Astronomical Bodies in The Solar System

The Gas Giant Planets
Unpacking the Benchmark

• SC.8.E.5.3 Distinguish the hierarchical relationships between planets and other astronomical bodies relative to the solar system, galaxy, and universe, including distance, size, and composition. High (EOC) REWRITE

• KNOW: The order of the universe. Size, distance and composition.

• DO: Compare the relationships between bodies in space.
Unpacking the Benchmark

• SC.8.E.5.7 Compare and contrast the properties of objects in the Solar System including the Sun, planets, and moons to those of Earth, such as gravitational force, distance from the Sun, speed, movement, temperature, and atmospheric conditions. Moderate. (EOC)

• REWRITE

• KNOW: The bodies in the Solar System & their gravity, speed, distance, movement, temp and atmo condition.

• DO: Compare/Contrast with the EARTH
Inside Jupiter

Inside Gas Giant JUPITER

The largest planet in our solar system, Jupiter could hold more than 1,200 Earths. It has dozens of moons and an enormous magnetic field. The planet, mostly a giant ball of gas and liquid, also has a dark ring system composed of fine dust grains.

TURBULENT ATMOSPHERE
89.8% hydrogen, 10.2% helium, plus trace gases.

SURFACE CONDITIONS
AIR PRESSURE: 1,000x Earth
TEMPERATURE: Varies by depth
WINDS: Over 400 mph in the upper atmosphere.

METAL CORE
Jupiter’s core is probably made up of layers of metals and rocks, along with methane ice, ammonia ice and water ice.

This image of Jupiter’s clouds was taken in 1979 by the Voyager 2 spacecraft.

Jupiter is over 11x larger than the Earth.

SOURCE: NASA
Jupiter
Part 1 of 3

- **Distance from Sun:** 5.2 AU
- **Mass:** 317.8 Earths
- **Surface Temperature:** -150°C
- **Revolution:** 11.86 Earth years
- **Rotation:** approx. 10 hours
- **Moons:** 67 Moons, 4 Galileian
Planet Structure
Part 2 of 3

• Solid Core with a liquid Hydrogen Outer Layer
• Atmosphere of Hydrogen and Helium gas.
• Red Spot is a storm LARGER THAN EARTH!
Moons
Part 3 of 3

- 67 moons
- The four largest were discovered by Galileo in the early 1600s.
- Galilean Moons:
  - Io, Europa, Ganymede, Callisto
Jupiter and its Moons
Revolution Compared to Earth
Jupiter’s Red Spot
ONE GIANT STORM!
Saturn
Part 1 of 3

- **Distance from Sun**: 9.58 AU
- **Mass**: 95 Earths
- **Temperature**: -180°C
- **Revolution**: 29.4 Earth years
- **Rotation**: 10.5 hours
- **Moons**: 62 Moons
Saturn in Ultraviolet
Planet Structure
Part 2 of 3

• Solid Rocky Core
• Layer of Liquid Metallic Hydrogen
• Atmosphere of liquid Hydrogen and Helium.
Moons & Rings
Part 3 of 3

• 62 moons
• Titan is the Largest
• Rings are made from ice (water)
• Remnants of a destroyed moon?
• Gaps in the rings are due to the gravity of its moons
SATURN

Undefeated Solar System
Hula Hoop Champ
Revolution Compared to Earth
Inside Uranus “The Gas (& Ice) Giant”

Inside Gas Giant URANUS

The seventh planet in our solar system is a giant ball of gas and liquid. It is tilted so far on its side that its axis lies nearly level with its path around the sun. Like the other gas and ice giants, Uranus has thick cloud cover. Its blue-green color is the result of methane in its atmosphere.

SMOGGY ATMOSPHERE
83% hydrogen,
15% helium,
2% methane plus trace gases.

SURFACE CONDITIONS
AIR PRESSURE: 1.3x Earth TEMPERATURE: 4,200°F (2,300°C) WINDS: About 450 mph.

ROCKY CORE The center of Uranus may be a rocky core about the size of Earth. More than 80% of the planet’s mass is a fluid mix of water, methane and ammonia ices.

GRAVITY 0.9 OF EARTH
EARTH 10 ft. dunk
URANUS 11 ft. dunk

Image of Uranus’ rings was taken in 2007 by the Hubble Space Telescope.

Uranus, with a diameter of 31,763 miles (51,118 km), is over 4x that of Earth.

SOURCE: NASA
ROSS TORO, SPACE.com
And then... and then the teacher said...

“Uranus is one of the gas giants!”
Uranus
Part 1 of 3

- **ICE GIANT!**
- Distance from Sun: 19.2 AU
- Mass: 14.5 Earths
- Temperature: -210 °C
- Revolution: 84 Earth years
- Rotation: 17 hours CLOCKWISE (RETROGRADE)
- Moons: 27 Moons
Planet Structure
Part 2 of 3

- Solid Iron Core
- Mantle- Ice from water, methane and ammonia
- Atmosphere of Hydrogen and Helium gas
- Considered an “Ice Giant”. SPINS ON ITS SIDE!
Moons & Rings
Part 3 of 3

• 27 moons
• Ex) Titania, Oberon

• Rings are made from ice (water)
• Planet spins on its side due to a early planetary collision.
Uranus (and its Ring) in Infrared
Revolution Compared to Earth
Inside Neptune “The Ice Giant”
Neptune
Part 1 of 3

- **THE ICE GIANT**
- **Distance from Sun:** 30.1 AU
- **Mass:** 17 Earths
- **Temperature:** -220 °C
- **Revolution:** 165 Earth years
- **Rotation:** 18 hours
- **Moons:** 13 Moons
Planet Structure
Part 2 of 3

- Rocky Core
- Mantle of Ices - water, ammonia, methane
- Atmosphere of Hydrogen, Methane and Helium gas
- Considered an “Ice Giant”.
Moons & Rings
Part 3 of 3

• 13 moons
• Largest is Triton
• Triton-Retrograde orbit means that it was a captured moon.

• Has a smaller ring system
Revolution Compared to Earth
How big would the sun look on other planets?

How does a planet’s distance from the sun affect the way you see an object?
1. As you travel farther from the Sun, Which of the following would DECREASE?

a) The distance from the Sun
b) The time for one revolution
c) The surface temperature
d) Number of moons
2. As you travel from Neptune inward towards the Sun, which of the following is TRUE?

a) The density of each planet decreases  
b) The period of revolution decreases  
c) The speed of rotation increases  
d) The planets get larger
3. What common factor do ALL of the terrestrial planets share?

a) They are ALL inside the asteroid belt
b) They ALL have moons
c) They ALL have dense gaseous atmospheres
d) They are ALL 1 AU (astronomical unit) or less from the Sun