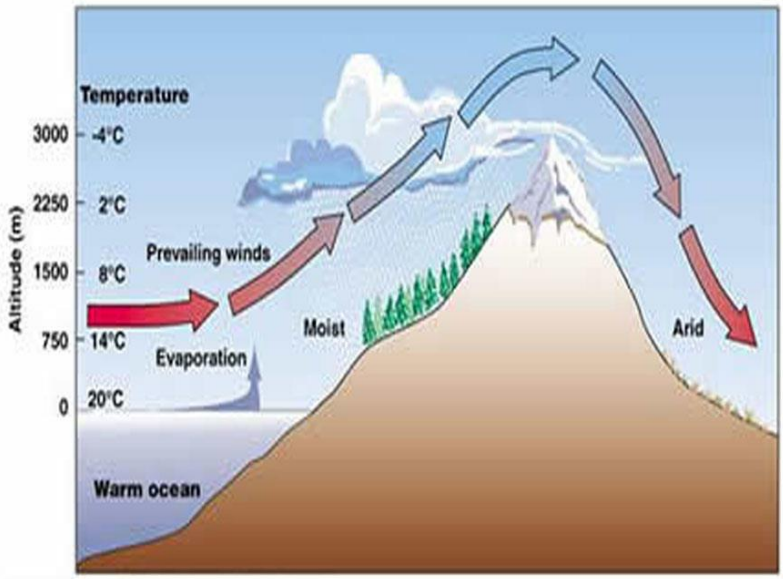
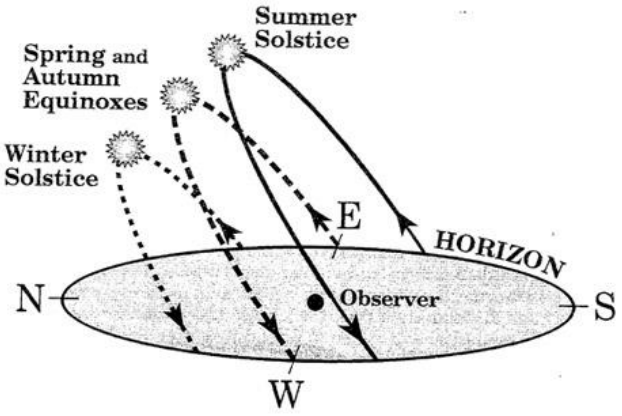
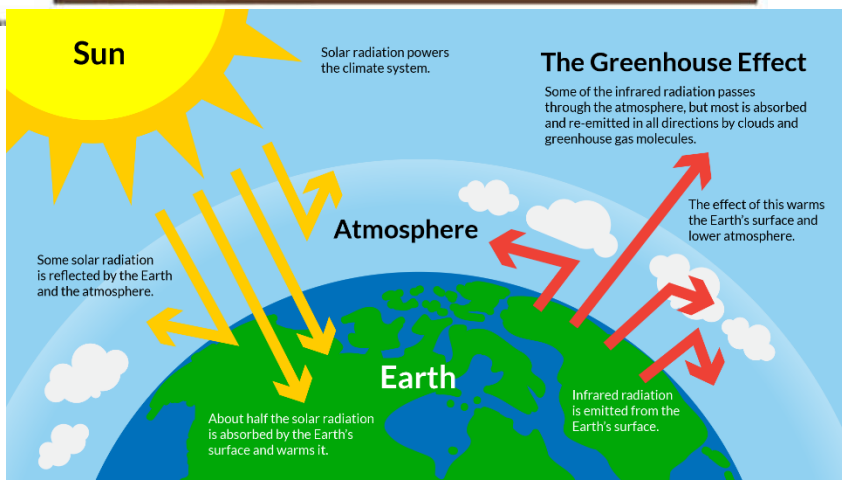
Practice Packet

Topic 8: Climate & Insolation







Name: _____

Vocabulary: _____

Lesson 1: _____

Lesson 2: _____

Lesson 3: _____

Lesson 4: _____

Lesson 5: _____

Lesson 6: _____

Lesson 7: _____

Lesson 8: _____

PRACTICE PACKET: TOPIC 8 CLIMATE

VOCABULARY

For each word, provide a short but specific definition from YOUR OWN BRAIN! No boring textbook definitions. Write something to help you remember the word. Explain the word as if you were explaining it to an elementary school student. Give an example if you can. Don't use the words given in your definition!

Climate: _____

Annual Temperature Range: _____

Arid: _____

Humid: _____

Angle of Intensity: _____

Marine Climate: _____

Continental Climate: _____

Monsoons: _____

El Niño: _____

La Niña: _____

Windward: _____

Leeward: _____

Insolation: _____

Infrared: _____

O-zone Layer: _____

Angle of Incidence: _____

Greenhouse Effect: _____

Global Warming: _____

Duration of Insolation: _____

Insolation Temperature Lag: _____

Parallelism: _____

Summer Solstice: _____

PRACTICE PACKET: TOPIC 8 CLIMATE

Fall Equinox: _____

Winter Solstice: _____

Spring Equinox: _____

Apparent Motion: _____

Real Motion: _____

Altitude of Polaris: _____

Zenith: _____

Lesson 1 – What is Climate

Objective:

- I can name the two properties that determine an areas climate
- I can explain Annual Temperature Range
- I can contrast Arid & Humid
- I can describe how latitude effects temperature & moisture

Climate is the overall view of a region's weather conditions over a long period of time. Factors that affect climate include latitude, elevation, proximity to large bodies of water, ocean currents, prevailing winds, mountain ranges, amount of cloud cover and vegetative cover. It is important to understand that since so many factors affect climate no one factor acts alone. For example a location at the equator on top of a mountain will have cold temperatures even though temperatures at the equator are generally warmer.

1. What is climate: _____
2. What are the 8 factors that affect climate? _____

_____ _____

_____ _____

_____ _____

_____

**** Temperature & Seasons are opposite in the Sothern Hemisphere. ****

1. What is the temperature like in NY in July? What about Argentina (42°S)?

2. What is the temperature like in NY in January? What about Argentina (42°S)?

PRACTICE PACKET: TOPIC 8 CLIMATE

Latitude: The data table below shows yearly average temperatures in degrees Fahrenheit for selected locations on a similar line of longitude. Use the data given to answer the questions below. The source of this information was www.worldclimate.com.

Location	Latitude	Longitude	Yearly average temperature (°F)
A. Ardmore, OK	34.20°N	97.15°W	64.0
B. Billings, OK	36.53°N	97.45°W	58.5
C. Wichita, KS	37.65°N	97.43°W	56.1
D. **Clay Center, NE**	39.38°N	97.11°W	55.0
E. Fairbury, NE	40.11°N	97.10°W	52.5
F. Columbia, SD	41.46°N	97.33°W	49.8
G. Gavins Point, SD	42.85°N	97.46°W	47.7
H. Howard, SD	44.02°N	97.52°W	45.3
I. Forman, ND	46.03°N	97.60°W	41.2
J. Hillsboro, ND	47.45°N	97.06°W	39.7

1. Which location was farthest North? _____
2. What is the yearly average temperature at this location? _____ °F
3. Which location was farthest South? _____
4. What is the yearly average temperature of this location? _____°F

Planetary Winds: The data below shows average rainfall of two locations at similar latitudes. Clearwater, WA is located on the west coast of North America and Van Buren, ME is located on the east coast. The source of this information was www.worldclimate.com.

Planetary winds help determine which way air masses and weather systems move. If an air mass originates over the water, and the planetary winds carry the air mass over land, that location will have a lot precipitation. If an air mass is carried over land to a location, there will not be as much precipitation.

CLEARWATER, WA is at about 47.58°N 124.30°W

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
inches	16.8	14.2	12.4	8.5	5.5	4.0	2.6	2.9	5.5	12.0	17.1	17.5	118.9

VAN BUREN, ME is at about 47.16°N 67.93°W

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
inches	2.7	1.9	2.2	2.6	3.1	3.4	4.1	4.0	3.1	3.4	3.5	2.8	36.8

PRACTICE PACKET: TOPIC 8 CLIMATE

Directions: Use the data and page 14 in your Earth Science Reference Tables to answer the following questions.

1. What is the name of the planetary wind located at the latitude shown above? _____
2. What is located to the west of Clearwater, WA? _____
3. What is the amount of rainfall in one year from Clearwater, WA? _____
4. What is located to the west of Van Buren, ME? _____
5. What is the amount of rainfall in one year from Van Buren, ME? _____
6. Explain why Clearwater has such a great amount of precipitation. _____

_____

THINKING CRITICALLY

Climate Clues

The chart below shows climate statistics for some U.S. cities. Information like this is recorded so that meteorologists can study and predict long-term weather patterns. Refer to the chart below to answer the questions that follow.

City	Average Temperature (°C)		Average Annual Precipitation (cm)	Average Number of Days	
	January	July		Clear	Cloudy
Albany, NY	–6.0	21.8	90.7	63	201
Anchorage, AK	–10.5	14.5	38.6	51	249
Boise, ID	–1.1	23.6	29.7	104	178
Boston, MA	–1.3	23.0	111.2	82	175
Chicago, IL	–5.8	22.7	84.6	85	185
Dallas, TX	6.6	30.1	74.8	144	120
Los Angeles, CA	13.3	20.5	30.6	170	68
Minneapolis, MN	–11.5	22.8	66.9	96	180
Nashville, TN	2.8	26.3	123.1	104	156
Portland, ME	–5.8	20.0	110.5	98	191
Salt Lake City, UT	–1.8	25.2	38.8	103	164
San Francisco, CA	9.1	16.7	50.0	183	91
Washington, DC	1.7	26.0	99.0	65	189

Your Turn to Think

1. Which city has the highest average temperature in January? in July?

   January: _____ July: _____
2. What climate factor or factors explain why the answer for highest temperature in January & July is not the same city?

3. Which city has the lowest temperature in January? in July?

   January: _____ July: _____

4. What climate factor or factors explain why the answer for lowest temperature in January & July is not the same city?

5. Based on the July averages what city do you think is the furthest North (highest latitude)? The furthest South (lowest latitude)? Explain your answers.

   High Latitude: _____ Low Latitude: _____

6. Which city has the highest number of cloudy days? _____

7. What climate factor or factors explains why it has the most cloudy days? *(Look at a map if you need help)*

8. If you like clear weather, which city would you prefer to live in? Explain your answer.

9. Which city has the largest range between its average January and July temperatures? What is the temperature difference?

   City: _____ Temperature Range: _____

10. Which city has the smallest range between its average January and July temperatures? What is the temperature difference?

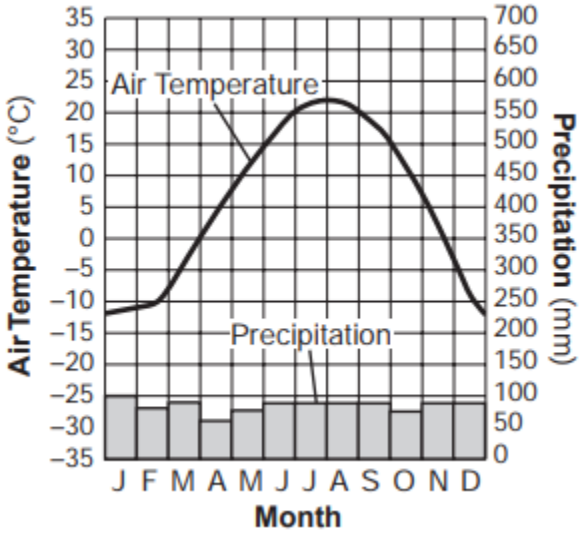
    City: _____ Temperature Range: _____

Regents Questions:

1. The graph below shows the yearly air temperature and precipitation of a location on Earth. This location would be most likely at a latitude of

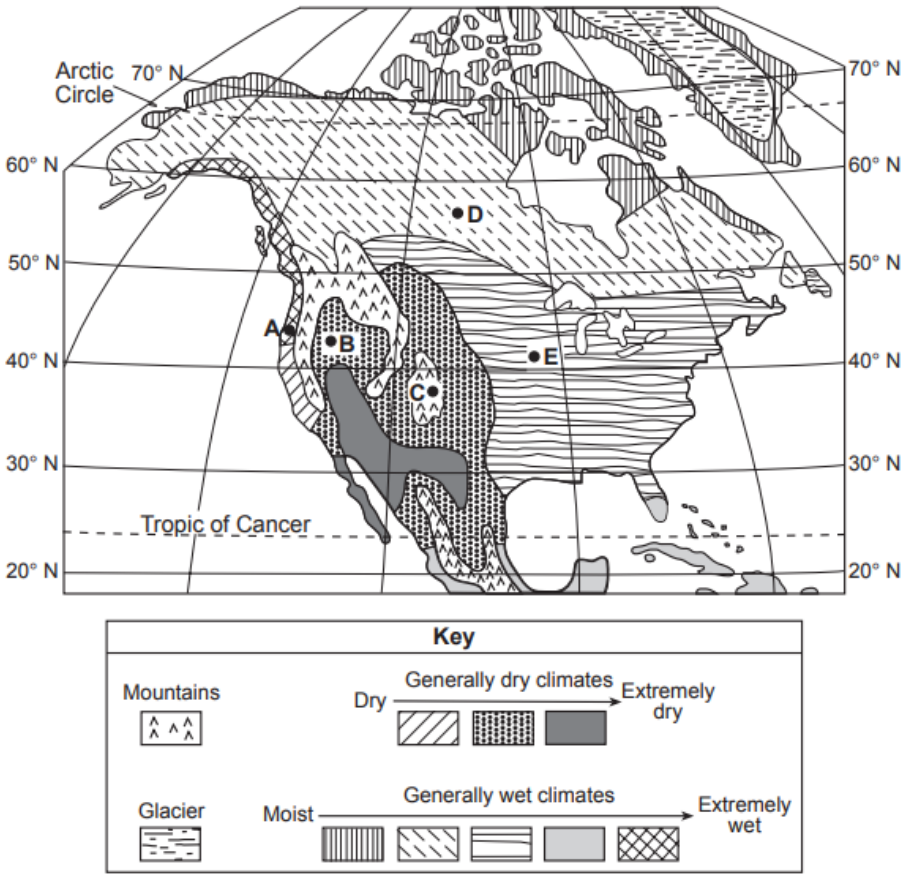
   a. 0° b. 50° N c. 35° S d. 90° N

2. Which climate condition generally results from both an increase in distance from the equator and an increase in elevation above sea level?
   a. cooler temperatures
   b. warmer prevailing winds
   c. increased precipitation
   d. increased air pressure



PRACTICE PACKET: TOPIC 8 CLIMATE

Base your answers to questions 3 through 5 on the generalized climatic moisture map of North America below and on your knowledge of Earth science. Areas are classified as generally dry or generally wet, and then ranked by relative moisture conditions. Glacial and mountain climate areas are also shown on the map. Points A, B, C, D, and E indicate locations on Earths surface.



