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## EARTH SCIENCE – UNIT 6 – CHAPTER 23 NOTES

### THE SUN-EARTH-MOON SYSTEM

#### 23.1 Roundness Ratio

- sphere = a round, 3-D object whose surface at all points is the same as the distance from the center
- The Earth is NOT a perfect sphere.
- roundness ratio = a way to compare the equatorial circumference with the polar circumference
- polar circumference = the distance around the Earth along the prime meridian (north-south)
- equatorial circumference = the distance around the Earth along the equator (east-west)
- The equatorial circumference is slightly greater than the polar circumference.
- Therefore, the roundness ratio of Earth is slightly greater than 1.

$$\text{ROUNDNESS RATIO} = \frac{\text{equatorial circumference}}{\text{polar circumference}}$$

#### 23.1 Planet Earth

- axis = an imaginary line around which the Earth spins
- Earth spins on its axis at a 23.5° angle.
- \*\*SHOW DIAGRAM OF EARTH SPINNING ON ITS AXIS AT A 23.5° ANGLE\*\*
- 1 complete rotation on its axis takes 23 hours and 56 minutes (or about a day)
- In one year, the Earth completes 365.25 rotations → 1 leap year every 4<sup>th</sup> year
- The rotation of the Earth on its axis causes DAY and NIGHT!
- The Earth revolves around the sun.
- ellipse = the shape of the Earth's orbit as it moves around the sun (like an oval)
- LITTLE KNOWN FACT #1: The Earth is closest to the sun in January, but it's winter.
- LITTLE KNOWN FACT #2: The Earth is farthest from the sun in July, but it's summer.
- Seasons are caused by the TILT of the Earth on its axis – not the distance from the sun!

#### 23.1 Seasons

Summer Solstice	Fall Equinox	Winter Solstice	Vernal Equinox
June 21/22	September 22/23	December 21/22	March 20/21
N = summer	N = fall	N = winter	N = spring
S = winter	S = spring	S = summer	S = fall
sunlight hits Earth at 23.5°N latitude (Tropic of Cancer)	sunlight hits Earth at 0°N or 0°S latitude (Equator)	sunlight hits Earth at 23.5°S latitude (Tropic of Capricorn)	sunlight hits Earth at 0°N or 0°S latitude (Equator)

\*\*SHOW SUN-EARTH DIAGRAMS FOR EACH OF THE FOUR SEASONS\*\*

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### 23.2 Earth's Moon (Luna)

- The moon rotates (spins) on its axis once every 27.3 days.
- The moon revolves around (moves around) the Earth every 27.3 days.
- Therefore, the same side of the moon is always facing the Earth.
- Lunar calendars are based on (approximately) a 4 week cycle (EX: Jewish calendar)
- The moon does not create its own light, like the sun.
- moon light = sunlight that is reflected off the surface of the moon

### 23.2 Phases of the Moon

- new moon
- waxing crescent
- first quarter
- waxing gibbous
- full moon
- waning gibbous
- third quarter
- waning crescent

**\*\*SHOW SUNLIGHT-EARTH-MOON DIAGRAMS FOR EACH OF THE EIGHT PHASES\*\***

### 23.2 Solar Eclipse

- occurs when the moon's shadow blocks out part of the Earth
- only a small portion of the Earth is affected at a time
- line up in this order: SUN MOON EARTH
- can only occur during a new moon (when the moon is between the sun and the Earth)
- umbra = darkest portion of the moon's shadow (this part of Earth receives a total eclipse)
- penumbra = lighter part of the moon's shadow (this part of Earth receives a partial eclipse)

**\*\*SHOW DIAGRAM OF A SOLAR ECLIPSE\*\***

### 23.2 Lunar Eclipse

- occurs when the Earth's shadow blocks out the moon
- affects the entire night-time side of the Earth
- line up in this order: SUN EARTH MOON
- can only occur during a full moon (when the moon is behind the sun and Earth)
- umbra = darkest portion of Earth's shadow (this part of the moon receives a total eclipse)
- penumbra = lighter part of Earth's shadow (this part of the moon receives a partial eclipse)

**\*\*SHOW DIAGRAM OF A LUNAR ECLIPSE\*\***

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### 23.2 Origin of the Moon

1. Capture Theory =  
The moon was captured by Earth's gravity.  
It formed somewhere else in the solar system and migrated toward the Earth.  
It was brought into Earth's gravitational field, and began to revolve around the Earth.
2. Impact Theory =  
About 4600 MYA (when the Earth was formed), a large object collided with Earth.  
This sent a lot of gas and debris into the air and into space.  
The gas and debris condensed into a solid object, forming the moon.  
(This is the most accepted theory.)

### 22.1 Light Pollution

- Light pollution is the glow in the night sky caused by urban, suburban, and rural lights.
- Light can't travel very easily through clouds and smog.
- The glare from lights can cause faint areas to appear completely dark (shadowy effect).
- PRO-LIGHTS: Lights are used for crime prevention.  
Lights are used for security lighting.
- ANTI-LIGHTS: Light pollution makes it difficult or impossible to view stars, meteors, etc.  
Light pollution makes it difficult or impossible to view the "natural" sky.