

Middle school | Where the Motion Energy Goes

Name: _____ Date: _____

Free classroom and home printable. No account, equipment or internet required.

First, make a prediction

Goal: develop and revise an explanation for what happens as a marble slows. Start with: recognising movement and describing a change.

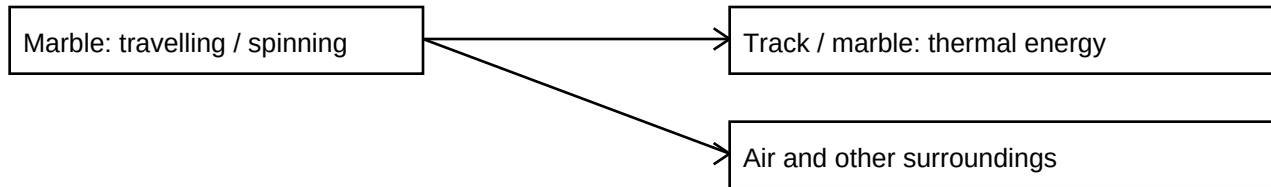
MS1. Imagine a marble travels along a track and gradually slows. Someone says, "Its energy has disappeared." Before reading page 2, do you agree? Give your reason.

MS2. Sketch the marble, track and nearby air. Circle the objects you would include when looking for where energy went. Write one question you still have.

These are imagined situations, not recorded experiments. Keep your first ideas; you may revise them later.

Read, connect, revise

A real track can deform, a marble can skid, joints can cause impacts, and air can receive energy from the moving marble. Energy no longer available for travelling and spinning has not disappeared. For example, thermal energy in the marble and track can increase. Include the surroundings when accounting for energy. This map names possible transfers; it does not measure their amounts.



Possible transfers only. Arrow sizes do not show energy amounts.

Movement energy: energy associated with travelling and spinning. Transfer: energy passing between objects or parts of a system. Surroundings: the track, air and other objects around the marble. Thermal energy: internal energy associated with heating. Qualitative: describing a relationship without measuring amounts.

MS3. Add a possible transfer arrow to your sketch from MS2. Name a destination and explain why a slower marble does not show that total energy disappeared.

MS4. Revisit MS1. What would you keep or change, and why? Does the diagram tell you how much energy went to each destination?

Paper design lab | A cloth patch

Materials: these pages and a pencil. Setup: draw a short track ending at a receiving cup. Steps: (1) Mark a possible cloth patch. (2) Label your prediction, not an observation. (3) Draw the same track without the patch. (4) Plan what you would compare. This paper activity needs no marbles, tools, heat or moving objects.

MS5. A designer adds cloth and catches the marble once. Write one possible reason to try cloth, one thing besides cloth that could affect a catch, and a way to compare repeated attempts fairly. Why is a catch not a measurement of heat?

MS6. Transfer your thinking: imagine a book sliding on a desk and slowing. Name the objects you would include in your energy account. Explain a possible destination for movement energy. Say what the description alone cannot tell you.

Finish: on your drawing, write "possible transfer" beside one arrow and "amount not measured" beside it. Do not invent results. Cloth is a possible slowing feature, not a guaranteed repair.

Optional rabbit hole: original micro-lesson:

<https://thisworldexplained.com/okay-but/where-the-motion-energy-goes/> . Optional story: One More Take:

<https://thisworldexplained.com/okay-but/one-more-take/> . The story mentions real-track limits; it does not isolate or measure individual energy transfers. Both are optional: this worksheet works entirely on paper.

Further reading: MIT OpenCourseWare, Classical Mechanics chapter 14, sections 14.7-14.8 (energy accounting and sliding friction); OpenStax University Physics Volume 1, 11.1 Rolling Motion (ideal rolling assumptions); Exploratorium, Marble Machines activity guide, pages 1-5 (slowing features and testing). These resources inform the explanation, not a measured result from this activity.