3. Explain why the climate at location A is more moist than the climate at location B.

4. State the climate factor that causes a cold climate at location C.

5. Explain why location D has a cooler climate than location E.

6. A high air-pressure, dry-climate belt is located at which Earth latitude?
   a. 30°N b. 15°N c. 0° d. 60°N

7. Which generally has the greatest effect in determining the climate of an area?
   a. Degrees of longitude
   b. Distance from the equator
   c. Extent of vegetation
   d. Month of the year

ASSESS YOURSELF ON THIS LESSON: _____/7
If you missed more than 2, do the Additional Practice. If not, go on to the next hw video!!!

1. An area with a high potential for evapotranspiration has little actual evapotranspiration and precipitation. The climate of this area is *best* described as
   a. cold and arid b. hot and humid c. cold and humid d. hot and arid

2. According to the *ESRT*, at which of these latitudes would average annual precipitation be *greatest*?
   a. 90°S b. 90°N c. 30°N d. 0°

3. The planetary wind & moisture belts indicate that large amounts of rainfall occur at Earth's equator because air at Earth's surface is
   a. Converging & rising
   b. Diverging & rising
   c. Converging & sinking
   d. Diverging & sinking

ASSESS YOURSELF ON THIS ADDITIONAL PRACTICE: _____/3
If you missed more than 1 you should see me for extra help and/or re-watch the lesson video assignment

Lesson 2 – Climate 2 Notes

Objective:
- I can explain how distance from water affects climate
- I can contrast Marine & Continental climates
- I can explain how ocean currents affect climate
- I can use the Planetary Wind chart in ESRT
- I can explain El Niño & La Niña

Nearness to a Large body of Water:

Climate Patterns for Four Cities near Lake Erie

City	Distance from lake (km)	Average monthly temperature range (°C)	Number of frost-free days per year	Annual precipitation (cm)
A	0.0	7.6	205	73.6
B	1.6	8.8	194	81.4
C	48.3	10.8	162	94.0
D	80.5	11.9	154	97.5

Notes:
- "Average monthly temperature range" is the average difference between the maximum and minimum temperatures for the month.
- "Annual precipitation" is the total amount of precipitation per year.

Questions:

1. What happens to the average monthly temperature range as the distance from the lake increases?

2. Why does this happen?

3. What happens to the number of frost-free days as the distance from the lake increases?

4. Why does this happen?

5. What happens to the annual precipitation as the distance from the lake increases?

6. Why does this happen?

Match the type of climate with its description.

7. Marine climate _____
8. Continental climate ___

a. Relatively warm winters and cool summers
b. Cold winters & warm or hot summers

Ocean Currents

Hebron, 58°N, is a small city on the northeast coast of Labrador. Westmanna, even farther north at 63° latitude, is on a small island just off the southern coast of Iceland. Both places are at about the same altitude-nearly at sea level-and both are on the Atlantic Ocean. The prevailing winds are from the west. With conditions so nearly alike, it might be expected that Hebron and Westmanna would have similar temperatures throughout the year, with Westmanna a little colder because of its higher latitude. In one important respect, however, conditions are different. Hebron's coast is washed by the cold Labrador Current. Westmanna is washed by the warm Gulf Stream. Let us see how this difference affects their temperatures through the year.

Average Monthly Temperatures (degrees Fahrenheit)		
Name	Hebron, Labrador	Westmanna, Iceland
Location	58°N, 63 °W	63 °N, 20 °W
Altitude	49 Feet	43 Feet
Ocean Current	Labrador Current	Gulf Stream
January	-6	35
February	-5	35
March	6	36
April	18	40
May	32	45
June	40	50
July	47	53
August	48	52
September	41	47
October	31	42
November	19	37
December	4	35
January	-6	35
Average for the Year	23	42
Range for the Year		

1. How much higher is the year's average temperature in Westmannu than in Hebron?

2. Why would Westmanna normally be expected to be colder rather than warmer than Hebron?

3. How do you explain this great difference in the average temperature of two cities so much alike in latitude, altitude, and location?

4. Calculate the year's temperature range (difference between warmest and coldest months) for both cities. Enter these figures in the table.

5. Compare the winter temperatures at Hebron---December, January, February-with those of Westmanna.

6. Use your ESRT pg 4 what type of current is Labrador? Where is the water flowing from?

7. Use your ESRT pg 4 what type of current is the Gulf Stream? Where is the water flowing from?

8. The waters of the Labrador Current have a temperature of about 27°F. How can you explain Hebron's low winter temperatures? (Where do its winds come from)

9. Why is Westmanna so much warmer than Hebron in winter?

10. Compare the summer temperatures-July, August-of the two places.

11. Why is Hebron cooler in summer than Westmanna?

El Niño & La Niña

The western coast of South America normally has cool ocean currents. This leads to nutrient rich water and an abundance of fish. Every three to seven years in late December an upwelling of warm currents occur. This is called El Niño and will last anywhere from several months to as long as a year. The warm water not only reduces the production of fish, it may cause an increase in rain and flooding along coastal areas of California while at the same time producing a drought in the western Pacific.

When it is not an El Niño year, cold, nutrient-rich water rises up. This is called La Niña and brings back nutrients and a rich fish population. It also causes very strong trade winds, colder than normal surface waters over the eastern tropical Pacific, and warmer than normal surface waters in the western tropical Pacific.

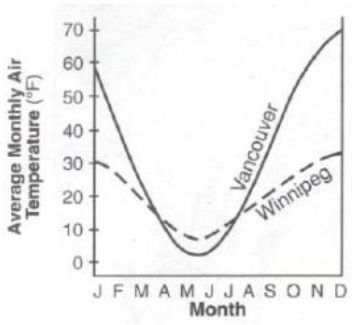
1. What is El Niño? _____
2. How often does El Niño occur? _____
3. How long does El Niño last? _____
4. How does El Niño affect the coastal areas of California? _____
5. What affect does El Niño bring to the western Pacific? _____

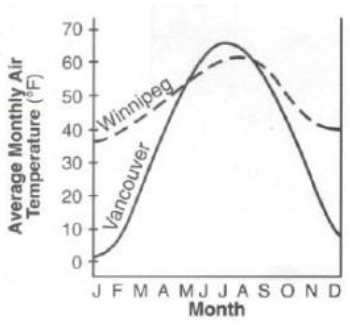
6. What economic impact may El Niño have? _____
7. When does La Niña occur? _____
8. What does La Niña cause in the eastern tropical Pacific? _____
9. What does La Niña cause in the western tropical Pacific? _____

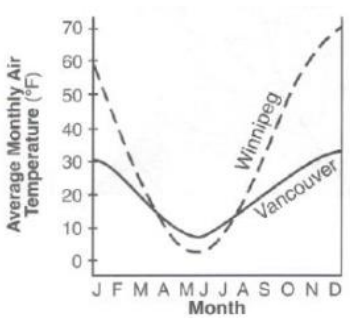
REGENTS QUESTIONS:

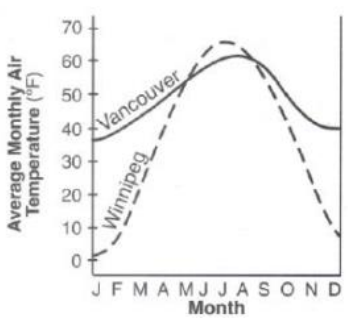
1. Riverhead, New York, has a smaller average daily temperature range than Elmira, New York, because Riverhead is located
   a. near a large body of water
   b. at a higher elevation
   c. at a lower latitude
   d. near a large city

2. The map shows a portion of the western United States and Canada. Two cities in Canada, Vancouver and Winnipeg, are labeled on the map. Which graph best represents the average monthly air temperatures for Vancouver and Winnipeg?

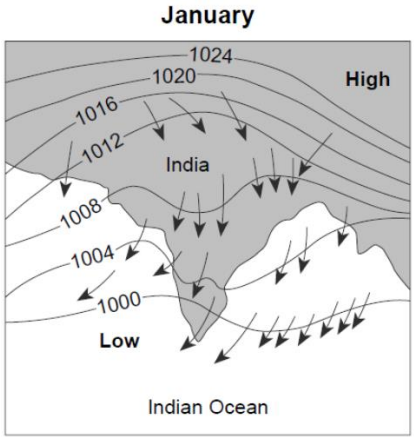


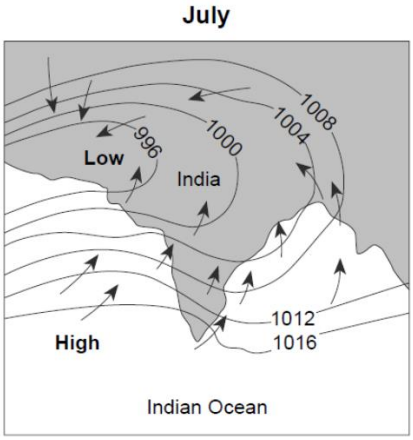






3. Arrows on the maps show differences in the direction of winds in the region of India and the Indian Ocean during January and July. Isobar values are recorded in millibars.





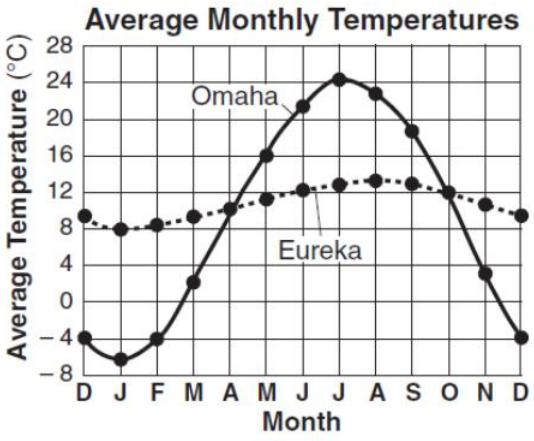
   Heavy monsoon rains usually occur in India during
   a. January, when winds blow from the land
   b. July, when winds blow from the ocean
   c. January, when winds blow toward high pressure
   d. July, when winds blow toward high Pressure

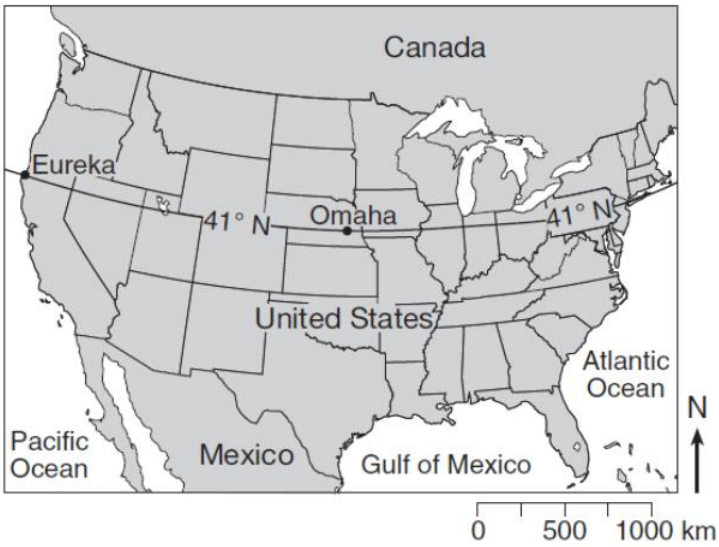
4. Which natural event periodically weakens western surface ocean currents in the equatorial Pacific Ocean, resulting in a change in air temperature and precipitation patterns in the United States?
   a. El Niño b. ocean tides c. transpiration d. volcanic eruptions

5. A city located on the coast of North America has warmer winters and cooler summers than a city at the same elevation and latitude located near the center of North America. Which statement best explains the difference between the climates of the two cities?
   a. Ocean surfaces change temperature more slowly than land surfaces.
   b. Warm, moist air rises when it meets cool, dry air.
   c. Wind speeds are usually greater over land than over ocean water.
   d. Water has a lower specific heat than land.

6. Which two 23.5°-latitude locations are influenced by cool surface ocean currents?
   a. the east coast of North America and the west coast of Australia
   b. the east coast of Asia and the east coast of North America
   c. the west coast of Africa and the east coast of South America
   d. the west coast of North America and the west coast of South America

Base your answers to questions 7 through 10 on the graph and map below and on your knowledge of Earth science. The average monthly temperatures for Eureka, California, and Omaha, Nebraska, are plotted on the graph. The map indicates the locations of these two cities.





7. Calculate the rate of change in the average monthly temperature for Omaha during the two-month period between October and December, as shown on the graph.

8. Explain why Omaha, which is farther inland, has a greater variation in temperatures throughout the year than Eureka, which is closer to the ocean.

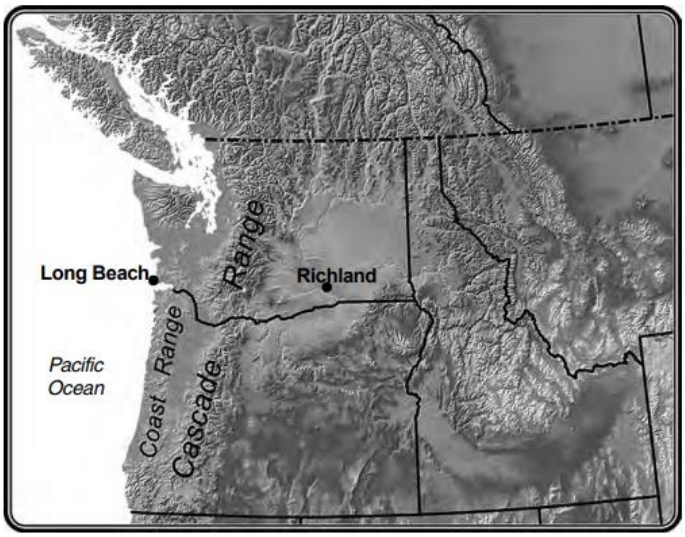
9. Identify the month with the greatest difference in the average temperature between these two cities.

10. Identify the surface ocean current that affects the climate of Eureka.

ASSESS YOURSELF ON THIS LESSON: _____/10
If you missed more than 3, do the Additional Practice. If not, go on to the next hw video!!!

PRACTICE PACKET: TOPIC 8 CLIMATE

Base your answers to questions 1 and 2 on the map below and on your knowledge of Earth science. The map shows the locations of the Coast Range and Cascade Range in the Pacific Northwest of the United States and two cities in this region.



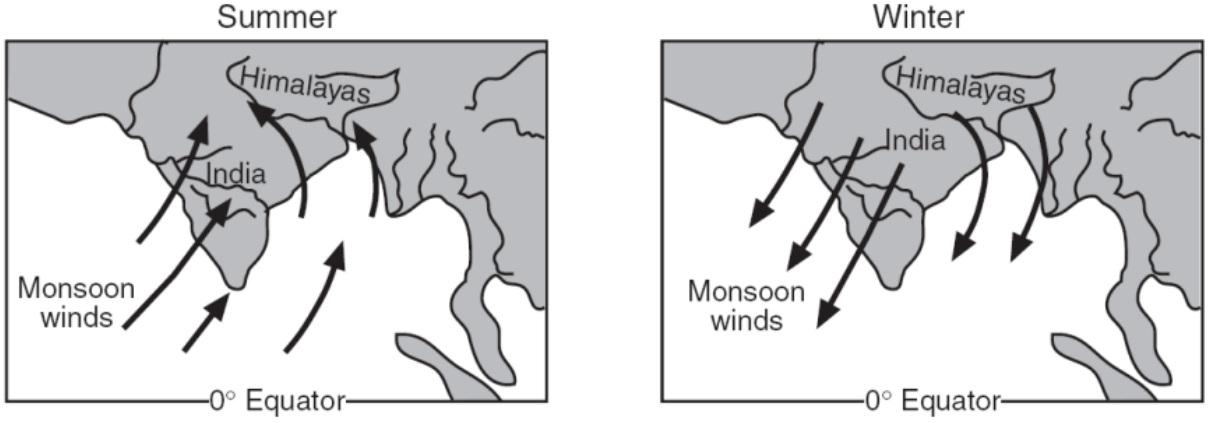
1. Identify the name of the cool surface ocean current that influences the climate of this region.

