Energy Arrangement Detectives

Model how changing positions or orientations changes stored potential energy.

MS-PS3-2 "Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each pair of objects that forms a system. Circle words that compare stored potential energy, then number the arrangement changes that cause those differences.

Systems That Store Energy

1. A potential-energy model focuses on a system, which is two objects that interact even when they do not touch. The model shows the objects, their positions, and the type of interaction. It also compares how much potential energy is stored in each arrangement. Potential energy is energy stored because of an arrangement. For gravity, the system may be Earth and an object. Lifting the object changes the distance between it and Earth. A model can use simple drawings, arrows, labels, and words such as more or less.

2. Consider a book resting on the first shelf of a bookcase and the same book resting on a higher shelf. In both arrangements, the two objects in the system are the book and Earth. Earth pulls the book downward through gravity. The higher arrangement stores more gravitational potential energy than the lower arrangement. A drawing could show Earth below both shelves, label the book at two heights, and write “more” beside the higher book. The drawing does not need numbers. Its purpose is to show a relative energy difference caused by a changed arrangement.

3. Magnetic and electric interactions can also be modeled as two-object systems. Place two bar magnets at the same distance with north poles facing each other, then turn one magnet so its south pole faces the other north pole. With the distance unchanged, the north-north arrangement stores more magnetic potential energy than the north-south arrangement. The magnets' orientation changed the stored energy. Likewise, a negatively charged balloon and a person's hair form an electric system. Bringing the balloon closer changes the arrangement and the amount of electric potential energy stored.

2 ANSWER WITH EVIDENCE

Use the passage

1. For the bookcase comparison, name the two objects in the system and the interaction between them.

2. Which book arrangement stores more gravitational potential energy? Explain what changed.

3. What four kinds of information should a model show to compare potential energy in two arrangements?

4. At the same distance, which magnet arrangement stores more magnetic potential energy: north facing north or north facing south? What changed between the arrangements?

3 YOUR TURN

Your own words

Create a two-panel model of Earth and a lunchbox at two different heights, such as on a low stool and on a high cabinet. In each panel, label both objects and gravity, then state which arrangement stores more gravitational potential energy and explain why.

ANSWER KEY

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GRADES 6-8 · MS-PS3-2

PART 1 · READ AND MARK

Underline each pair of objects that forms a system. Circle words that compare stored potential energy, then number the arrangement changes that cause those differences. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	For the bookcase comparison, name the two objects in the system and the interaction between them.	**The system is the book and Earth. They interact through gravity.**
2	Which book arrangement stores more gravitational potential energy? Explain what changed.	**The book on the higher shelf stores more gravitational potential energy because its position, or distance from Earth, changed.**
3	What four kinds of information should a model show to compare potential energy in two arrangements?	**The objects in the system, their positions or arrangement, the type of interaction, and which arrangement has more or less potential energy.**
4	At the same distance, which magnet arrangement stores more magnetic potential energy: north facing north or north facing south? What changed between the arrangements?	**North facing north stores more magnetic potential energy. One magnet was turned, changing the magnets' orientation.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Panel A: Earth and a lunchbox on a low stool. A downward arrow labeled gravity points toward Earth. This arrangement stores less gravitational potential energy. Panel B: Earth and the lunchbox on a high cabinet. A downward arrow labeled gravity points toward Earth. This arrangement stores more gravitational potential energy because the lunchbox is higher and farther from Earth than in Panel A.

Accept clear drawings or written models that identify exactly two objects, the interaction, two different arrangements, and a correct relative comparison. For the open task, the higher lunchbox arrangement must be identified as storing more gravitational potential energy.