



## OUT OF THIS WORLD

# Asteroid-Harpooning Hitcher

Have you ever dreamed of what it would be like to ride on an asteroid? What challenges would you have to overcome to catch an object moving so quickly, so far out in space? Read *Asteroid-Harpooning Hitcher* to learn more!

### What did you learn?

#### QUESTIONS

1. Kuiper belt objects (KBO) are ...
  - a. Icy asteroids
  - b. Rocky asteroids
  - c. Dying stars
  - d. Space debris
2. Measurements of velocity are ...
  - a. Absolute
  - b. Inaccurate
  - c. Accurate
  - d. Relative
3. The harpoon will be made out of ...
  - a. Iron
  - b. Diamond
  - c. Obsidian
  - d. Gold
4. The asteroid hitcher would take about how many years to reach a KBO?
  - a. 1,000 years
  - b. 100 years
  - c. 10 years
  - d. 1 year
5. What does NIAC stand for?
6. Who is this?



#### TRUE OR FALSE?

- |   |   |
|---|---|
| _____ 1. The first asteroid was discovered in the early 1900's. | _____ 4. The asteroid-hitcher will be able to release 100 to 800 miles of tether. |
| _____ 2. Asteroids have a smaller gravitational pull.           | _____ 5. The asteroid-hitcher uses kinetic energy to slow down its velocity.      |
| _____ 3. Zylon rope is 20 times stronger than ordinary rope.    | _____ 6. The asteroid-hitcher can take off by pulling on the harpoon.             |



## ANSWERS

- 1. b. Icy asteroids.** According to section “The leftovers” on page 9, we know that “They are similar to asteroids in some ways, but KBO’s are icy, rather than rocky.” So, the correct answer is B.
- 2. d. Relative.** According to section “Hitching an asteroid” on page 19, we know that “In truth, all measurements of velocity are relative.” So, the correct answer is D.
- 3. b. Diamond.** According to section “An expensive harpoon” on page 30, we know that “To hitch an asteroid at the target speed, the harpoon will have to be made of the hardest material known—diamond.” So, the correct answer is B.
- 4. c. 10 years.** According to section “A local train in the outer solar system” on page 40, we know that “Launched from Earth, the asteroid hitcher would take about 10 years to reach its first target KBO.” So, the correct answer is C.
- 5.** According to page 7, NIAC stands for NASA Innovative Advanced Concepts.
- 6.** As can be seen on page 7, the illustration shows Masahiro (“Hiro”) Ono.

## TRUE OR FALSE? ANSWERS

- 1. False.** According to section “Visiting the asteroids” on page 14, we know that “Astronomers discovered the first asteroids by looking through telescopes in the early 1800’s.” So, the correct answer is False.
- 2. True.** According to section “Stopping in” on page 17, we know that “an asteroid has a much smaller gravitational pull.” So, the correct answer is True.
- 3. True.** According to section “Big idea: Tethers” on page 22, we know that “Zylon rope is about 20 times stronger than ordinary rope.” So, the correct answer is True.
- 4. False.** According to section “Braking” on page 34, we know that “An asteroid-hitcher will be able to release 60 to 600 miles (100 to 1,000 kilometers) of tether.” So, the correct answer is False.
- 5. True.** According to section “Big idea: Regenerative braking” on page 37, we know that “Likewise, the asteroid hitcher could use the kinetic energy of the line as it is released to power a generator. Converting this energy to electricity would in turn slow the craft.” So, the correct answer is True.
- 6. True.** According to section “Taking off again” on page 42, we know that “In the same way, the asteroid hitcher might take off simply by pulling on the harpoon.” So, the correct answer is False.