2. Explain why the difference between average winter and summer temperatures is smaller in Long Beach than in Richland.

3. Compared to an inland location, a location on an ocean shore at the same elevation and latitude is likely to have
   a. cooler winters and cooler summers
   b. warmer winters and cooler summers
   c. cooler winters and warmer summers
   d. warmer winters and warmer summers

4. The Canaries Current along the west coast of Africa and the Peru Current along the west coast of South America are both
   a. warm currents that flow away from the Equator
   b. warm currents that flow toward the Equator
   c. cool currents that flow away from the Equator
   d. cool currents that flow toward the Equator

5. The arrows on the two maps below show how the monsoon winds over India change direction with the seasons.

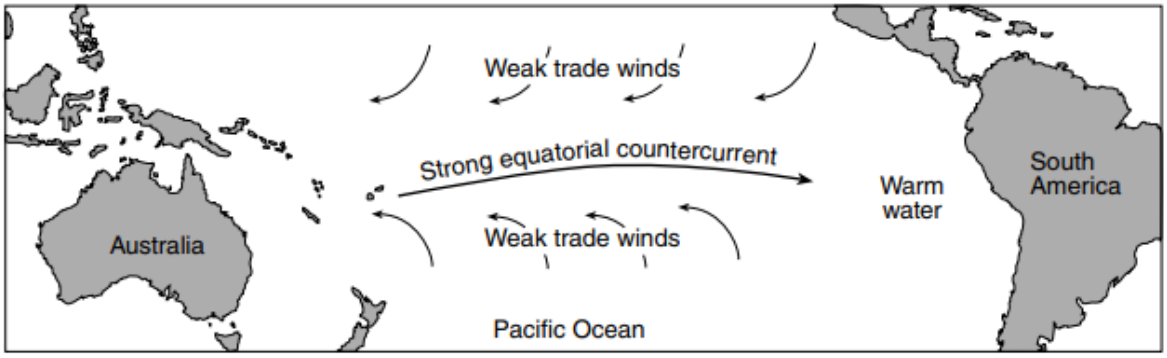


How do these winds affect India's weather in summer and winter?
   a. Summer is cooler and less humid than winter.
   b. Summer is warmer and more humid than winter.
   c. Winter is warmer and less humid than summer.
   d. Winter is cooler and more humid than summer.

6. Which ocean current has the greatest warming influence on the climate of the Outer Banks of North Carolina?
   a. Gulf Stream Current
   b. North Atlantic Current
   c. Labrador Current
   d. Canary Current

7. The map below shows the weak trade winds and strong equatorial countercurrent in the Pacific Ocean during El Niño conditions. This causes warm surface ocean water to migrate eastward, lowering the atmospheric pressure above this warm water

El Niño Conditions



What are the most likely changes to atmospheric temperature and precipitation along the west coast of South America during El Niño conditions?
   a. lower temperatures and lower amounts of precipitation
   b. lower temperatures and higher amounts of precipitation
   c. higher temperatures and lower amounts of precipitation
   d. higher temperatures and higher amounts of precipitation

ASSESS YOURSELF ON THIS ADDITIONAL PRACTICE: _____/7
If you missed more than 2 you should see me for extra help and/or re-watch the lesson video assignment

Lesson 3 – Climate 3

Objective:
- I can explain elevations effects on temperature & precipitation
- I can contrast the windward & leeward side of a mountain
- I can describe vegetation's effects on temperature
- I can explain how clouds effect temperature during the day & night

Elevation: In order to study the effects of altitude on temperature, it is necessary for us to exclude other factors such as latitude, distance from the sea, etc., from our examples. In other words, we must compare places which are as much alike as possible in all respects affecting temperature except **altitude.** Then, if there are differences in temperature, we can attribute them largely to differences in altitude. In this exercise we shall study two pairs of cities. The first pair, Singapore, Malaya, and Quito, Ecuador, are both on the Equator. Singapore is 10 feet above sea level, while the altitude of Quito is 9350 feet. The second pair of cities, Denver, Colorado, and Kansas City, Missouri, are both at about 39° north latitude in interior United States. The elevation of Kansas City is 750 feet, while Denver is 5290 feet above sea level.

Average Monthly Temperatures (degrees Fahrenheit)				
Name	Singapore, Malaya	Quito, Ecuador	Kansas City, Mo	Denver, Colo.
Latitude	2°N	0°	39°N	40°N
Altitude	10 feet	9350 feet	750 feet	5290 feet
January	80	55	30	31
February	80	55	35	34
March	81	55	44	39
April	82	55	56	49
May	82	55	65	57
June	81	55	75	67
July	81	55	81	74
August	81	55	79	72
September	81	55	71	64
October	81	55	60	53
November	81	54	44	41
December	80	55	34	34
January	80	55	30	31
Average for the Year	81	55	59	50
Range for the Year				

1. Compare the average annual temperatures of Singapore and Quito. Is the difference due to latitude or altitude?

2. State the relationship indicated between altitude and average temperature.

3. Compute the year's range (difference between warmest and coldest months) for Singapore and Quito. Enter these in the table.
4. Is the difference between the ranges of the two cities large or small? _____

   Does altitude appear to have much effect on range in this case?_____

   What accounts for the very small range in both of these cities?

5. Compare the average annual temperatures of Denver and Kansas City.

6. What relationship between altitude and average temperature is indicated?

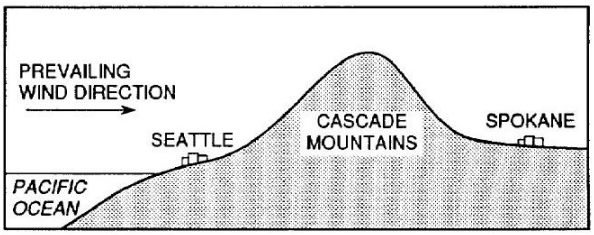
7. Compute the year's range for the two cities. And enter this information on the data table.
8. Is the difference between the ranges of the two cities large or small? _____

   Does altitude appear to have much effect on range in this case?_____

   What accounts for the very small range in both of these cities?

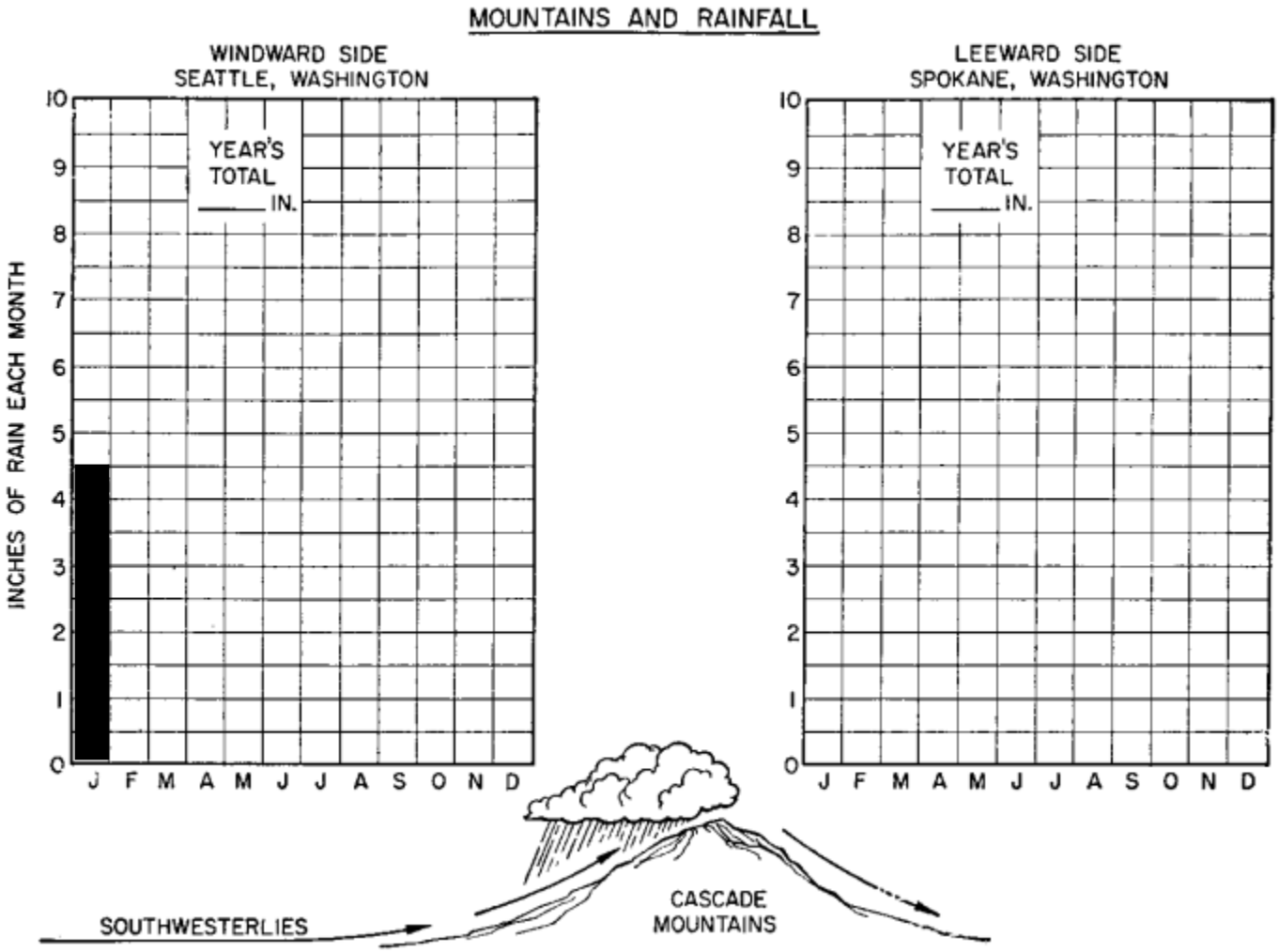
9. In which season are the temperatures of Denver and Kansas City almost identical (for three months)? Name the months.

Mountains & Rainfall: Seattle, Washington and Spokane, Washington are in almost exactly the same latitude-about 48° North, in the prevailing southwesterly wind belt. Seattle, nearer the Pacific, is about 200 miles west of Spokane, and separated from it by the north-south running Cascade Mountains. Seattle is on the western or windward side of the mountain range. Spokane is on the eastern or leeward side.



Average Monthly Rainfall (inches)		
Name	Seattle, Washington	Spokkane, Washington
Location	48°N, 122 °W	48 °N, 118 °W
January	4.5	1.7
February	3.7	15
March	3.1	1.3
April	1.9	1.0
May	1.6	1.0
June	1.2	1.2
July	0.5	0.4
August	0.9	0.5
September	1.6	0.9
October	3.1	1.3
November	4.5	1.9
December	5.3	2.2
Total for the Year		

Procedure: On the blank graphs provided for this exercise, plot the rainfall of both Seattle and Spokane as bar graphs. Estimate tenths of inches of rain as closely as possible. Each box represents 0.5 of an inch of rain. The rainfall for January has been plotted for you as a sample on Seattle, Washington.



1. Using the table, add up the monthly rainfall to find the total rainfall for the year: For Spokane & for Seattle. Enter the total on both the table and the graph.

2. Which side of the mountain, windward or leeward, receives greater rainfall? _____

3. Why should more rain fall on the windward side of a mountain than on the leeward side'?

4. Which six months are rainiest in Seattle? What seasons do these include?

5. Why are these seasons rainier than the other *two*? (Compare temperatures of land and sea.)

6. What factor, other than the Cascade Mountains, might be cited to explain why Snokane gets less rain than Seattle?

PRACTICE PACKET: TOPIC 8 CLIMATE

Vegetation: Locations with dense vegetation are generally cooler in the summer but very humid.

1. What process adds moisture to the atmosphere from plants?

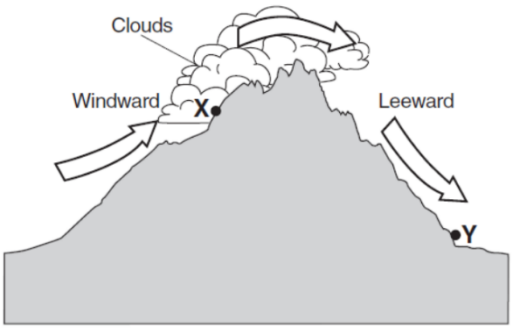
2. If there is a large number of trees and vegetation in an area, how would that affect the amount of moisture in the atmosphere?

3. Explain how added vegetation would cause the climate to be cooler.

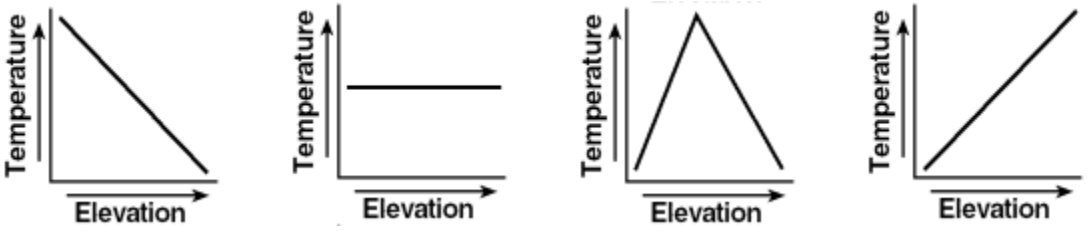
Regents Questions:

1. Mount Kilimanjaro is located in eastern Africa at 3° S. Which climate factor best explains the presence of permanent snow on its peak?
   a. latitude b. prevailing winds c. elevation d. ocean currents

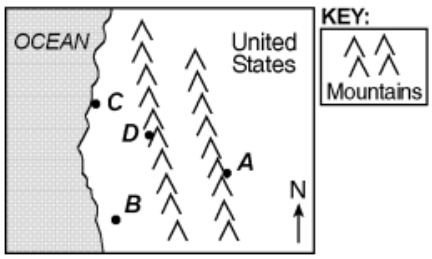
2. The cross section represents the windward and leeward sides of a mountain range. Arrows show the movement of air over a mountain. Points *X* and *Y* represent locations on Earth's surface. Describe how the air's temperature and water vapor content at point *X* is different from the air's temperature and water vapor content at point *Y*.



