

Chapter 19: Earth, Moon and Sun

I. Earth in Space – We're Moving through space!

A. Night and Day

1. Once every day (24 hours) we rotate on our axis.
2. We rotate counterclockwise as seen from above the North Pole
3. Sun appears to rise in east and set in west.
4. Length of day changes because of the TILT of the Earth's axis

B. A Year in Space

1. We revolve counterclockwise around the sun once every 365.24 days.
2. Because of .24 we have leap year every 4 years and we add a day to the month of February

C. Seasons

1. Caused by **tilt** which is at an angle of 23.5 degrees
2. Each season lasts 3 months
3. The hemisphere tilted towards the sun gets more direct light - therefore more heat.
4. As Earth moves around the sun, direct light hits a different part. On four **days** it is special and each of these days begins a new season.
 - **Summer solstice** - sun's rays hit as far north as tilt will allow and occurs in the month June – longest “day” in the Northern Hemisphere
 - **Winter solstice** - sun's rays hit as far south as tilt will allow and occurs in the month of December – shortest “day” in the Northern Hemisphere
 - **Vernal equinox** - direct rays hit on equator and occurs in the month March; first day of spring
 - **Autumnal equinox** - direct rays hit on equator and occurs in the month September; first day of fall

II. The Moon, Earth, and Sun

A. Light on the Moon

1. Moon doesn't produce its own light - it shines by reflection.
2. **Earthshine** - when you see the dark side because of small amounts of light bouncing off Earth (seen at crescent)
3. Area not receiving light from the sun (dark) passes from right to left
4. Moon rises and sets east to west.
5. Rises 50 minutes later each day.

B. Phases of the Moon

1. **New Moon** - Earth cannot see any part of the moon (one day)
2. **Waxing Crescent** - waxing means growing (several days)
3. **First quarter** - right half of face is visible (one day)
4. **Waxing gibbous** - more than 1/2 of face is visible (several days)
5. **Full moon** - entire face is visible (one day)
6. **Waning gibbous** - getting smaller but more than 1/2 of face is visible (several days)
7. **Last quarter** - left half of face is visible (one day).
8. **Waning crescent** (several days)

C. Phases are **NOT** caused by the Earth casting a shadow on the moon

D. **Eclipses** - shadows caused by the blocking of sunlight.

1. Shadow has two parts
 - a. **Umbra** - total darkness where total eclipse occurs.
 - b. **Penumbra** - part of light is blocked, where partial eclipse occurs.
2. Two kinds of eclipses
 - a. **Lunar** - Earth casts a shadow on the MOON - occurs only at full moon
 - b. **Solar** - moon casts a shadow on Earth - occurs only at new moon
3. Amount of light blocked is not always the same, causes total and partial eclipses

E. TIDES

1. Due to gravitational pull of the moon and sun. Most of the change is caused by the moon (70%).
2. High tide
 - a. Side facing the moon has water pulled by the moon (Direct tide)
 - b. Side opposite the moon (Opposite tide)
3. Between the bulges are low tides.
4. Earth rotates every 24 hrs, so there are 2 high and 2 low tides each day.

F. Position of the Earth, moon and sun affect tides.

1. **Spring tides** - when the sun and moon line up in a straight line with the Earth.
 - a. it causes more pull than usual.
 - b. occurs at full and new moon
 - c. causes very high, high tides and very low, low tides.
2. **Neap tides** - when the moon, Earth, and sun form a right angle, not much daily change.
 - a. forces are canceled out
 - b. occurs at quarter phases of the moon
 - c. little change in tides

III. The Moon

A. Apollo project

1. Goal was to land men on the moon before the end of the 1960's
2. Neil Armstrong was first man to walk on the moon - July 20, 1969

B. Stats of Moon

1. One fourth Earth's diameter
2. Has 1/6 of our gravity
3. Is 250,000 miles away
4. Laser mirror left to measure distance.
5. We also measure moonquakes
6. It's core has almost completely cooled

C. Features of the moon

1. Mountains are called **Highlands** (light colored).
2. Smooth, low, dark areas are **Maria** (Latin for sea).
3. No atmosphere therefore no weather and the sky is black even during the day.
4. Many **craters** caused by meteorites hitting it.
5. Due to moon's movement the same side always faces Earth.

D. Formation of the moon – **Collision theory** – Evidence from the composition (what it is made of) shows that the moon was formed by a collision of an object the size of Mars hitting the Earth. The material that blasted into space began to orbit the Earth and eventually collected up to form the moon.