

Forces Across Space

Use observations as evidence for unseen fields.

S8P5.a "Construct an argument using evidence to support the claim that fields (i.e., magnetic fields, gravitational fields, and electric fields) exist between objects exerting forces on each other even when the objects are not in contact."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each observation that shows objects exerting a force without touching. Circle the words that name the field scientists use to explain that force.

Evidence in the Space Between

- ① Scientists can observe forces without seeing a field directly. Put two bar magnets close together with their north poles facing. Before the magnets touch, each magnet pushes the other away. The push changes when the gap changes or when one magnet is turned. This pattern is evidence of a magnetic field in the space around each magnet. The field allows the magnets to exert a force across the gap, even though their surfaces never meet.
- ② Gravity gives another example. Earth pulls a dropped ball downward, but Earth and the ball do not need to touch before the ball moves. Earth also keeps the Moon in orbit from far away. The Moon continually changes direction as it travels, showing that a force acts on it. Scientists explain these effects with a gravitational field around Earth. As distance from Earth increases, its gravitational pull becomes weaker, which also supports the idea that the force acts through space.
- ③ Electric fields can be inferred from the behavior of charged objects. After a plastic comb is rubbed with wool, it can attract tiny paper pieces without touching them. The paper moves toward the comb because the comb's electric field exerts a force through the air. A field is not a material that flows between objects. Instead, it is a way to describe how one object can affect another at a distance. In each case, motion or a changed path supplies evidence for the unseen field.

2 ANSWER WITH EVIDENCE Use the passage

- 1 What observation with the two magnets is evidence that a magnetic field exists between them? Explain why it is evidence.

- 2 Use the Moon example to state a claim about Earth's gravitational field and give the evidence that supports it.

- 3 What does the movement of the paper pieces show after the comb is rubbed with wool?

- 4 What shared pattern in all three examples supports the claim that fields exist between objects?

3 YOUR TURN Your own words

Two balloons are rubbed with wool and then held close together. They move apart before they touch. Write a three-sentence argument that states a claim about an electric field, gives this observation as evidence, and explains how the evidence supports your claim.

PART 1 • READ AND MARK

Underline each observation that shows objects exerting a force without touching. Circle the words that name the field scientists use to explain that force. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	What observation with the two magnets is evidence that a magnetic field exists between them? Explain why it is evidence.	The north poles push apart before the magnets touch. Their motion shows that a force acts across the gap, which is evidence of a magnetic field.
2	Use the Moon example to state a claim about Earth's gravitational field and give the evidence that supports it.	Earth has a gravitational field that acts on the Moon at a distance. The Moon stays in orbit and continually changes direction even though it is far from Earth.
3	What does the movement of the paper pieces show after the comb is rubbed with wool?	The paper pieces move toward the comb without touching it. This shows that the comb's electric field exerts a force through the air.
4	What shared pattern in all three examples supports the claim that fields exist between objects?	In every example, an object moves or changes direction before contact occurs. This noncontact force is evidence that a magnetic, gravitational, or electric field acts through space.

PART 3 • YOUR TURN (SAMPLE ANSWER)

An electric field exists between the two balloons. After both balloons were rubbed with wool, they moved apart before they touched, so a force acted across the air gap. Because the balloons exerted a force without contact, an electric field explains how each charged balloon affected the other.

Accept equivalent claims that an electric field exists and acts between the balloons. A strong response includes the noncontact movement as evidence and connects that evidence to a force acting through space.