# Beyond the Belt

Compare solar system bodies by location and properties

**ESS.2.d** "Investigate and communicate major properties of bodies in the solar system and the zones they inhabit."

NAME _____ DATE _____

## 1 READ AND MARK

Read it twice

**YOUR JOB** Underline each zone named in the passage, then circle one property of a body found in each zone. Use your marks to compare what scientists might find in different places.

### A Trip Outward

1 Imagine sending a spacecraft outward from the Sun. It first passes the inner planets: Mercury, Venus, Earth, and Mars. These planets have rocky surfaces, though their atmospheres and temperatures differ greatly. Beyond Mars lies the asteroid belt, a zone of many small bodies orbiting the Sun between Mars and Jupiter. Some asteroids are rich in rock; others contain substantial metal. Ceres, the largest body in the belt, is classified as a dwarf planet. Its surface contains minerals altered by water, and evidence suggests salty liquid once rose from below. A zone tells you where to look, not exactly what you will find.

2 After the belt, the spacecraft reaches the outer planets. Jupiter and Saturn are gas giants, with thick outer layers made mostly of hydrogen and helium. Uranus and Neptune are ice giants; their interiors contain more water, ammonia, and methane than the gas giants' interiors do. All four are much larger than Earth and have rings and many moons. A visitor could not stand on any of these planets as if on bare rock. Farther from the Sun, sunlight is weaker, but distance alone does not explain every feature: composition and internal heat also shape conditions on a planet.

3 Past Neptune is the Kuiper Belt, a broad zone of icy bodies. Pluto, a dwarf planet there, has mountains of water ice and plains of frozen nitrogen. Some comets begin in this distant region. When one travels toward the inner solar system, sunlight warms its ices, releasing gas and dust that form a fuzzy coma and sometimes a tail. Far from the Sun, that same comet may look like a small, dark body instead. Comparing Ceres with Pluto, or a comet near and far from the Sun, shows why scientists report both a body's location and its properties.

## 2 ANSWER WITH EVIDENCE

Use the passage

1. How do the bodies in the inner planet zone differ from those in the asteroid belt? Use one property from each zone.

2. Jupiter and Neptune are both outer planets. How do their compositions differ, and what property do they share?

3. Ceres and Pluto are both dwarf planets. How do their zones and the properties described in the passage differ?

4. How might a comet from the Kuiper Belt look different after it travels toward the inner solar system? Explain what causes the change.

## 3 YOUR TURN

Your own words

Design a two-stop spacecraft investigation using one body in the asteroid belt and one outer planet from the passage. In four sentences, name both targets and their zones, describe one observation at each stop, and explain what your observations could and could not tell you about their compositions.

# Beyond the Belt



## PART 1 · READ AND MARK

Underline each zone named in the passage, then circle one property of a body found in each zone. Use your marks to compare what scientists might find in different places. Accept any marking that follows this job and points at the right text.

## PART 2 · ANSWERS

| # | QUESTION | ANSWER |
|---|---|---|
| 1 | How do the bodies in the inner planet zone differ from those in the asteroid belt? Use one property from each zone. | **The inner planets have rocky surfaces. The asteroid belt contains many smaller bodies, including rock-rich or metal-rich asteroids.** |
| 2 | Jupiter and Neptune are both outer planets. How do their compositions differ, and what property do they share? | **Jupiter has outer layers made mostly of hydrogen and helium. Neptune's interior contains more water, ammonia, and methane than a gas giant's interior does. Both are much larger than Earth and have rings and many moons.** |
| 3 | Ceres and Pluto are both dwarf planets. How do their zones and the properties described in the passage differ? | **Ceres is in the asteroid belt and has surface minerals altered by water. Pluto is in the Kuiper Belt and has mountains of water ice and plains of frozen nitrogen.** |
| 4 | How might a comet from the Kuiper Belt look different after it travels toward the inner solar system? Explain what causes the change. | **Far from the Sun it may look small and dark. Closer to the Sun, warming ice releases gas and dust, forming a fuzzy coma and sometimes a tail.** |

## PART 3 · YOUR TURN (SAMPLE ANSWER)

I would visit Ceres in the asteroid belt and Jupiter in the outer planet zone. At Ceres, a spectrometer could check surface minerals for signs of past water. At Jupiter, a spectrometer could measure hydrogen and helium in its outer atmosphere. The observations would compare a solid surface with a gas giant's outer layers, but they would not reveal Jupiter's entire interior.

Accept other passage-based targets and feasible observations. The response should distinguish what a surface or atmosphere measurement reveals from what it cannot establish about an entire body.