Magnets on the Move

Model how changing a gap changes stored energy.

7.PS3.2 "Develop or modify a model to describe that when objects interacting at a distance change their arrangement, different amounts of potential energy are stored in the system."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each sentence that describes a change in the gap between magnets. Circle the words that tell whether stored magnetic potential energy increases or decreases.

The Magnetic Cart Track

1. In a science museum, a clear plastic track holds two small carts. A magnet is fastened to each cart, and the carts can roll without touching. When the ends facing each other are alike, the magnets repel. The force acts across the gap between them. To describe the energy of this interaction, draw a model that includes both magnets as one system. Mark the gap between their facing ends and label the energy stored by their arrangement as magnetic potential energy. A model can show several arrangements of the same system.

2. Suppose a visitor slowly pushes the repelling carts toward each other and holds them still. The gap shrinks while the magnets remain the same. The visitor transfers energy into the two-magnet system, so it stores more magnetic potential energy. If the visitor lets go, the carts move apart, and the stored potential energy decreases as their motion increases. A useful model compares gaps rather than claiming that one cart alone contains the energy. When you compare any two positions, keep the magnets and their facing ends unchanged.

3. Now imagine the visitor turns one cart so opposite ends face. The magnets attract rather than repel. Pulling these attracting carts farther apart requires energy, and the system then stores more magnetic potential energy than it did when they were closer. Releasing the carts lets them move together, decreasing that stored energy. Because turning a magnet changes the interaction, a careful model labels which ends face each other as well as the gap. Arrows can show which way the carts move after release, while labels compare the stored energy before and after.

2 ANSWER WITH EVIDENCE

Use the passage

1. Two magnets on a desk have north ends facing. In one arrangement the gap is 1 cm; in another it is 5 cm. Which arrangement should your model label as storing more magnetic potential energy?

2. A student moves two repelling magnets from a gap of 4 cm to a gap of 2 cm. What change in stored energy should the student's model show, and where did the added energy come from?

3. Two magnets with opposite ends facing are first 2 cm apart, then 6 cm apart. Which arrangement should a model label as storing more magnetic potential energy? Explain using the passage.

4. A classmate compares a model with opposite ends facing at a 2 cm gap to one with like ends facing at a 5 cm gap. The classmate uses only the gaps to decide which stores more energy. What should the classmate change to make a comparison supported by the passage?

3 YOUR TURN

Your own words

Invent a setting with two magnets that can move without touching. In two panels, sketch different gaps with the same magnet ends facing, label which arrangement stores more magnetic potential energy, and write one sentence explaining why.

ANSWER KEY

Magnets on the Move

GRADE 7 · 7.PS3.2

PART 1 · READ AND MARK

Underline each sentence that describes a change in the gap between magnets. Circle the words that tell whether stored magnetic potential energy increases or decreases. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Two magnets on a desk have north ends facing. In one arrangement the gap is 1 cm; in another it is 5 cm. Which arrangement should your model label as storing more magnetic potential energy?	**The 1 cm arrangement stores more magnetic potential energy because the like ends are closer together.**
2	A student moves two repelling magnets from a gap of 4 cm to a gap of 2 cm. What change in stored energy should the student's model show, and where did the added energy come from?	**The two-magnet system stores more magnetic potential energy at 2 cm. The student transferred energy to it by pushing the magnets closer.**
3	Two magnets with opposite ends facing are first 2 cm apart, then 6 cm apart. Which arrangement should a model label as storing more magnetic potential energy? Explain using the passage.	**The 6 cm arrangement stores more magnetic potential energy because pulling attracting magnets farther apart requires energy.**
4	A classmate compares a model with opposite ends facing at a 2 cm gap to one with like ends facing at a 5 cm gap. The classmate uses only the gaps to decide which stores more energy. What should the classmate change to make a comparison supported by the passage?	**Keep the same two magnets with the same ends facing in both arrangements, then compare their gaps.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Panel 1: Two toy boats each carry a magnet. Their north ends face across a 3 cm gap. Label: more magnetic potential energy. Panel 2: The same boats and north ends face across a 9 cm gap. Label: less magnetic potential energy. Sentence: Pushing the repelling boats closer stores more magnetic potential energy in the two-magnet system.

Accept any invented setting that keeps the magnets and facing ends the same across both panels. For like ends facing, the smaller gap must be labeled as storing more energy; for opposite ends facing, the larger gap must be labeled as storing more.