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1. Overview of Uranus

- Position in Solar System: 7th planet from the Sun
 - Distance from Sun: ~2.87 billion km (19.8 AU)
 - Orbital Period: 84 Earth years
 - Rotation Period: 17 hours, 14 minutes (Retrograde rotation)
 - Diameter: 50,724 km (4 times Earth's size)
 - Gravity: 8.7 m/s² (89% of Earth's)
 - Temperature:
 - Average: -195°C (-320°F)
 - Moons: 27 (Confirmed)
 - Atmosphere: Hydrogen (83%), Helium (15%), Methane (2%)
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2. Key Characteristics

- Ice Giant: Primarily composed of “icy” materials – water, ammonia, and methane.

- Axial Tilt: 98° (rotates almost on its side).
 - Color: Pale blue-green due to methane absorbing red light.
 - Density: 1.27 g/cm³ (2nd least dense planet after Saturn).
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3. Rings of Uranus

- Composition: Dark, narrow rings made of icy particles and dust.
 - Number of Rings: 13 known rings.
 - Discovery: First observed in 1977 during a star occultation.
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4. Orbital and Rotational Facts

- Orbital Speed: 6.8 km/s
 - Eccentricity: Almost circular orbit.
 - Unique Tilt: Causes extreme seasonal variations, with poles experiencing 42 years of continuous sunlight or darkness.
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5. Atmosphere and Climate

- Composition:
 - Hydrogen and helium dominate, but methane gives Uranus its color.
 - Methane absorbs red light, reflecting blue and green hues.
 - Wind Speeds: Up to 900 km/h (560 mph).
 - Coldest Planet: Uranus experiences lower temperatures than Neptune, despite being closer to the Sun.
 - Storms: Occasionally shows large, dark storms and bright cloud formations.
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6. Internal Structure

- Core: Small rocky core.
 - Icy Mantle: Surrounding the core, composed of water, ammonia, and methane.
 - Outer Layer: Hydrogen and helium atmosphere.
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7. Moons of Uranus

- Largest Moons: Titania, Oberon, Umbriel, Ariel, and Miranda.
 - Miranda: Known for its fractured and unusual surface.
 - Naming Theme: Moons named after characters from William Shakespeare and Alexander Pope.
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8. Exploration of Uranus

- Voyager 2 (1986):
 - Only spacecraft to fly by Uranus.
 - Discovered 10 new moons and 2 rings.
 - Future Missions: NASA and ESA are considering missions to Uranus in the 2030s.
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9. Interesting Facts

- Sideways Rotation: Uranus is the only planet that rotates on its side.
 - Faint Rings: Uranus' rings are darker and less prominent than Saturn's.
 - Invisible to the Naked Eye: Discovered by William Herschel in 1781 using a telescope.
 - Magnetic Field Tilt: Offset by 59° from the planet's rotation axis.
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10. Why is Uranus Important?

- Understanding Ice Giants: Provides insight into the formation of ice giants and distant exoplanets.
 - Extreme Seasons: Studying Uranus helps scientists understand the effects of axial tilt on climate.
 - Moons and Rings: Uranus' diverse moons may hold clues about planetary formation and evolution.
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11. Key Measurements

Property	Value
Diameter	50,724 km
Distance from Sun	2.87 billion km (19.8 AU)
Orbital Period	84 Earth years
Rotation Period	17.2 hours
Gravity	8.7 m/s ²
Surface Temperature	-195°C
Moons	27
Rings	13

12. Uranus in Mythology and Culture

- Named After: Uranus, the Greek god of the sky (Ouranos).
 - Symbol: ♅
 - Astrological Significance: Associated with innovation, rebellion, and change.
 - Pop Culture: Frequently referenced in jokes and science fiction due to its unique name and characteristics.
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13. Differences Between Uranus and Earth

Feature	Uranus	Earth
Atmosphere	Hydrogen, Helium, Methane	78% N ₂ , 21% O ₂
Surface Temp.	-195°C	15°C
Gravity	8.7 m/s ²	9.8 m/s ²
Moons	27	1
Axial Tilt	98°	23.5°
Rings	13	None

14. Can Uranus Support Life?

- Surface: No solid surface – composed mainly of gas and ice.
- Moons (Potential for Life): Some moons, like Titania and Ariel, may have subsurface oceans.
- Atmosphere: Hostile for human life, with extreme cold and toxic gases.