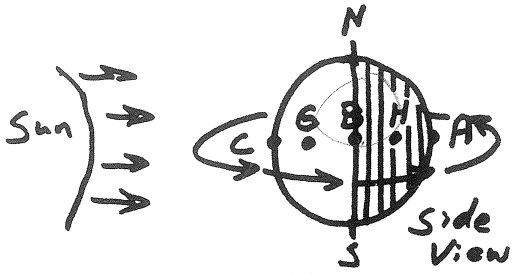
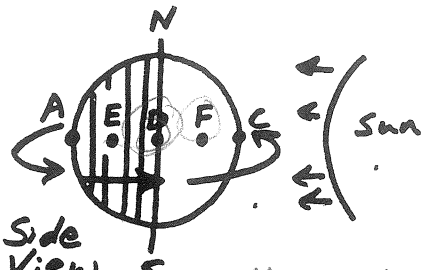
Unit: System of The Earth, Moon, and Sun

Earth Science Notes (Stapleton) **Name:** Answers ★ 88

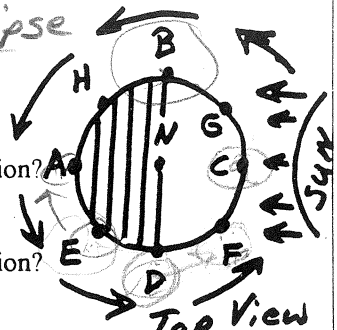
Time Zones and The International Dateline

(Earth's Rotation)



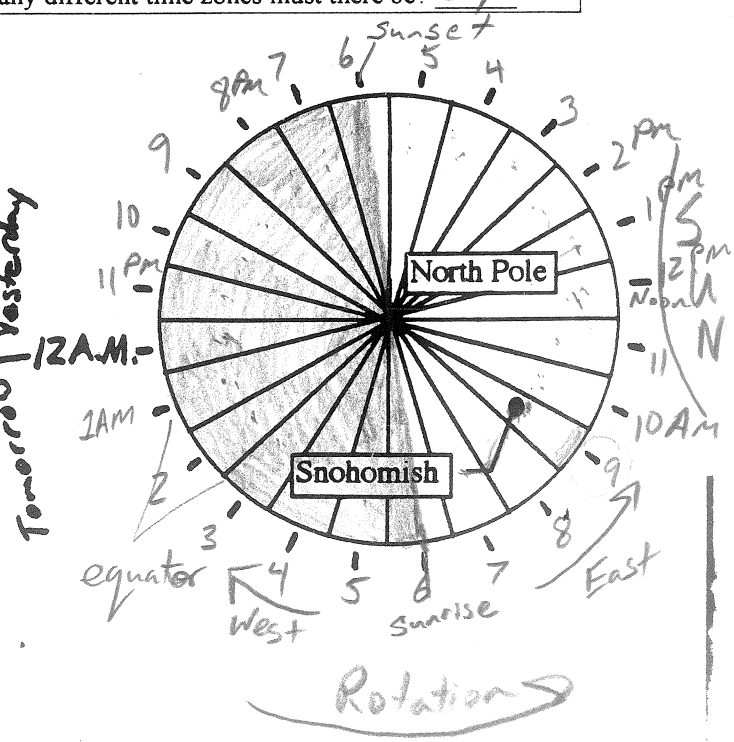


1. a) How much of the Earth is always dark? 1/2
   b) Is there ever an exception to this? If so, explain. Solar Eclipse
2. Which side is dark? (the side facing the sun, or the side opposite the sun)
3. a) In the pictures above, which point is entering darkness? B
   b) What's that time of day called? Sunset
   c) Approximately what hour would it be according to a clock at this location? 6PM
4. a) In the pictures above, at which point is the sun directly overhead? C
   b) What's that time of day called? Noon
   c) Approximately what hour would it be according to a clock at this location? 12PM
5. a) In the pictures above, which point is entering daylight? D
   b) What's that time of day called? Sunrise
   c) Approximately what hour would it be according to a clock at this location? 6AM
6. a) In the pictures above, which point is located opposite the sun, in complete darkness? A
   b) What's that time of day called? Midnight
   c) Approximately what hour would it be according to a clock at this location? 12AM



