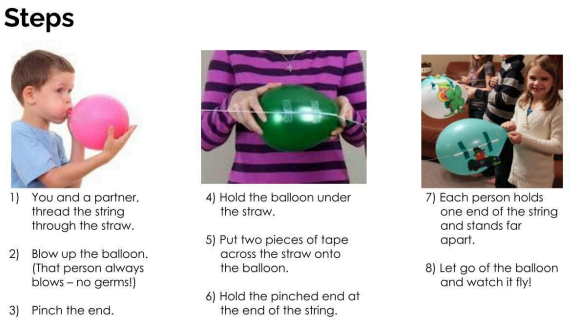
Let's become rocket scientists!

[CLICK: Advance to Slide 02]

VISUALS	SPOKEN SCRIPT + CLASS INTERACTION + ACTION
SLIDE 02: Balloon Rocket *(On-Screen: Inflated blue balloon taped to drinking straw on string)* Balloon Rocket 	The first experiment we are going to do is a balloon rocket. In this experiment, we want to investigate how forces can cause changes in the motion and energy of objects. **[CLICK: Advance to Slide 03]**

SLIDE 03: Steps (Balloon Rocket)

(On-Screen: Procedure steps overview graphic)



Here are the steps to set up and launch your balloon rocket with a partner:

1) You and a partner will thread the string through the straw.

2) Blow up the balloon. (That person always blows – no germs!)

3) Pinch the end.

4) Hold the balloon under the straw.

5) Put two pieces of tape across the straw onto the balloon.

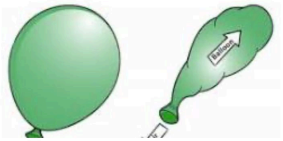
6) Hold the pinched end at the end of the string.

7) Each person holds one end of the string and stands far apart.

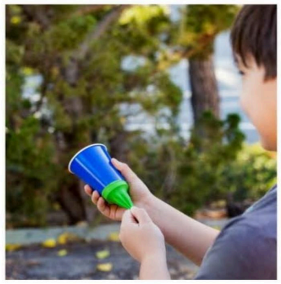
8) Let go of the balloon and watch it fly!

[CLICK: Advance to Slide 04]

VISUALS	SPOKEN SCRIPT + CLASS INTERACTION + ACTION
SLIDE 04: Video Demonstration *(On-Screen: Scientist holding a balloon)*  **[PAUSE FOR VIDEO: 90 SEC]**	Now let's learn about the science behind this. **[CLICK & PLAY: 1-Min. 30-Sec. Video]** *[Backup video link available in presentation notes if needed.]* **[CLICK: Advance to Slide 05]**

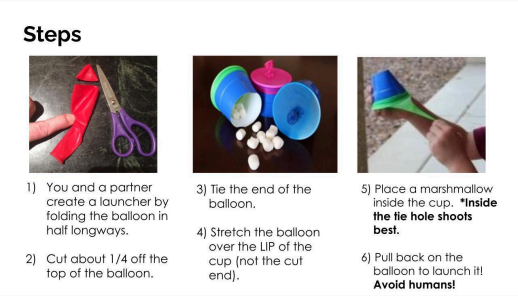
VISUALS	SPOKEN SCRIPT + CLASS INTERACTION + ACTION
SLIDE 05: Key Concepts *(On-Screen: Potential and Kinetic Energy balloon diagram)* **Key Concepts** ▪ Energy Transformation ▪ Unbalanced Net Force ▪ Friction Potential and Kinetic Energy 	These are the key concepts we want to observe and record on your worksheet: **Energy Transformation**: Watch how energy inside the blown up balloon transforms into kinetic energy of motion as the air escapes. **Unbalanced Net Force**: Net force is the combination of all forces acting on an object. An unbalanced net force causes the resting balloon rocket to accelerate down the line. **Friction**: Friction is a force that opposes the motion of an object. Watch where the plastic straw rubs against the string, and notice if friction acts against the rocket's movement to slow it down. **[CLICK: Advance to Slide 06]**