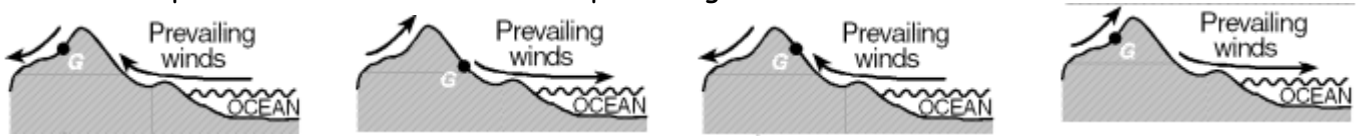
3. Which graph best shows the general effect that differences in elevation above sea level have on the average annual temperature?



4. The map shows the location of four cities, A, B, C, and D, in the western United States where prevailing winds are from the southwest. Which city most likely receives the least amount of average yearly precipitation?
   a. A b. B c. C d. D

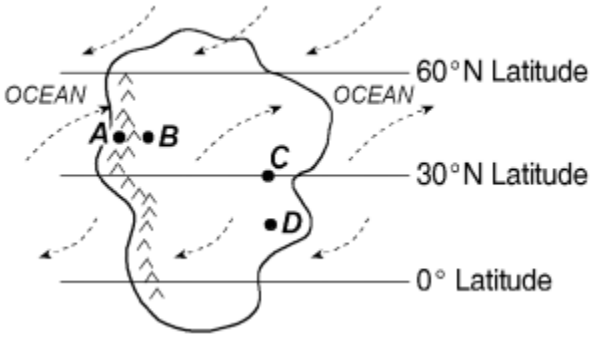


5. Location G has a cold, humid climate. Which profile best represents the position of location G with respect to the mountains and the prevailing winds?



PRACTICE PACKET: TOPIC 8 CLIMATE

The map shows an imaginary continent on Earth. Arrows represent prevailing wind directions. Letters A through D represent locations on the continent. Locations A and B are at the same latitude and at the same elevation at the base of the mountains.



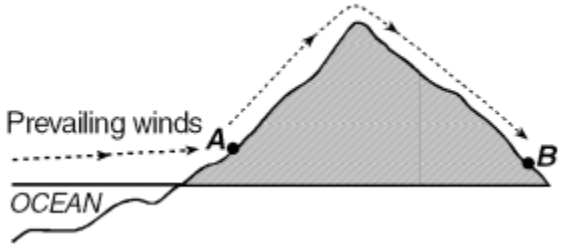
6. Over the course of a year, compared to location B, location A will have
   a. less precipitation and a greater temperature range
   b. less precipitation and a smaller temperature range
   c. more precipitation and a smaller temperature range
   d. more precipitation and a greater temperature range

7. Compared to the observations made at location D, the observed altitude of Polaris at location B is
   a. only greater from March 21 to September 22
   b. only less from March 21 to September 22
   c. always less
   d. always greater

8. The climate at location C is much drier than at location D. This difference is best explained by the fact that location C is located
   a. at a latitude that experiences longer average annual daylight
   b. at a latitude where air is sinking and surface winds diverge
   c. farther from any mountain range
   d. closer to a large body of water

ASSESS YOURSELF ON THIS LESSON: _____/8
If you missed more than 5, do the Additional Practice. If not, go on to the next hw video!!!

1. In the diagram of a mountain below, location A and location B have the same elevation. Compared to the climate at location A, the climate at location B will be
   a. warmer and drier
   b. warmer and wetter
   c. cooler and drier
   d. cooler and wetter

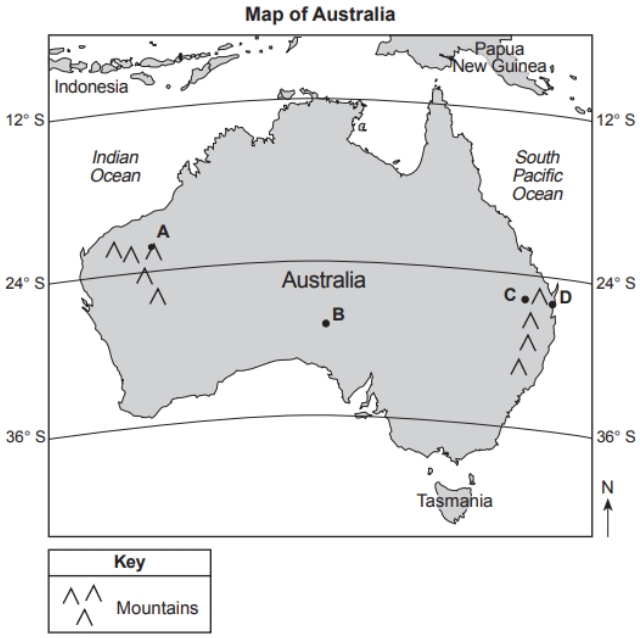


2. Which climate condition generally results from both an increase in distance from the equator and an increase in elevation above sea level?
   a. cooler temperatures
   b. increased precipitation
   c. warmer prevailing winds
   d. increased air pressure

3. Mt. Kilimanjaro, a volcano in Africa, located near the equator. Which climate factor is responsible for the snow seen on top Mt. Kilimanjaro?
   a. high latitude
   b. nearness to a cold ocean current
   c. high elevation
   d. nearness to a high-pressure weather center

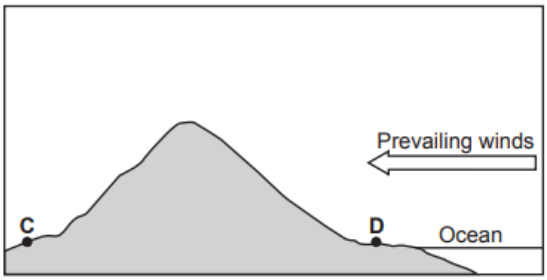
PRACTICE PACKET: TOPIC 8 CLIMATE

Base your answers to the questions below on the map of Australia and on your knowledge of Earth science. Points A through D on the map represent locations on the continent.



4. Explain why location A has a cooler average yearly air temperature than location B.

5. The cross section represents a mountain between locations C and D and the direction of prevailing winds. Explain why location D has a wetter climate than location C.



ASSESS YOURSELF ON THIS ADDITIONAL PRACTICE: _____/5
If you missed more than 2 you should see me for extra help and/or re-watch the lesson video assignment

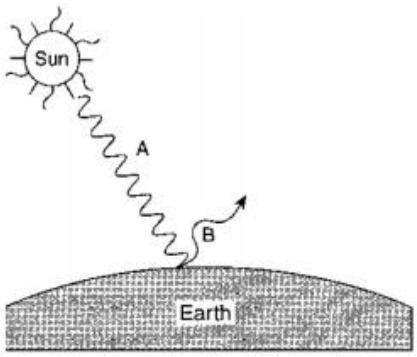
Lesson 4 – What is Insolation?

Objective:
- I can explain how Earth receives & gives off energy
- I know where the ozone layer is & what it protects us from
- I can name the factors that affect reflection & scattering
  - Angle
  - Surface characteristics
  - Land vs water

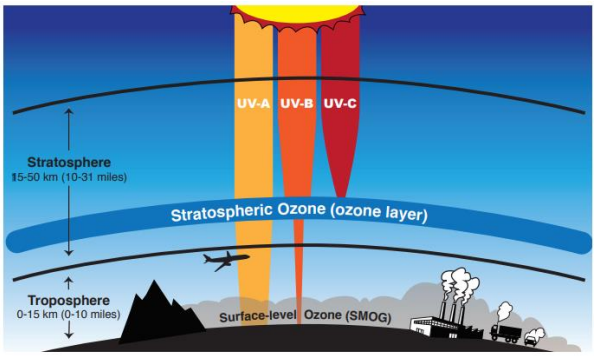
Incoming **Sol**ar Radi**ation** is commonly called insolation. In simple terms it means radiation from the sun. Many factors contribute to the amount and intensity of insolation that actually reaches Earth's surface. Atmospheric transparency (cloud cover), Angle of insolation (how high the sun is) and Duration of insolation (how long the sun is above the horizon).

1. What does the word "insolation" refer to? _____
2. List and describe three factors that contribute to the amount and intensity of insolation that reaches Earth's surface.
   a. _____
   b. _____
   c. _____

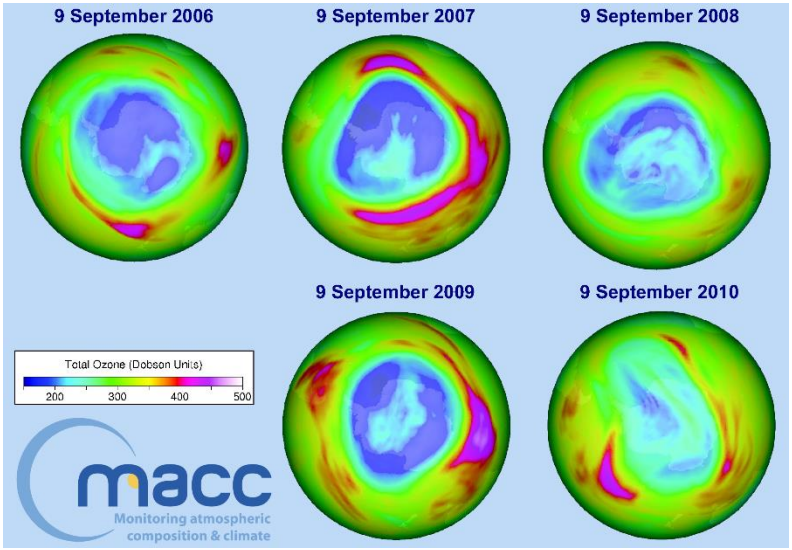
3. The diagram to the right represents Solar Radiation from the Sun and Terrestrial Radiation given off by Earth. Label the diagram next to each letter:
   A – Insolation (UV rays)
   B – Terrestrial radiation (infrared radiation)



Ozone (O_3) is a molecule made up of three atoms of oxygen (O), and is mostly found in the stratosphere, where it protects us from the Sun's harmful ultraviolet (UV) radiation. Although it represents only a tiny fraction of the atmosphere, ozone is crucial for life on Earth. Ozone in the stratosphere—a layer of the atmosphere between 15 and 50 kilometers (10 and 31 miles) above us—acts as a shield to protect Earth's surface from the sun's harmful ultraviolet radiation. Without ozone, the Sun's intense UV radiation would sterilize the Earth's surface. With a weakening of this shield, more intense UV-B and UV-A radiation exposure at the surface would lead to quicker sunburns, skin cancer, and even reduced crop yields in plants. However, near the surface where we live and breathe, ozone is a harmful pollutant that causes damage to lung tissue and plants. This "bad" ozone forms when sunlight initiates chemical reactions in the air involving pollutants, particularly a family of gases called nitrogen oxides (released from vehicles and industry during the combustion process) and with volatile organic compounds (carbon-containing chemicals that evaporate easily into the air, such as petroleum products).



The Ozone Hole is not really a "hole" but a thinning of the ozone layer over the south polar region. Every year, since at least 1978, there is a sudden, rapid decrease in the stratospheric ozone levels at the end of the Antarctic winter. The Vienna Convention was agreed to in 1985, and called out **ozone-depleting substances (ODS)** as an ozone threat. Faced with the strong possibility that ODSs—gases containing halogens such as CFCs (chlorofluorocarbons)—could cause serious ozone depletion, policy makers from around the world signed the Montreal Protocol treaty in 1987, limiting CFC production and usage. As a result of the Montreal Protocol and its subsequent Amendments and Adjustments, ODS emissions decreased substantially between 1990 and the present.

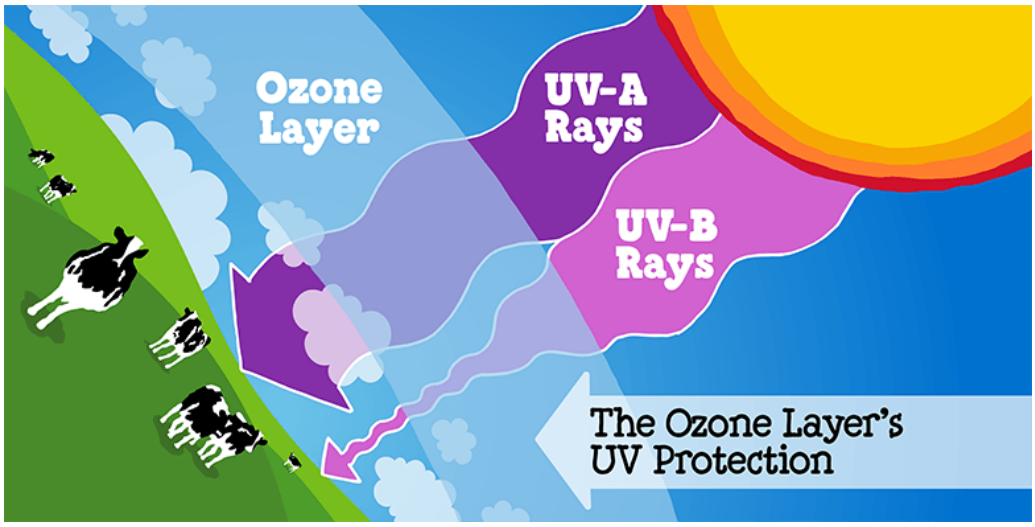


Emissions of ODSs ended in 1992. However, their abundance is only now beginning to decline because the chemicals stay in the atmosphere for 50 to 100 years. The peak abundance of CFCs in the atmosphere occurred around 2000, and has

decreased by roughly 4 percent to date. Stratospheric ozone was depleted by 5 to 6 percent at middle latitudes, but has rebounded a little in recent years. The largest recorded Antarctic ozone hole was recorded in 2006, with slightly smaller holes since then. The "Real World" simulation predicts the recovery of the ozone layer to above 300 DU by the 2050-2060 time frame.

1. What is Ozone? _____
2. Where is Ozone found? _____
3. What does it protect us from? _____
4. What would a weakening of this shield lead to? _____

   _____
5. Where does "bad" ozone come from? _____
6. What does "bad" ozone cause? _____
7. What is the ozone hole? _____
8. What does ODS stand for? _____
9. What does CFC's stand for? _____
10. What did the Montreal Protocol treaty do? _____
11. Why is the abundance of ODSs just starting to decline? _____
12. When was the peak abundance of CFCs? _____
13. When was the largest recorded Antarctic ozone hole? _____
14. When does the "Read World" simulation predict the recovery of the ozone layer? _____



PRACTICE PACKET: TOPIC 8 CLIMATE

NASA's fleet of Earth observing satellites produce 1500 Terabytes of data each year, enough to fill 3000 laptops, each with a 500 GB hard drive. To help interpret this wealth of data, scientists rely on techniques to visualize information such as mapping data values to colors. Create your own color map using data from Aura's OMI instrument of total ozone from October 2012.