7. Estimate the time of day at each of the following points:
   E = 3AM F = 9AM G = 3PM H = 9PM
8. If a person moves instantly from point D to point F, does the time of day get later or earlier?
9. If a person moves instantly from point E to point A, does the time of day get later or earlier?
10. When you travel east into a new time zone, should you add an hour or subtract an hour? add
    When you travel west into a new time zone, should you add or subtract an hour? subtract
11. Imagine that you take a one minute trip around the world, and you keep re-setting your watch every time you cross into a new time zone. Your watch says 8:00 AM as you leave. What time should it say when you return? 8:01 AM In order for this to happen, how many different time zones must there be? 24

12. **The diagram on the right shows the Earth as you would see it if you were looking down from above the North Pole.**
    a) **Part of the Earth should be dark. On the Diagram lightly shade the correct part of the Earth.**
    b) **Draw the sun where it should be located.**
    c) **Use arrows to show which direction the Earth is rotating.**
    d) **On the diagram, label a place where the sun is "rising."**
    e) **Label places which are experiencing sunset, midnight, and noon.**
13. a) Label the equator.
    b) Draw an arrow along the equator pointing East, and label it "East"
    c) Draw an arrow along the equator pointing West, and label it "West"
14. The time in one of the time zones is labelled. Correctly label the times in the other 23 time zones.



15. Using the diagram on the first page, take a mental trip around the world. Start on the diagram in Snohomish. Imagine your starting date is April 20th. Keep heading east, and watch how the time changes. Also watch how the day changes. Remember that a new day begins at 12:00 A.M. (Midnight). What time is it when you arrive back in Snohomish? What is the date? 9AM April 21st
16. Repeat your mental trip going West instead of east. According to the diagram, do you return a day earlier or a day later? 9AM April 19th
17. If someone could leave an airport at noon and fly around the world in 30 minutes, they should return on the same day that they left. Your previous answers should have shown that the day would change. In order to fix things so that you get the correct date:
    a) should you add a day or subtract a day when you travel around the world heading east? Subtract
    b) should you add a day or subtract a day when you travel west? add a day

Notes:

- There are 24 time zones on the Earth.
- When you cross into a new time zone heading east, you: +1 hour
- When you cross into a new time zone heading west, you: -1 hour
- The international dateline is at 180° longitude, in the middle of the pacific ocean.
- When you cross the international dateline heading west, you add 1 day. When you cross the international dateline heading east, you subtract 1 day.

Questions:

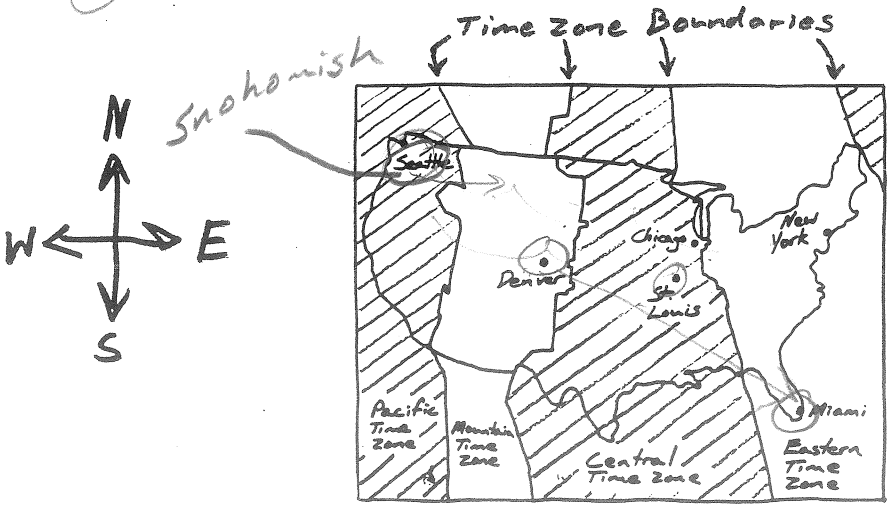
1. If it is 1:00 P.M. in Snohomish, what time is it in the next time zone to our east? 2PM
2. It is 5:30 P.M. in Seattle. What time is it in New York? 830
3. What time is it in Seattle when it is 4:20 A.M. in St. Louis? 220 AM
4. If you fly west across the international dateline and it was Monday when you left, what day will it be after you cross the dateline? Tuesday