VISUALS	SPOKEN SCRIPT + CLASS INTERACTION + ACTION
SLIDE 06: Scientific Question *(On-Screen: Testable scientific question prompt)* How does changing the amount of air inflated into the balloon affect the speed and distance the rocket travels down the string?	Before we do our experiment we need a testable, scientific question. Scientific Question: How does changing the amount of air inflated into the balloon affect the speed and distance the rocket travels down the string? Before we release our balloons, let's form a hypothesis—which means to make an educated guess about what will happen when you conduct the experiment. **[STUDENT PARTICIPATION]** **"Use your worksheets to make a cause-and-effect statement: 'If [this happens], then [this will happen].'"** *Tip: Pause for a moment to allow students to record their hypotheses before advancing.* **[CLICK: Advance to Slide 07]**

VISUALS	SPOKEN SCRIPT + CLASS INTERACTION + ACTION
SLIDE 07: Marshmallow Shooter *(On-Screen: Handheld marshmallow launcher photo)* Marshmallow Shooter 	The second experiment we are going to do is marshmallow shooters. In this experiment, we stretch a tied balloon over a plastic cup, place a mini marshmallow inside over the knot, pull back on the knot, and release to launch. We want to test how the launch force affects the motion of our projectile. **[CLICK: Advance to Slide 08]**

SLIDE 08: Steps (Marshmallow Shooter)

(On-Screen: 3-panel photos of launcher assembly)



Here are the steps to create your marshmallow launcher with a partner:

1) You and a partner create a launcher by folding the balloon in half longways.

2) Cut about 1/4 off the top of the balloon.

3) Tie the end of the balloon.

4) Stretch the balloon over the LIP of the cup (not the cut end).

5) Place a marshmallow inside the cup. (*Inside the tie hole shoots best.)

6) Pull back on the balloon to launch it! Avoid humans!

[CLICK: Advance to Slide 09]

SLIDE 09: Scientific Question

(On-Screen: Testable scientific question prompt for marshmallow shooter)

How does changing how far back we pull the balloon launcher affect the speed and kinetic energy of the marshmallow?

Our testable scientific question is:

How does changing how far back we pull the balloon launcher affect the speed and kinetic energy of the marshmallow?

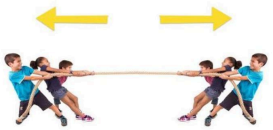
Let’s make another hypothesis for this experiment.

[STUDENT PARTICIPATION]

"Use your worksheets to make a cause-and-effect statement: 'If [this happens], then [this will happen].'"

Tip: Pause for a moment to allow students to record their hypotheses before advancing.

[CLICK: Advance to Slide 10]

VISUALS	SPOKEN SCRIPT + CLASS INTERACTION + ACTION
SLIDE 10: Key Concepts *(On-Screen: Tug-of-war graphic illustrating net forces)* **Key Concepts** ■ Kinetic Energy, Speed and Direction ■ Energy Transfer and Contact Forces ■ Net Force 	As you launch your marshmallows, here are the key concepts to observe and record on your worksheet: **Kinetic Energy, Speed, and Direction**: Moving objects have kinetic energy, which is the energy of motion. Motion is described by the marshmallow's direction and speed—how fast it travels. **Energy Transfer & Contact Forces**: When the snapping balloon hits the marshmallow, direct contact forces transfer energy from the launcher to the projectile. **Net Force**: The unbalanced force from the rubber causes the stationary marshmallow to move. **[CLICK: Advance to Slide 11]**

VISUALS	SPOKEN SCRIPT + CLASS INTERACTION + ACTION
SLIDE 11: Let's Experiment! *(On-Screen: Trimming balloon tip with scissors)* Let's Experiment! 	Spend a few minutes with your partner going over your hypotheses and cutting your balloons for the marshmallow shooters. Remember: You are going to fold the balloon in half longways and cut about 1/4 off the top of the balloon. **[STUDENT PARTICIPATION]** ***[Give students a few minutes for this.]*** Now we are going to go outside! Grab your clipboards, pencils, and worksheets. Remember: Safety first! Always keep launchers pointed away from faces and people at all times.