274	289	291	300	305	307	312	314	312	320	318	319	309	302	296	292
280	289	296	304	309	311	314	314	323	330	334	329	330	317	307	297
279	292	308	313	312	310	306	311	322	331	345	343	346	332	324	308
293	305	311	315	310	289	283	279	290	314	336	359	360	353	339	320
305	314	317	318	300	259	236	232	236	257	291	342	374	372	356	332
305	316	325	325	289	242	208	194	196	217	247	301	368	386	370	347
321	325	321	330	288	232	195	179	169	180	216	280	357	400	376	352
322	328	326	325	304	253	210	187	177	186	219	287	359	402	388	364
324	326	327	328	327	297	247	224	216	222	254	306	375	408	386	358
320	329	331	332	342	340	304	285	279	283	307	353	395	403	383	362
315	325	340	348	359	368	363	352	357	347	366	399	409	397	376	357
315	326	331	356	362	381	397	402	401	407	415	415	406	390	369	348
311	323	341	349	366	385	404	412	424	423	423	413	396	378	359	346
304	322	330	345	361	376	395	406	411	408	397	388	376	358	341	326
302	320	327	339	354	368	378	389	397	389	381	367	359	342	331	316
292	306	318	329	338	347	352	361	368	367	361	356	342	330	320	306

Color Scale (Dobson Units)

_____	_____	_____	_____	_____	_____	_____

1. The ozone layer protects life on Earth by absorbing harmful ultraviolet radiation. The ozone layer is located between 17 kilometers and 35 kilometers above Earth's surface in which atmospheric temperature zone?
   a. troposphere b. stratosphere c. mesosphere d. thermosphere

2. Scientists are concerned about the decrease in ozone in the upper atmosphere primarily because ozone protects life on Earth by absorbing certain wavelengths of
   a. x-ray radiation
   b. infrared radiation
   c. ultraviolet radiation
   d. microwave radiation

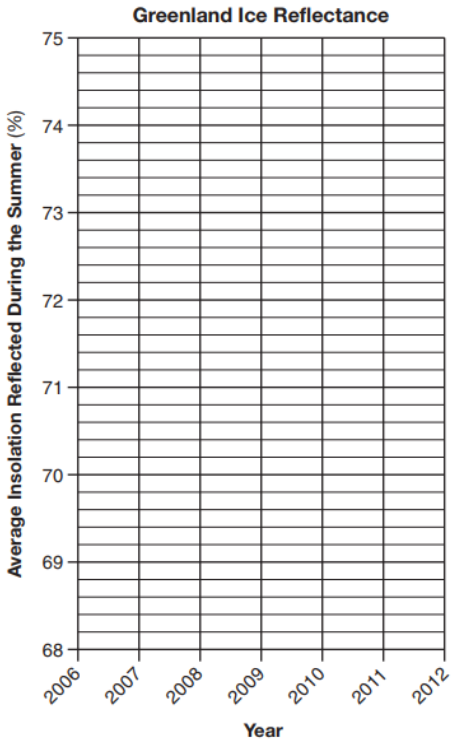
3. Most of the electromagnetic energy radiated from Earth's surface is in the form of
   a. ultraviolet rays b. infrared rays c. gamma rays d. x rays

4. Equal areas of which surface would absorb the greatest amount of insolation on a sunny day?
   a. light-colored, smooth surface c. light-colored, rough surface
   b. dark-colored, smooth surface d. dark-colored, rough surface

Base your answers to questions 5 through 7 on the data table below and on your knowledge of Earth science. The data table shows the average percentage of insolation from 2006 to 2012 that was reflected during the summer months by the ice sheet that covers a large portion of Greenland.

Data Table

Year	Average Insolation Reflected During the Summer (%)
2006	74.3
2007	72.8
2008	72.9
2009	71.8
2010	70.3
2011	70.1
2012	68.3



5. On the grid, construct a line graph by plotting the average insolation reflected during the summer by the Greenland ice sheet from 2006 to 2012. Connect all seven plots with a line.

6. Describe the general trend for the average insolation reflected by the Greenland ice sheet from 2006 to 2012 and state what can be inferred about the change in size of the Greenland ice sheet during this time period.

   Insolation-reflected trend: _____

   _____

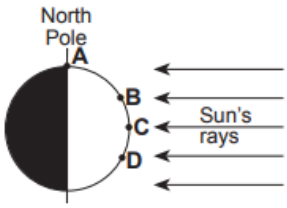
   Inferred change in size: _____

   _____

7. Describe one characteristic of the ice sheet that makes it a good reflector of insolation.

8. Which gas absorbs some of the harmful insolation in Earth's upper atmosphere before that insolation reaches Earth's surface?
   a. nitrogen b. oxygen c. ozone d. hydrogen

9. The diagram below represents Earth and the Sun's incoming rays. Letters A, B, C, and D represent locations on Earth's surface. Which two locations are receiving the same intensity of insolation?



   a. A and B
   b. B and C
   c. C and D
   d. D and B

10. Equal areas of which type of surface will reflect the most insolation?
   a. light gray rooftop
   b. dark tropical forest
   c. snow-covered field
   d. black paved road

ASSESS YOURSELF ON THIS LESSON: _____/10
If you missed more than 3, do the Additional Practice. If not, go on to the next hw video!!!

1. A solar water heater contains fluid-filled tubing that absorbs sunlight energy on its outside surface. Which tubing exterior will best absorb insolation?
   a. dark-colored and rough
   b. light-colored and rough
   c. dark-colored and smooth
   d. light-colored and smooth

2. The ozone layer protects life on Earth by absorbing harmful ultraviolet radiation. The ozone layer is located between 17 kilometers and 35 kilometers above Earth's surface in which atmospheric temperature zone?
   a. troposphere b. mesosphere c. stratosphere d. thermosphere

3. At what approximate altitude in the atmosphere can stratospheric ozone be found?
   a. 10 km b. 70 km c. 30 km d. 100 km

Base your answers to questions 4 through 6 on the passage below and on your knowledge of Earth science.

Ozone in Earth's Atmosphere

Ozone is a special form of oxygen. Unlike the oxygen we breathe, which is composed of two atoms of oxygen, ozone is composed of three atoms of oxygen. A concentrated ozone layer between 10 and 30 miles above Earth's surface absorbs some of the harmful ultraviolet radiation coming from the Sun. The amount of ultraviolet light reaching Earth's surface is directly related to the angle of incoming solar radiation. The greater the Sun's angle of insolation, the greater the amount of ultraviolet light that reaches Earth's surface. If the ozone layer were completely destroyed, the ultraviolet light reaching Earth's surface would most likely increase human health problems, such as skin cancer and eye damage.

4. State the name of the temperature zone of Earth's atmosphere where the concentrated layer of ozone gas exists.

5. Explain how the concentrated ozone layer above Earth's surface is beneficial to humans.

ASSESS YOURSELF ON THIS ADDITIONAL PRACTICE: _____/5
If you missed more than 2 you should see me for extra help and/or re-watch the lesson video assignment

PRACTICE PACKET: TOPIC 8 CLIMATE

Lesson 5 – Factors affecting Insolation

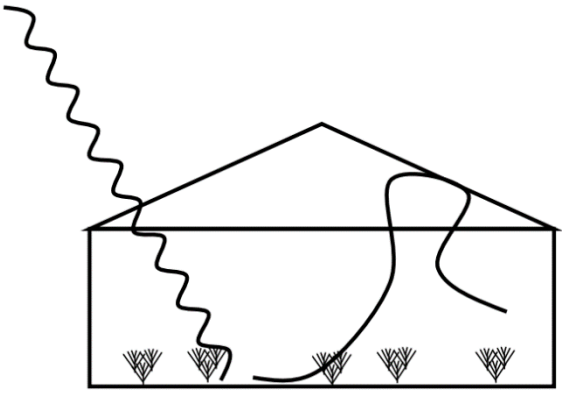
Objective:

- I can explain the greenhouse effect
- I can describe global warming
- I can name the main factors that affect insolation
- I can explain why the angle of insolation changes

Insolation from the sun is primarily in the visible light range. This short wave radiation (Ultraviolet Rays) is able to enter Earth's atmosphere and heats Earth's surface. This heat energy is then re-radiated from Earth's surface and is called terrestrial radiation. Infrared radiation (long wave radiation) is emitted from Earth and other terrestrial objects. Greenhouse gasses absorb and trap in the long wave radiation.

The Earth has a natural greenhouse effect—it has been around since the planet formed and has sustained life for many millions of years. We have always had greenhouse gases in our atmosphere. Without them the Earth would be too cold for us, or any other living thing, to survive. Naturally-occurring greenhouse gases, such as **carbon dioxide**, **methane** & **water vapor**, allow solar radiation to reach the Earth's surface, while trapping radiation from the Earth on its way back out to space. The trapped energy warms the Earth's surface, making it about 35°C warmer than it would be if we didn't have greenhouse gases in the atmosphere. There would be no life on Earth without the warmth provided by this natural greenhouse effect.

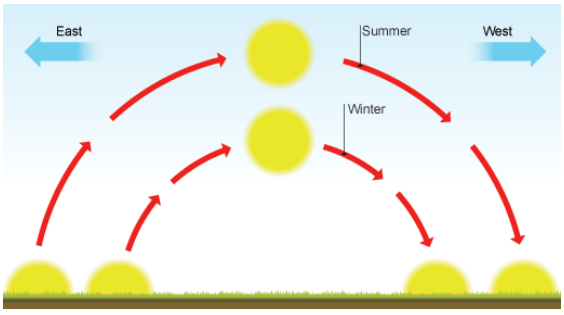
1. In the diagram to the right, label ultraviolet light and infrared radiation.



2. What are the two **main** greenhouse gasses?
   _____ &
   _____

3. Describe how the greenhouse effect occurs?

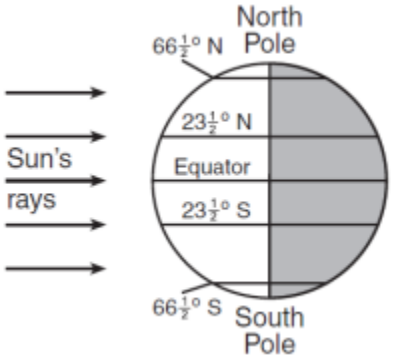
Angle of insolation changes depending on three things:



1. **Time of day**
   a. Label on the picture →
      i. Sunrise
      ii. Sunset
      iii. Noon
   b. Sunrise - Sun is [low / high] in the sky and temperatures are [warmer / cooler].
   c. Solar noon – Sun is [highest / lowest] the sky and temperatures are [warmer / cooler].
   d. Sunset - Sun is [low / high] in the sky and temperatures are [warmer / cooler].

PRACTICE PACKET: TOPIC 8 CLIMATE

2. **Latitude** – refer to the diagram to the right



   a. Which location (name and degree latitude) is the sun's rays directly overhead (highest angle of insolation)

      _____, _____°

   b. Which location would have the highest temperatures?

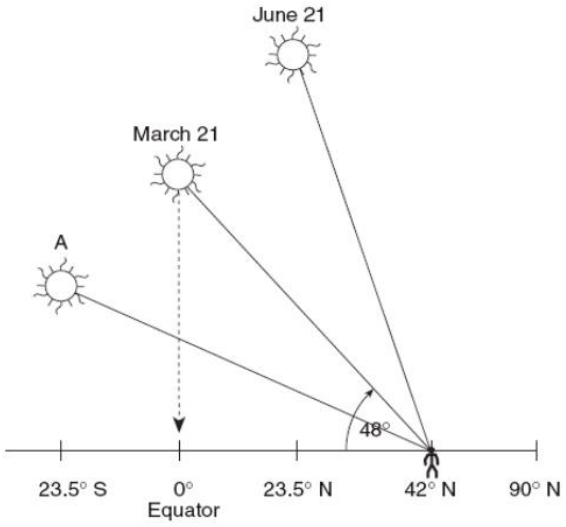
   c. Which two locations (name and degree latitude) are the sun's rays at the lowest angle of insolation. _____, _____° & _____, _____°

   d. What is true about the temperatures at the two locations in question "c"? (warm / cold)

   e. Write the relationship between angle of insolation and the rate of heating.

   f. Draw the relationship between latitude and the angle of insolation on the graph to the right. Remember to label the axis.

3. **Season**



   a. Label the seasons (summer and spring) next to the dates given in the diagram to the right.
   b. Determine the month for the sun labeled "A" on the diagram.

   c. What season is "A"? _____

   d. Which season is the sun highest in the sky?

   e. Which season has the warmest temperatures?

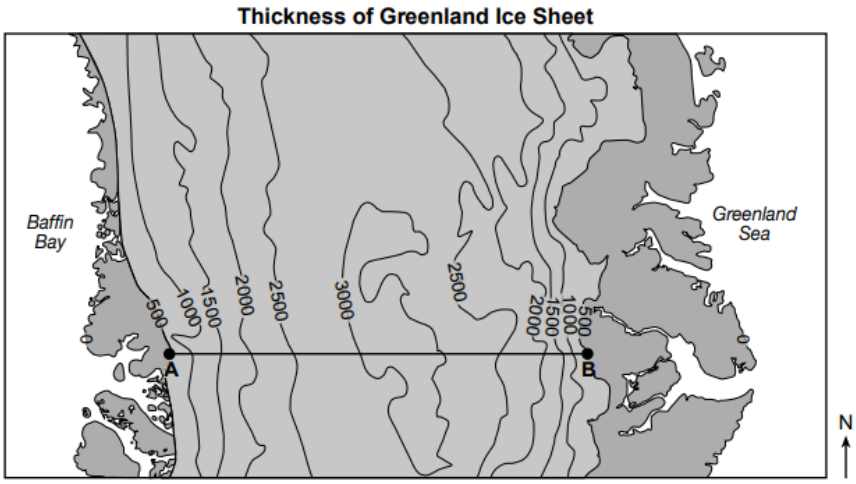
   f. Which season is the sun lowest in the sky? _____

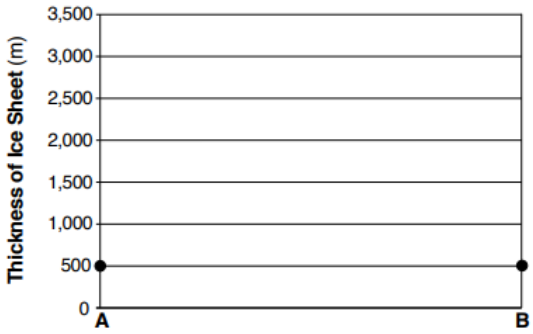
   g. Which season has the coldest temperatures? _____

Regents Questions:

1. Evidence supports the idea that increases in carbon dioxide and methane in Earth's atmosphere are major contributors to global warming. This is based primarily on the fact that carbon dioxide and methane are excellent absorbers of
   a. gamma rays b. visible light c. microwaves d. infrared radiation

Base your answers to questions 2 through 4 on the map and passage below and on your knowledge of Earth science. The map shows isolines that represent the thickness of a portion of the Greenland Ice Sheet in meters (m). Letters A and B represent points on the ice sheet's surface.





Greenland Ice Sheet

The Greenland Ice Sheet is a vast body of ice covering roughly 80 percent of the surface of Greenland. The ice sheet is almost 2400 kilometers long in a north-south direction. The ice sheet, consisting of layers of snow compressed over more than 100,000 years, contains a valuable record about Earth's past climates. The ice sheet glaciers continue to flow seaward and deposit sediment, but global warming has affected them. Warmer air temperatures have caused increased melting, resulting in a thinning of the ice sheet and faster glacial movement at the ice sheet edges.

2. On the grid, construct a profile along line AB by plotting the thickness of the ice sheet where each isoline crosses line AB. Thicknesses of the ice sheet at A and B have been plotted on the grid. Connect all twelve plots with a line from A to B to complete the profile.