Challenging:

5. Why do you think the edges of the time zones are not always straight lines? So time zones don't divide states, cities, etc.
6. You are on the west side of the international dateline. Your time is 5:00 P.M., on Thursday. What is the time and day when you step to the east and cross the international dateline? 6PM Wednesday
7. You fly from Denver to Miami. The flight lasts 3 hours. You left Denver at 7:15 A.M. Mountain Time. What time do the clocks in Miami show when you arrive in the Miami airport? 12:15 PM
8. Why do we need an international dateline? Cancels out the hours added or subtracted by time zone changes

Most difficult

9. Judging by the diagram on the first page, how is it possible to travel around the world, through every time zone, in under 5 seconds -- without using any machinery? Go to a pole and circle it.
10. If every location on the Earth has the same day and date, what time is it at the International Date Line? 12AM



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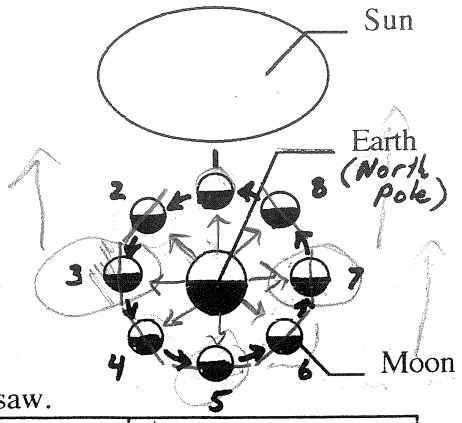
Earth Science Notes Name: _____

Purpose: to understand why the shape of the moon appears to change over the course of a month.

Simulate The Moon Phases

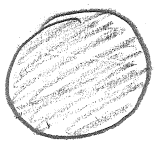
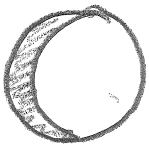
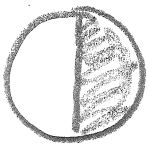
Be like the diagram on the right. Your head is the Earth. Your tennis ball is the moon. Stretch out your arm and hold the tennis ball away from your head. Imagine that the sun is in the front of the room -- this means you will need to make sure the sunny side of the moon is facing the front of the room. Hold the moon in position 1, then move it to positions 2, 3,...



Not To Scale! Out Of Proportion!

Draw the moon Phases

For each position on the diagram above, draw what you saw.

1.  Name: New	2.  Name: Waxing Crescent	3.  Name: Waxing Quarter	4.  Name: Waxing Gibbous
5.  Name: Full	6.  Name: Waning Gibbous	7.  Name: Waning Quarter	8.  Name: Waning Crescent

Name The Moon Phases
Use the terms below to come up with names for the moon phases you drew in the boxes above.

Waxing: Becoming more full. (When the right side of the moon is lit, it is waxing.)
Waning: Becoming less full. (When the left side of the moon is lit, it is waning.)
Crescent Moon: A thin, curved moon.
Gibbous Moon: A moon which is almost full, but it's not quite round.
Quarter Moon: A moon which is half light and half dark.
Full Moon: A complete, fully lit moon.
New Moon: A completely dark, invisible moon.

9-16. A moon's name has two parts. Part 1: tells whether it is growing or shrinking. Part 2: describes the shape. For example, an almost full moon which is growing is a waxing gibbous. Full moons and new moons are neither waxing nor gibbous. Label the each of the boxes above with the full, correct name.

17. A solar eclipse occurs when the moon's shadow covers us. A lunar eclipse occurs when the Earth's shadow falls on the moon.
   a) During which moon phase can we have a solar eclipse? New Moon
   b) During which moon phase can there be a lunar eclipse? Full Moon

18. Can you see the dark part of the moon? Not generally.

19. If you watch the moon at night, it appears to move across the sky. Why does it do that?
Earth is rotating (same reason sun rises & sets)

