
Unit 05 – Tides and Eclipses

Duration: 60 Minutes

I. Introduction: The Dance of Three Bodies (5 Minutes)

- **The Players:** The Sun, Earth, and Moon.
- **The Force:** Gravity. We think of gravity as a "pull," but for this class, we will think of it as a "stretcher."
- **The Scale:** A quick reminder that the Moon is much closer and has a far greater immediate impact on our daily lives than the distant Sun.

II. Tides: The Ocean's Pulse (20 Minutes)

- **The Tidal Bulge:** Gravity isn't uniform. The Moon pulls harder on the side of Earth facing it than the side away from it. This creates two "bulges" of water.
 - *Common Confusion:* Why is there a high tide on the *opposite* side of the Earth? (The "Inertia" factor).
 - **Spring Tides vs. Neap Tides:**
 - **Spring Tides:** When the Sun and Moon line up (New/Full Moon), their gravity combines. Tides are "extra" high and low.
 - **Neap Tides:** When they are at right angles (Quarter Moons), they cancel each other out. Tides are moderate.
 - **Land Tides:** Mention that gravity pulls on the solid ground too! The Earth's crust actually rises and falls by about **30cm** twice a day, though we don't feel it.
 - **The "Braking" Effect:** Fun Fact: Tides create friction that is actually slowing Earth's rotation by about 2 milliseconds per century. Days were shorter when dinosaurs were alive!
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III. Eclipses: The Perfect Alignment (20 Minutes)

- **Solar Eclipses:** The Moon passes between the Earth and Sun.
 - **The Cosmic Coincidence:** The Sun is 400x larger than the Moon, but it is also 400x further away. This makes them appear the *exact same size* in our sky—a fluke of our current geological era.
 - **Total vs. Annular:** Why we sometimes see a "Ring of Fire" (Annular) because the Moon's orbit is elliptical and it's sometimes too far away to cover the Sun completely.
 - **Lunar Eclipses:** Earth passes between the Sun and Moon.
 - **The Blood Moon:** Why does the Moon turn red? Earth's atmosphere scatters the blue light and refracts the red light (all the world's sunrises and sunsets) onto the Moon's surface.
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IV. Why Don't They Happen Every Month? (10 Minutes)

- **The 5° Tilt:** If the Moon's orbit were perfectly flat, we'd have two eclipses every month. Instead, the Moon usually passes "above" or "below" the Sun or Earth's shadow.
 - **Nodes:** Explain that eclipses only happen when the Moon crosses the "ecliptic plane" (the Earth-Sun path).
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V. Future Events & Safety (5 Minutes)

- **The 2026/2027 Outlook:** Mention upcoming eclipses (e.g., the Total Solar Eclipse in August 2026 over Greenland, Iceland, and Spain).
 - **Safety Brief:** Why you can't use sunglasses for solar eclipses (they don't block infrared/UV), but you don't need anything for a lunar eclipse.
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Follow-Up Resource List

- **Interactive Eclipse Map:** [TimeAndDate.com Eclipse Map](#) - See when the next one hits your city.
- **Real-Time Tide Tracker:** [NOAA Tides & Currents](#)
- **Video:** [NASA | Understanding Tides](#)
- **Cundy's Harbor Tides:**
<https://tidesandcurrents.noaa.gov/noaatidepredictions.html?id=8417387>

Quick Comparison Table

Event	Alignment	Moon Phase	Visibility
Solar Eclipse	Sun-Moon-Earth	New Moon	Small path on Earth
Lunar Eclipse	Sun-Earth-Moon	Full Moon	Entire night side of Earth
Spring Tide	Linear (Straight)	New / Full	Worldwide Oceans
Neap Tide	L-Shape (90°)	1st / 3rd Quarter	Worldwide Oceans