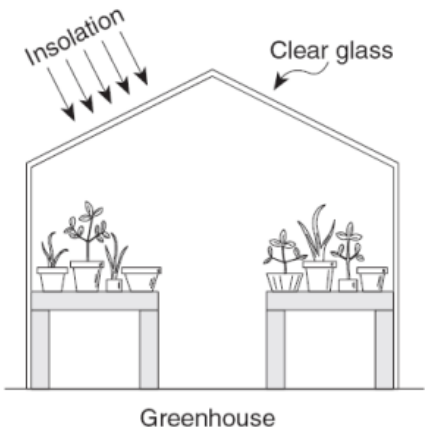
3. Describe one glacial feature that could be found on the exposed surface bedrock of Greenland that would indicate the direction that the ice moved.

4. Identify <u>two</u> major greenhouse gases that are inferred to contribute to global warming and increased temperatures in Greenland.

5. Which two gases in Earth's atmosphere are believed by scientists to be greenhouse gases that are major contributors to global warming?
   a. carbon dioxide and methane
   b. hydrogen and helium
   c. oxygen and nitrogen
   d. ozone and chlorine

6. A gradual increase in atmospheric carbon dioxide would warm Earth's atmosphere because carbon dioxide is a
   a. poor reflector of ultraviolet radiation
   b. poor absorber of infrared radiation
   c. good reflector of ultraviolet radiation
   d. good absorber of infrared radiation

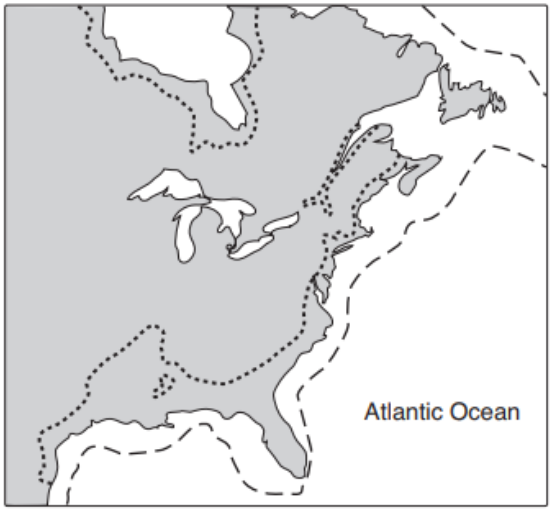
7. The diagram to the right shows a greenhouse. What is the primary function of the clear glass of the greenhouse?
    a. The glass reduces the amount of insolation entering the greenhouse.
    b. The glass allows all wavelengths of radiation to enter and all wavelengths of radiation to escape.
    c. The glass allows short wavelengths of radiation to enter, but reduces the amount of long wavelength radiation that escapes.
    d. The glass allows long wavelengths of radiation to enter, but reduces the amount of short wavelength radiation that escapes.

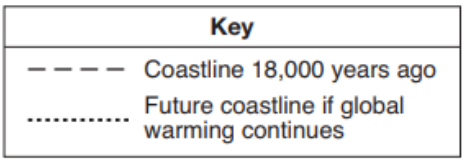


8. Most scientists infer that increasing levels of carbon dioxide in Earth's atmosphere are contributing to
    a. decreased thickness of the troposphere
    b. increased absorption of ultraviolet radiation
    c. depletion of ozone
    d. increased global temperatures

9. Which two gases in Earth's atmosphere are believed by scientists to be greenhouse gases that are major contributors to global warming?
    a. carbon dioxide and methane
    b. hydrogen and helium
    c. oxygen and nitrogen
    d. ozone and chlorine

Base your answers to questions 10 and 11 on the map below and on your knowledge of Earth science. The map shows part of the North American coastline. The present coastline is shown as a solid line. The symbols on the key below indicate the inferred coastline 18,000 years ago and an inferred future coastline if global warming continues.

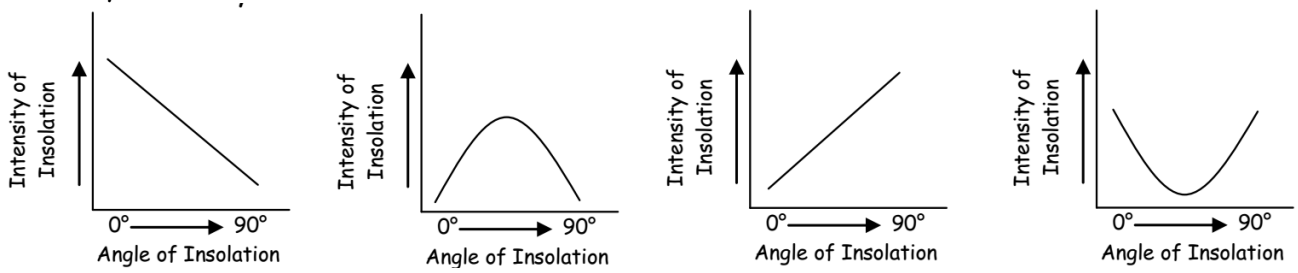




10. Which statement best explains why 18,000 years ago the coastline was at a different location than it is today?
    a. The climate of Earth was extremely hot and dry.
    b. A large amount of Earth's water was stored in large continental ice sheets.
    c. The east coast of North America was being subducted under the Eurasian Plate.
    d. North America had just separated from Africa, and the Atlantic Ocean was forming.

11. The inferred position of the future coastline is based on the assumption that the
    a. total amount of global precipitation will decrease
    b. thickness of the ozone layer will decrease
    c. concentration of carbon dioxide in Earth's atmosphere will increase
    d. rate of uplift of the North American continent will increase

12. Which graph best represents the relationship between the angle of insolation and the intensity of insolation?

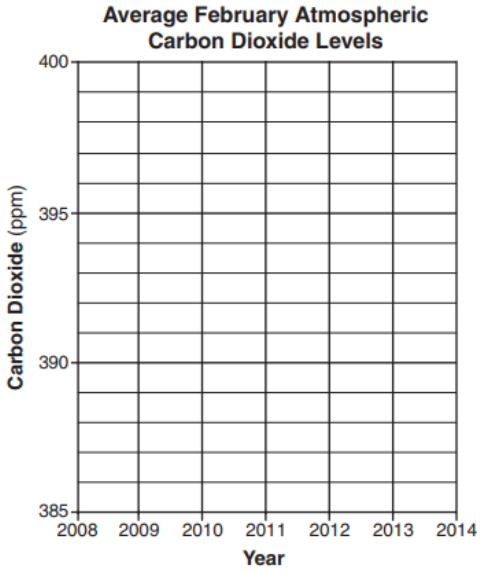


13. Which component of Earth's atmosphere is classified as a greenhouse gas?

a. oxygen b. carbon dioxide c. helium d. hydrogen

Base your answers to questions 13 through 16 on the data table below and on your knowledge of Earth science. The data table shows the average level of atmospheric carbon dioxide (CO2), measured in parts per million (ppm), for the month of February at the Mauna Loa observatory in Hawaii from 2008 to 2014.

Year	Average February Atmospheric CO_2 Levels (ppm)
2008	386
2009	387
2010	390
2011	392
2012	394
2013	396
2014	398



14. On the grid, construct a line graph by plotting the data for the average February atmospheric carbon dioxide (CO2) levels for the years 2008 to 2014. Connect the plots with a line.

15. These measurements of atmospheric carbon dioxide were collected at an altitude of 3.4 kilometers. Identify the temperature zone of the atmosphere where these data were collected.

16. Identify one major greenhouse gas, other than carbon dioxide.

17. Describe two human activities that would decrease the amount of carbon dioxide that humans add to Earth's atmosphere.

ASSESS YOURSELF ON THIS LESSON: _____/17

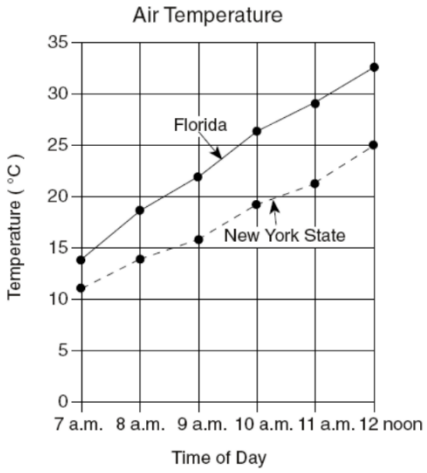
If you missed more than 5, do the Additional Practice. If not, go on to the next hw video!!!

PRACTICE PACKET: TOPIC 8 CLIMATE

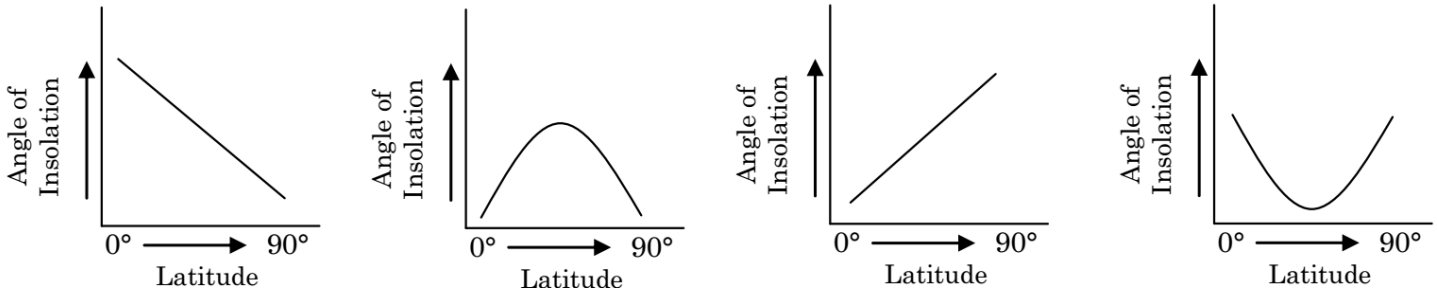
1. An increase in which gas would cause the most greenhouse warming of Earth's atmosphere?
   a. nitrogen b. carbon dioxide c. oxygen d. hydrogen

2. The average temperature at Earth's North Pole is colder than the average temperature at the Equator because the Equator
   a. receives less ultraviolet radiation
   b. has more cloud cover
   c. receives more intense insolation
   d. has a thicker atmosphere

3. The graph to the right shows air temperatures on a clear summer day from 7 a.m. to 12 noon at two locations, one in Florida and one in New York State. Air temperature rose slightly faster in Florida than in New York State because Florida
   a. has a lower angle of insolation
   b. has a higher angle of insolation
   c. is closer to the Prime Meridian
   d. is farther from the Prime Meridian

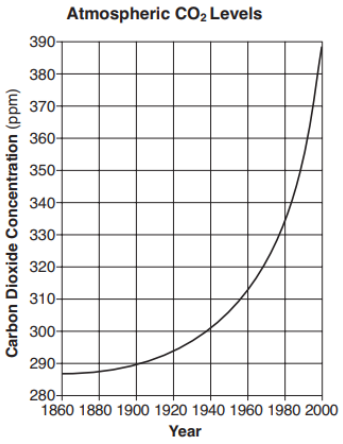


4. Which graph best represents the relationship between the latitude and the angle of insolation?



5. Which list contains three major greenhouse gases found in Earth's atmosphere?
   a. carbon dioxide, methane, and water vapor
   b. hydrogen, oxygen, and methane
   c. carbon dioxide, oxygen, and nitrogen
   d. hydrogen, water vapor, and nitrogen

6. The graph shows changes in carbon dioxide concentrations in Earth's atmosphere over a 140-year period. Carbon dioxide concentrations are shown in parts per million (ppm). This significant change in CO2 concentration is most likely caused by
   a. decreased cloud cover, and is predicted to decrease average global temperatures
   b. decreased volcanic activity, and is predicted to increase average global temperatures
   c. increased use of fossil fuels, and is predicted to increase average global temperatures
   d. increased El Niño activity, and is predicted to decrease average global temperatures



ASSESS YOURSELF ON THIS ADDITIONAL PRACTICE: _____/6
If you missed more than 2 you should see me for extra help and/or re-watch the lesson video assignment

PRACTICE PACKET: TOPIC 8 CLIMATE

Lesson 6: Factors affecting Insolation – Continued

Objective:

- I can describe what duration of insolation depends on
- I can name the # of hours of daylight for NY & the North Pole on the first day of all seasons
- I can explain how clouds affect insolation
- I can describe why the poles have more reflection
- I can explain insolation temperature lag

Duration of Insolation is the length of time the sun is over the horizon.

✓ The longer the sun is over the horizon the greater the duration of insolation. This depends on two main factors.

1. **Latitude**
   a. What locations on Earth is there 24 hours of darkness or sunlight for approximately 6 months of the year?
   _____, _____°N & _____, _____°S

   b. Does location in question "a" have a high or low angle of insolation?

   c. What are the temperatures like at the locations listed above?

   d. Name the location where 12 hours of daylight every day? _____ , _____°

   e. Does location in question "d" have a high or low angle of insolation?

   f. What are the temperatures like at the location listed above?

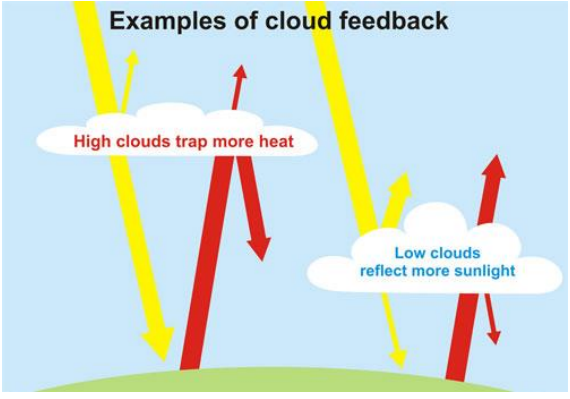
2. **Time of Year**
   a. In New York State, what season has the longest hours of daylight?

   b. What season has the warmest temperatures in New York State?

   c. In New York State, what seasons has the shortest hours of daylight?

   d. What season has the coldest temperatures in New York State?

Clouds have both cooling and warming effects on Earth's surface. You can appreciate that if you go out on a hot and sunny day, and a cloud passes by overhead, it's a great relief from the heat. And the reason of course is because the cloud is reflecting sunlight. But it's a different story for clouds that are high up in the atmosphere. Those high, wispy clouds actually keep Earth warm, like a blanket, by preventing heat from escaping into space.



PRACTICE PACKET: TOPIC 8 CLIMATE

1. Why do low clouds cool Earth's surface?

2. Why do high clouds heat Earth's surface?

On the summer solstice, the sun's rays are the most direct at the Tropic of Cancer (the sun appears directly above you, those at the Equator actually see a lower sun angle on this day). In addition, the amount of incoming solar energy, or radiation, is the highest. However, bodies of water and the ground, have a certain heat capacity, which is the amount of energy it takes to change the temperature of an object by a given amount. In fact, water takes much longer to heat up than land. Since our Earth is around 71% water our temperatures on land are highly dependent on the temperatures of the bodies of water near it.