20. Approximately how long does it take the moon to orbit the Earth?
≈ 1 month

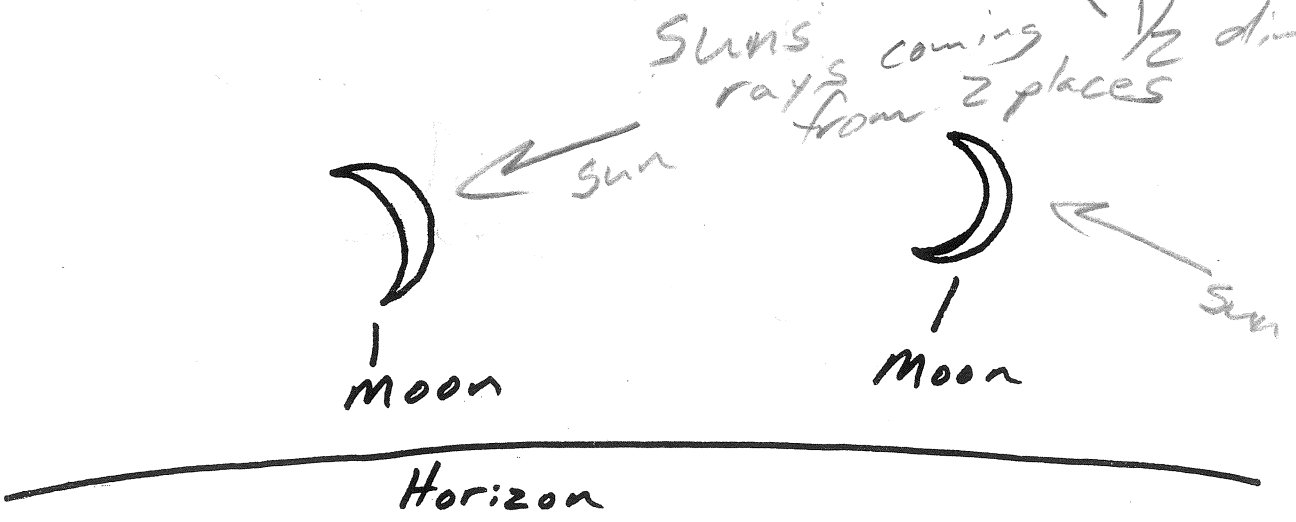
21

≈ 9PM ≈ 12AM (time of day -- on a clock)

22. Challenging: According to the diagram, at what time should a full moon be closest to overhead? What about a waxing gibbous?

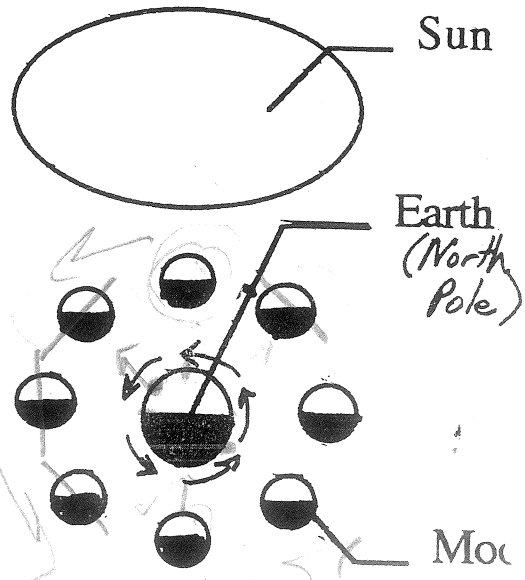
22.5 If you hold something at arm's length, and use it to cover up the full moon, how big should that thing be? Dime? Quarter? Nickel?

23. Challenging: The picture below shows what the night sky might look like on a planet with two moons. The planet orbits one star. Something is wrong with the diagram; what is it?



24. Challenging: Use your knowledge from the time zones notes to determine the approximate moonrise and moonset times below.

	Rise	Set
Full	6PM	6AM
Waxing Gibbous	3PM	3AM
Waning Crescent	3AM	3PM
New	6AM	6PM
1st Qtr (Waxing Quarter)	12PM	12AM



Earth Science (More Moon Stuff)

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Read pages 159-162, in the textbook, for a better understanding.

