Paddle Power

Follow an energy change from design to test.

4.4 "Design, construct, and test a device that changes energy from one form to another."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline where energy is stored, circle the part that uses that energy to move the boat, and write 1 and 2 beside the first test and the changed test.

Mina's Moving Boat

1. Mina wants to build a tiny boat that moves without a push. She chooses a foam tray, a rubber band, and a paddle cut from a plastic lid. Her plan is to wind the paddle so the twisted band stores elastic energy. When she lets go, that energy can change into the paddle's motion energy. The paddle will push water backward to move the boat forward.

2. An adult cuts two notches at the back of the tray and a small paddle from the lid. Mina hooks the rubber band into the notches and slips the paddle through the middle of the band. She turns the paddle six times, keeping her fingers clear of its path. When she releases it, the twisted band pulls on the paddle and makes it spin.

3. Mina puts the boat in a tub and marks its starting point. On her first test, the boat moves only a little. She notices that the paddle rubs against the tray. She makes the notches deeper so the paddle has room to turn. For the next test, she winds the band six times again and starts at the same mark. This time the boat travels farther.

2 ANSWER WITH EVIDENCE

Use the passage

1. What part stores energy, and what motion does that stored energy make?

2. Why does Mina slip the paddle through the rubber band?

3. What does Mina change after the first test, and how does that help the boat move?

4. Why does Mina wind the band six times and use the same starting mark in both tests?

3 YOUR TURN

Your own words

Design a device other than Mina's boat that changes energy from one form to another. In three sentences, name its parts and how you would connect them, explain the energy change, and describe a test and one change you would make if it failed.

ANSWER KEY

Paddle Power

GRADE 4 · 4.4

PART 1 · READ AND MARK

Underline where energy is stored, circle the part that uses that energy to move the boat, and write 1 and 2 beside the first test and the changed test. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	What part stores energy, and what motion does that stored energy make?	**The twisted rubber band stores elastic energy. It makes the paddle spin.**
2	Why does Mina slip the paddle through the rubber band?	**The band must pull on the paddle when it untwists so the paddle can spin.**
3	What does Mina change after the first test, and how does that help the boat move?	**She makes the notches deeper so the paddle does not rub against the tray and has room to spin.**
4	Why does Mina wind the band six times and use the same starting mark in both tests?	**Keeping those steps the same helps her tell whether the deeper notches improved the boat's movement.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I would connect a small bulb to a battery with two wires so electricity can flow through the bulb. Stored chemical energy in the battery changes to electrical energy and then light energy. I would test whether the bulb glows, and if it does not, I would check that each wire touches the bulb and battery.

Accept other workable device designs that identify an energy change and describe a test. The proposed change should address a possible reason the device did not work.