In July, terrestrial radiation (outgoing radiation from Earth), is still reaching its peak based on the large heat capacity of the oceans and to a lesser extent land masses. This added terrestrial radiation allows air temperature to continue to rise even though energy from the sun is decreasing. On a daily scale, much of the same process explains why the highest temperatures typically occur at 3 PM rather than solar noon. Taking a look at NYC below, the seasonal lag is clearly shown in the average highs and lows.

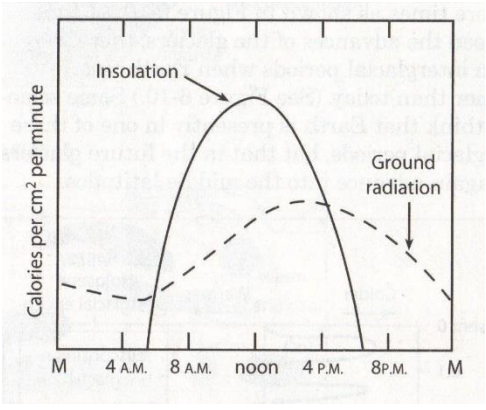
1. Where are the sun's rays most direct on the summer solstice? _____
2. What is heat capacity? _____
3. Why does water take longer to heat up than land? _____
4. Why is the Earth still reaching its peak temperatures in July?

5. What time of the day are temperatures usually the highest? _____

Regent Questions:

1. How did the huge ash cloud that covered Alaska in 1989 affect the amount of insolation reaching Earth's surface and the air temperatures near Earth's surface?
   a. Insolation decreased and temperatures increased.
   b. Insolation increased and temperatures decreased.
   c. Both insolation and temperatures increased.
   d. Both insolation and temperatures decreased.

2. The following graph shows the relationship between insolation & Earth's surface radiation during a 24 hour period in NYS on March 21st. At what time did the maximum air temperature probably occur?
   a. 6 AM b. 12 noon c. 4 PM d. 6 PM



3. The length of time that daylight occurs at a location during one day is called the location's
   a. Angle of incidence c. Intensity of insolation
   b. Duration of insolation d. Eccentricity of insolation

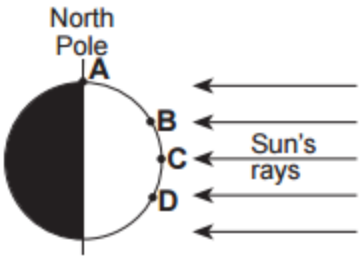
4. What is the usual cause of the drop in temperature that occurs between sunset & sunrise at most NYS locations?
   a. Strong winds b. Ground radiation c. Cloud formation d. Heavy precipitation

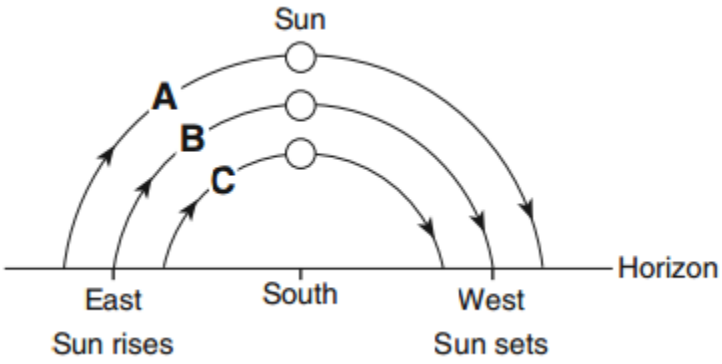
5. When do maximum surface temperatures usually occur in the N. Hemisphere?
   a. Early June to Mid-June
   b. Late August to Mid-September
   c. Mid-July to Early August
   d. Mid-September to Early October

6. The seasonal temperature changes in the climate of NYS are most influenced by the changing
   a. CO_2 content of the air
   b. Angle of incidence at which the sun's rays strike Earth's surface
   c. Distance from the sun to Earth
   d. Speed at which Earth revolves around the sun

7. Which angle of the sun above the horizon produces the greatest intensity of sunlight per unit area?
   a. 25° b. 40° c. 60° d. 70°

8. The diagram below represents Earth and the Sun's incoming rays. Letters A, B, C, and D represent locations on Earth's surface. Which location is receiving the most intensity of insolation?
   a. A b. B c. C d. D





9. The diagram represents the horizon and the Sun's apparent paths, A, B, and C, on three different dates, as viewed from the same location in New York State. Which table correctly shows the dates on which the apparent paths of the Sun were observed?

Path of Sun	Date
A	December 21
B	September 23
C	March 21

Path of Sun	Date
A	March 21
B	September 23
C	June 21

Path of Sun	Date
A	December 21
B	March 21
C	June 21

Path of Sun	Date
A	June 21
B	March 21
C	December 21

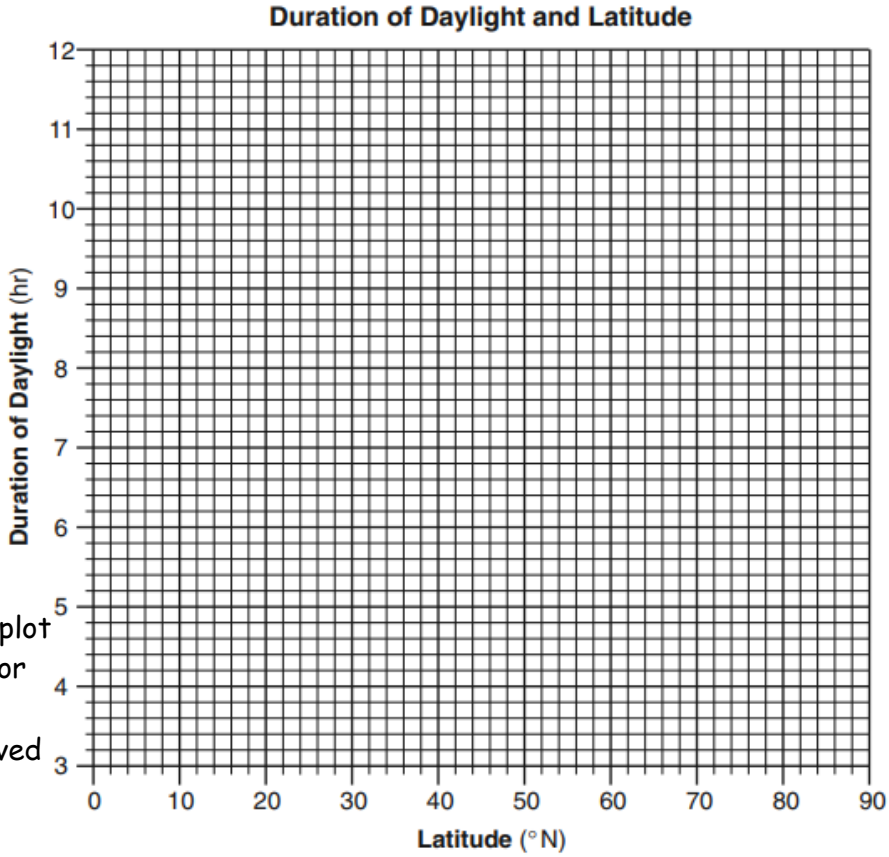
10. In New York State, which day has the shortest duration of insolation?
    a. March 21 b. June 21 c. September 21 d. December 21

PRACTICE PACKET: TOPIC 8 CLIMATE

Base your answers to questions 11 through 14 on the data table below. The data table shows the latitude of several cities in the Northern Hemisphere and the duration of daylight on a particular day.

Data Table

City	Latitude (°N)	Duration of Daylight (hr)
Panama City, Panama	9	11.6
Mexico City, Mexico	19	11.0
Tampa, Florida	28	10.4
Memphis, Tennessee	35	9.8
Winnipeg, Canada	50	8.1
Churchill, Canada	59	6.3
Fairbanks, Alaska	65	3.7



11. On the grid in your answer booklet, plot with an **X** the duration of daylight for each city shown in the data table. Connect your **X**s with a smooth, curved line.

12. Based on the data table, state the relationship between latitude and the duration of daylight.

13. Use your graph to determine the latitude at which the Sun sets 7 hours after it rises.

14. The data were recorded for the first day of a certain season in the Northern Hemisphere. State the name of this season.

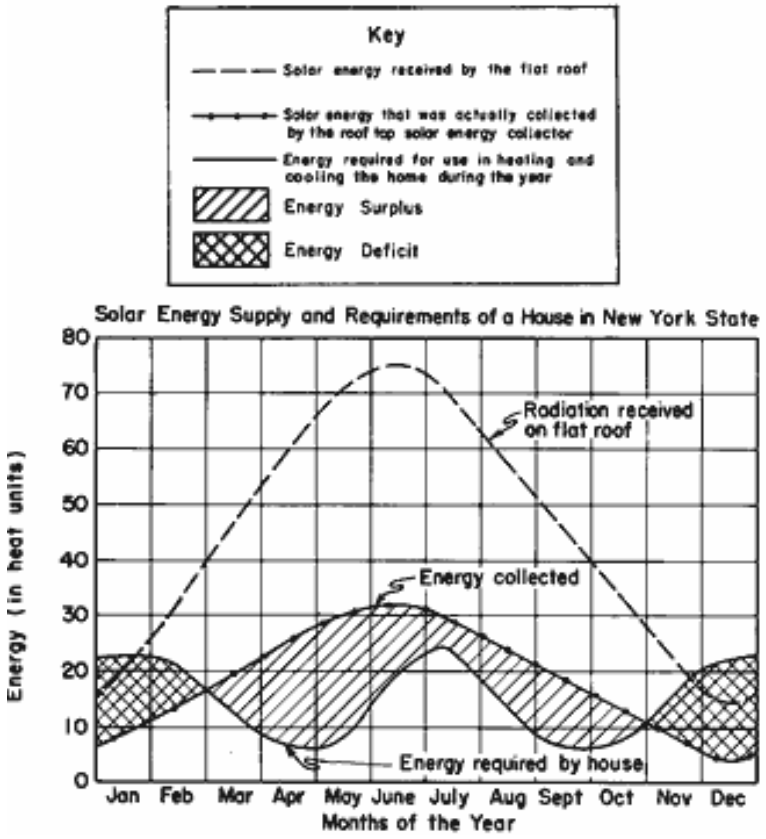
ASSESS YOURSELF ON THIS LESSON: _____/14
If you missed more than 4, do the Additional Practice. If not, go on to the next hw video!!!

1. As both the duration and the angle of insolation increase, the potential evapotranspiration will generally
   a. Decrease b. increase c.remain the same

2. The length of time that daylight is received at a location during one day is called the location's
   a. angle of insolation
   b. duration of insolation
   c. intensity of insolation
   d. eccentricity of insolation

3. Which statement best describes how the insolation changes in New York State from May 21 through June 21?
    a. The intensity and the duration of insolation both decrease.
    b. The intensity and the duration of insolation both increase.
    c. The intensity of insolation decreases and the duration of insolation increases.
    d. The intensity of insolation increases and the duration of insolation decreases.

Base your answer questions 4-8 on your knowledge of Earth science and on the graph below. The graph shows the insolation received and the energy used by a house in New York State. There is a solar energy collector on the roof that absorbs solar radiation and converts the energy to a form useful for heating and cooling the home.



4. For how many months of the year is the amount of energy absorbed by the collector greater than the amount of energy required by the house?
    a. 12 months c. 8 months
    b. 6 months d. 4 months

5. On April 15, what is the approximate percentage of the energy collected compared to the radiation received on the roof?
    a. 26% c. 34%
    b. 42% d. 60%

6. On which date was the energy budget for the house in equilibrium?
    a. January 21 c. March 1
    b. June 21 d. October 1

7. Why is the amount of energy required for cooling the house greatest in July rather than at the time of maximum radiation?
    a. The intensity of insolation per unit area increases as the angle of insolation approaches perpendicular.
    b. The house is located at a high altitude.
    c. Maximum duration of insolation occurs during July.
    d. Maximum surface air temperature occurs sometime after maximum insolation is received.

8. If observations were made for an identical house in similar surroundings at a location 500 kilometers due north, how would the energy collected at the two locations compare over a year?
    a. The house farther north would collect less energy.
    b. The house farther north would collect more energy.
    c. The house farther north would collect the same amount of energy.

ASSESS YOURSELF ON THIS ADDITIONAL PRACTICE: _____/8
If you missed more than 3 you should see me for extra help and/or re-watch the lesson video assignment

PRACTICE PACKET: TOPIC 8 CLIMATE

Lesson 7: Seasons

Objective:

- I can explain why we get different seasons
- I can describe what would happen if the Earth's tilt changed
- I can fill out the seasons chart

The Earth's seasons are ***NOT*** caused by the differences in the distance from the Sun throughout the year (these differences are extremely small). The seasons are the result of the ***tilt of the Earth's axis, revolution around the sun, & parallelism.***

The Earth's axis is tilted by 23.45°. This tilting is what gives us the four seasons of the year - spring, summer, autumn (fall) and winter. Since the axis is tilted, different parts of the globe are oriented towards the Sun at different times of the year.

Summer is warmer than winter (in each hemisphere) because the Sun's rays hit the Earth at a more direct angle during summer than during winter and also because the days are much longer than the nights during the summer. During the winter, the Sun's rays hit the Earth at a smaller angle, and the days are very short. These effects are due to the tilt of the Earth's axis.

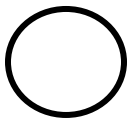
Solstices -The solstices are days when the Sun reaches its farthest northern and southern declinations. The winter solstice occurs on December 21 and marks the beginning of winter (this is the shortest day of the year). The summer solstice occurs on June 21 and marks the beginning of summer (this is the longest day of the year).

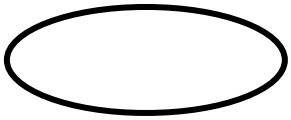
Equinoxes - Equinoxes are days in which day and night are of equal duration. The two yearly equinoxes occur when the Sun crosses the celestial equator. The vernal equinox occurs in late March (this is the beginning of spring in the Northern Hemisphere and the beginning of fall in the Southern Hemisphere); the autumnal equinox occurs in late September (this is the beginning of fall in the Northern Hemisphere and the beginning of spring in the Southern Hemisphere).

1. Is the seasons caused by the distance from the sun? _____
2. What three factors cause the seasons? _____

   _____
3. What two reasons explain why the summer temperatures are warmer? _____

   _____
4. Label the circles below with either **direct heat energy** or **indirect heat energy**.





5. What is the date of the winter solstice? _____
6. What is the date of the summer solstice? _____
7. What season starts on the vernal equinox? _____
8. What season starts on the autumnal equinox? _____

PRACTICE PACKET: TOPIC 8 CLIMATE

The direct ray of the sun, also known as the Sun's vertical ray, occurs when the Sun is directly overhead at a location on Earth (at its Zenith). Due to Earth's tilt of the axis at 23 ½° the direct ray of the Sun changes as Earth revolves around the Sun. It is the movement of the direct ray that causes the change in seasons.

The Tropic of Cancer (23 ½ °N) and Tropic of Capricorn (23 ½ °S) are the farthest locations north or south of the equator where the Sun is ever directly overhead. The area between the two tropics is sometimes referred to as "within the tropics". This means the Sun is NEVER directly overhead in the Continental United Sates and therefore NEVER directly overhead in New York State.