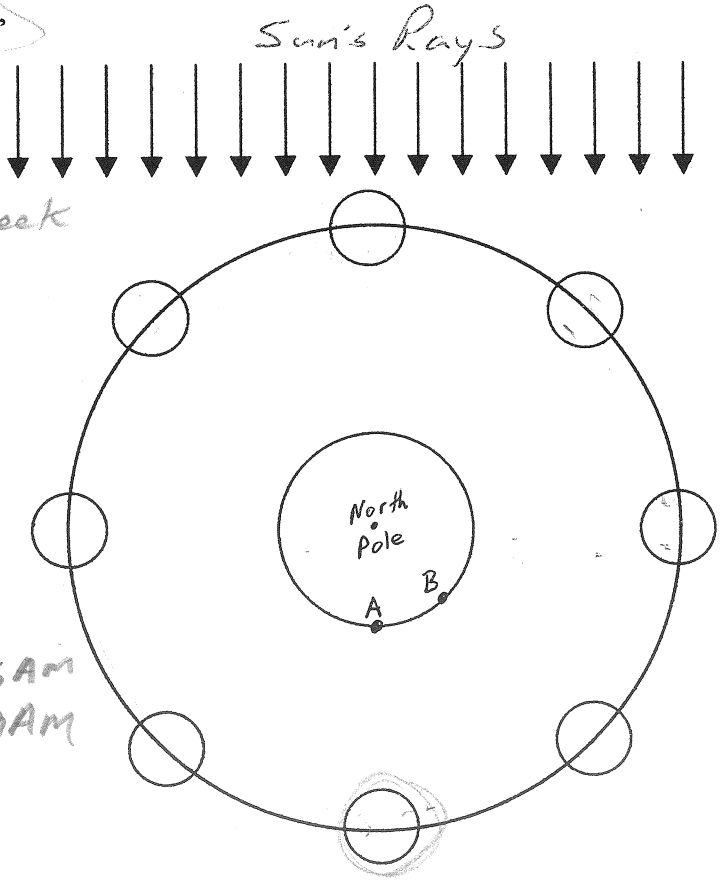
Useful Vocabulary:

Revolution: movement of something around something else in an elliptical or circular path.
Rotation: spinning of something on its axis.
Synodic Month: **29.5 earth days (very roughly, 4 weeks)**; the time it takes to go from one new moon to the next. 7 ½ days ≈ 1 week ≈ ¼ moon cycle.
Sidereal Month: 27 1/3 days; the time it takes for the moon to make a complete revolution.
Lunar Eclipse: the earth's shadow falls on the moon.
Solar Eclipse: the moon's shadow falls on the earth.
Partial Eclipse: a person standing in the shadow can see some, but not all, of the sun.
Total Eclipse: a person standing in the shadow cannot see any of the sun.
Zenith: the point at which something is highest in the sky. For example, the sun is at its zenith at around noon.
Tides: the rise and fall of water's surface due to the gravitational pull of the moon and sun.
Spring Tide: An especially strong tide that is produced when the sun and moon are working together.
Neap Tide: An especially weak tide that is produced when the sun and moon are working against each other.

Earth to sun (average distance) ≈ 93,000,000 miles (8 light minutes)
Earth to moon (average distance) ≈ 240,000 miles (1.3 light seconds)
Diameter of Earth at equator ≈ 8,000 miles
Diameter of Moon at equator ≈ 2,200 miles
Mass of Earth ≈ 6×10^{24} kg Mass of Sun ≈ 2×10^{30} Mass of Moon ≈ 7×10^{22} kg

Answer Choices (weeks): 0, ½, 1, 1 ½, 2, 2 ½, 3, 3 ½, 4

1. If today is a new moon, approximately how long will it be until there's another new moon? 4 weeks
2. How long does it take the moon to get through one quarter of it's cycle? 1 week
3. If today there is a waxing gibbous, how long will it be until there's a last quarter moon? 1 ½ weeks
4. Today there is a first quarter moon. Sometime during the next synodic month there will be a solar eclipse and a lunar eclipse. In how many days will the solar eclipse occur? 3 weeks
   In how many days will the lunar eclipse occur? 1 week



Answer choices (AM or PM): 12, 3, 6, 9

5. What time is it at point A? 12 AM
6. What time is it at point B? 3 AM
7. At what time does a new moon rise? 6 AM
8. At what time does a waning gibbous set? 9 AM
9. At what time is a waning crescent at it's zenith? 9 AM
10. When is a waxing crescent at its zenith? 3 PM
11. If you want to take one of those pictures of someone standing with the rising full moon behind him, at what time should you be ready to take your picture? 6 AM