The Arctic circle (66 ½ °N) and Antarctic Circle (66 ½°S) are the first locations north or south of the equator that have at least one 24 hour period of daylight, while the other experiences a 24 hour period of darkness.

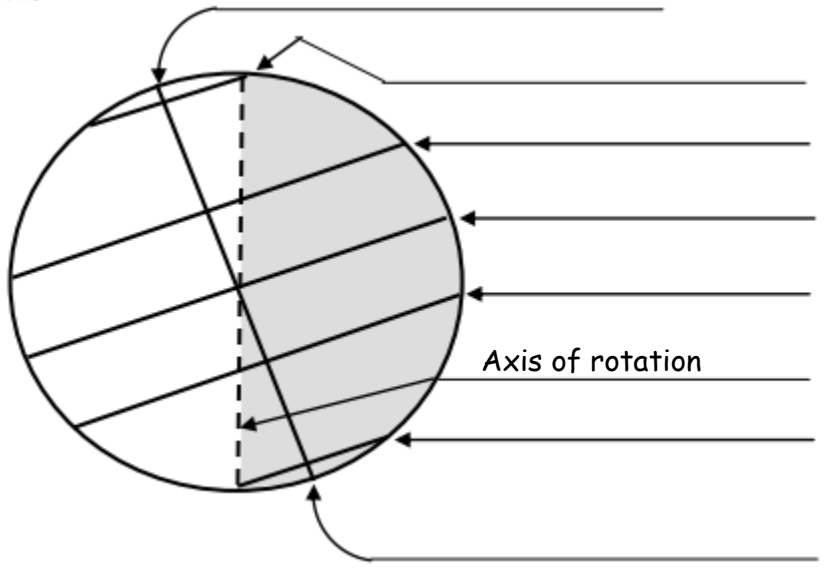
1. Where in the sky is the sun when the vertical ray at that location? _____
2. What two factors cause the direct ray of the Sun to change its location on Earth?

   _____
3. What is the tilt of Earth's axis? _____
4. What is the latitude of the North Pole? _____
5. Subtract the tilt of Earth's axis from the latitude of the North Pole. _____
   a. What is located at the degree latitude you just determined? _____
6. Think: What season begins in New York State when the Sun's vertical rays are at the Tropic of Cancer (23 ½°N)? _____
7. Think: What is true about the amount of daylight on the first day of summer in New York State? Circle the answer: (longest amount of daylight / shortest amount of daylight / 12 hours of daylight)

Picture this: Locations on Earth: Note: the part of Earth that is lit by the Sun (left side of diagram) is called the Circle of Illumination.

Label the diagram below using the following locations.

North Pole (90°N)
South Pole (90°S)
Equator (0°)
Tropic Cancer (23 ½ °N)
Tropic of Capricorn (23 ½ °S)
Antarctic Circle (66 ½ °S)
Arctic Circle (66 ½ °N)

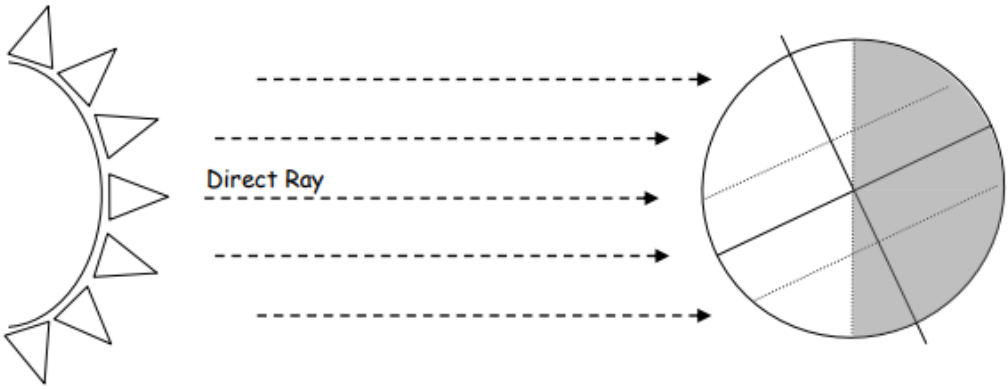


PRACTICE PACKET: TOPIC 8 CLIMATE

Directions:

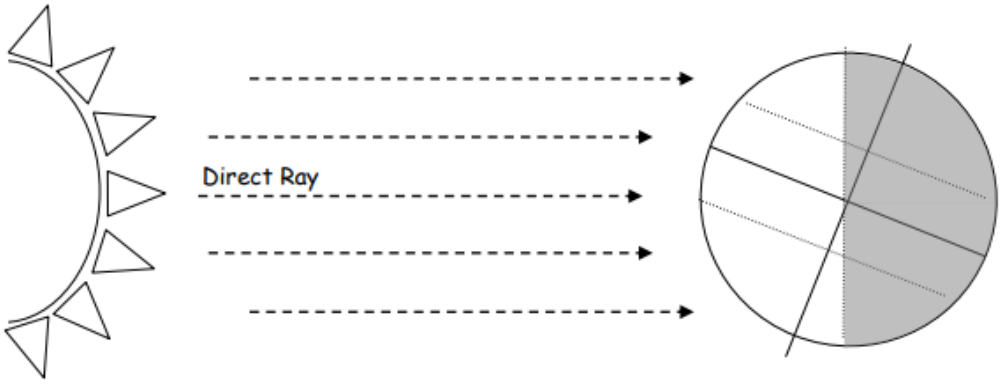
- On each of the three diagrams (A, B, and C) of Earth, label the North Pole, South Pole, Equator, Tropic of Cancer and Tropic of Capricorn on the lines in the Earth's illustration **NOT on the dotted lines** for the Sun's rays.

Diagram A



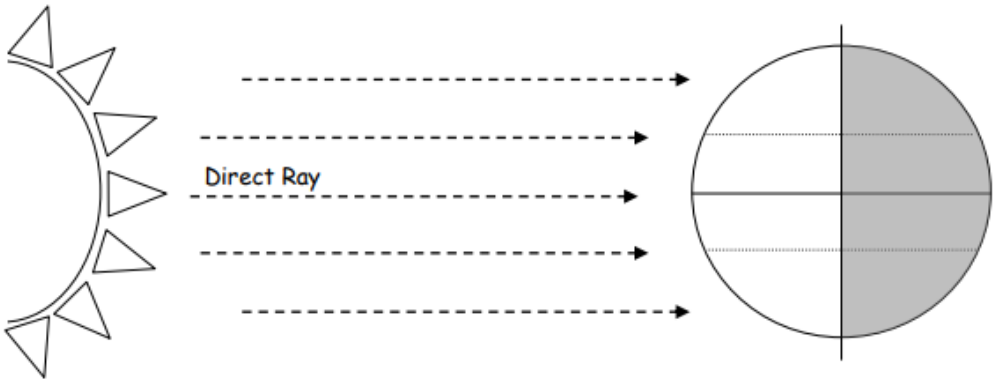
1. At what location is the direct ray of the Sun? _____
2. Referring to the illuminated portion of Earth, are the daylight hours greater than the night north or south of the equator? _____
3. What season would it be when the daylight hours are greater than the night? _____
4. What season would it be when the night time hours are greater than daylight? _____
5. What season is it in New York State when the direct rays of the Sun are located as shown in the diagram above? _____

Diagram B



6. At what location is the direct ray of the Sun? _____
7. Referring to the illuminated portion of Earth, are the daylight hours greater than the night north or south of the equator? _____
8. What season would it be when the daylight hours are greater than the night? _____
9. What season would it be when the night time hours are greater than daylight? _____
10. What season is it in New York State when the direct rays of the Sun are located as shown in the diagram above? _____

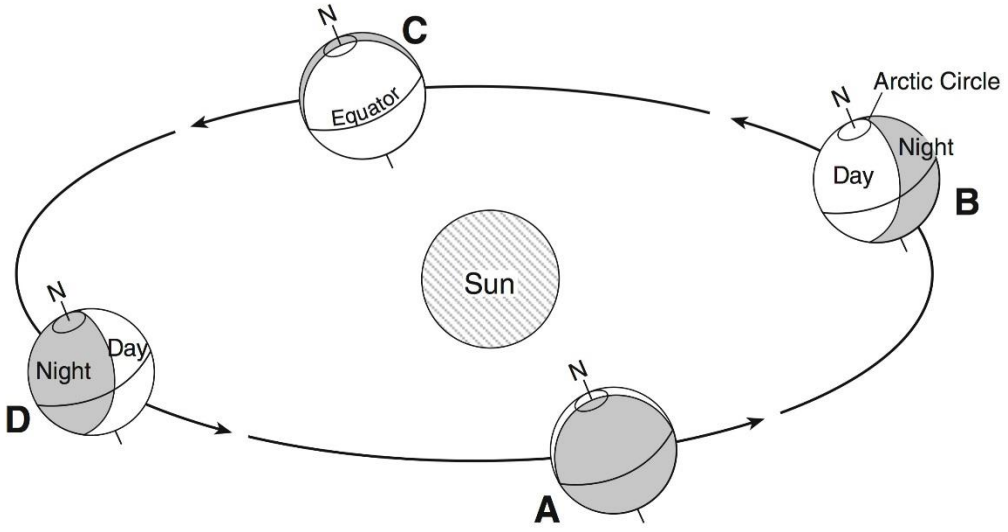
Diagram C



11. At what location is the direct ray of the Sun? _____
12. Referring to the illuminated portion of Earth, what is true about the daylight and night time hours? _____
13. What two seasons would it be when the daylight hours are equal to the night? _____

    _____
14. What two season is it in New York State when the direct rays of the Sun are located as shown in the diagram above? _____

Label the diagram below with the underlined facts that corresponds with each season.



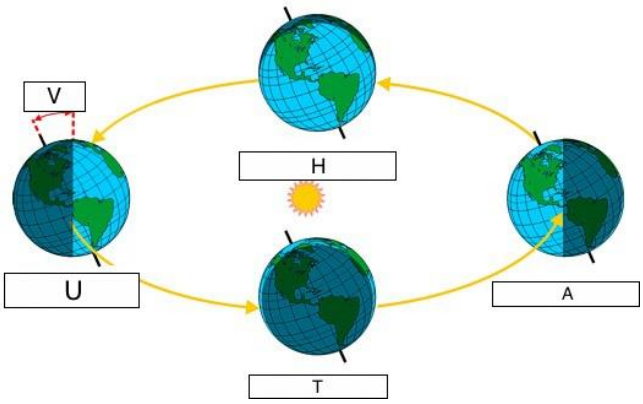
- Looking at the diagram determine which diagram represents summer in the northern hemisphere and label it "Summer solstice" (North Pole tilted toward the Sun).
  - This occurs on June 21
  - The direct ray of the Sun is at the Tropic of Cancer (23 ½°N).
  - This is the longest "day" (hours of daylight) north of the equator and any location on or past the Arctic Circle has 24 hours of daylight.
  - Approximately 15 hours of daylight in New York State (NYS)

PRACTICE PACKET: TOPIC 8 CLIMATE

- Determine which diagram represents winter in the northern hemisphere and label it "Winter solstice" on the line provided (South Pole tilted toward the Sun).
    - This occurs on December 21
    - The direct ray of the Sun is at the Tropic of Capricorn (23 ½°S).
    - This is the shortest "day" (hours of daylight) north of the equator and any location on or past the Arctic Circle has 24 hours of night.
    - Approximately 9 hours of daylight in New York State (NYS)

- Follow the arrows of Earth counterclockwise to determine which is Spring and which is Autumn. Label the "Spring equinox" and "Autumnal equinox" where the direct rays are at the equator.
    - The *Spring Equinox* occurs on March 21
    - The *Autumnal Equinox* occurs on September 23
    - For each equinox, the direct ray of the Sun is at the Equator (0° latitude),
    - There is 12 hours of daylight at every location on Earth (except at the poles).

Diagram Questions: Label the letters on each diagram that represents the first day of each season in the Northern Hemisphere. (**THEY ARE NOT THE SAME**)



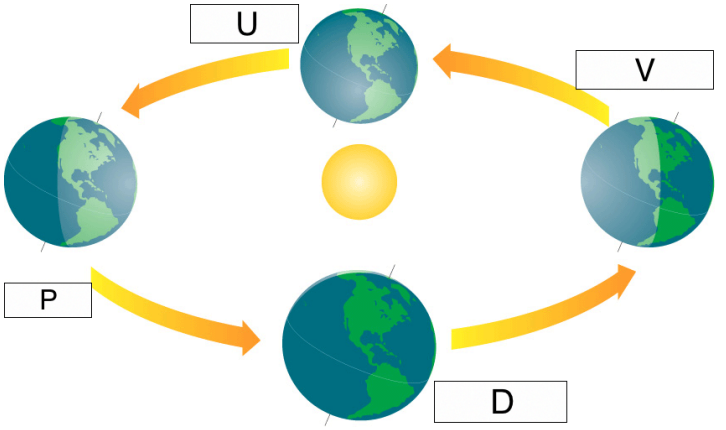
U: _____

T: _____

A: _____

H: _____

V: _____



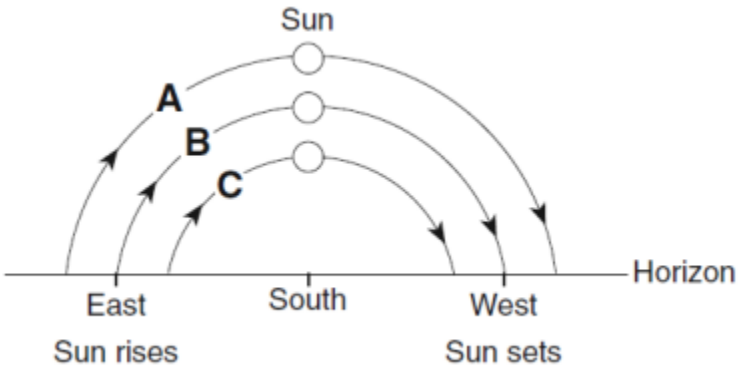
Robin Storesund

U: _____

V: _____

P: _____

D: _____



A: _____

B: _____

_____

C: _____

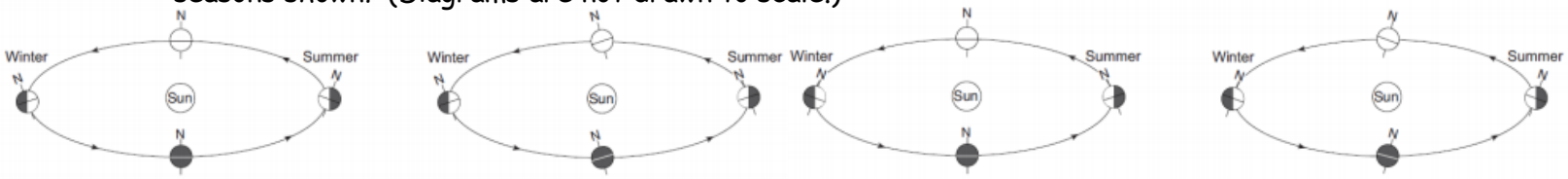
PRACTICE PACKET: TOPIC 8 CLIMATE

Seasons Summary:

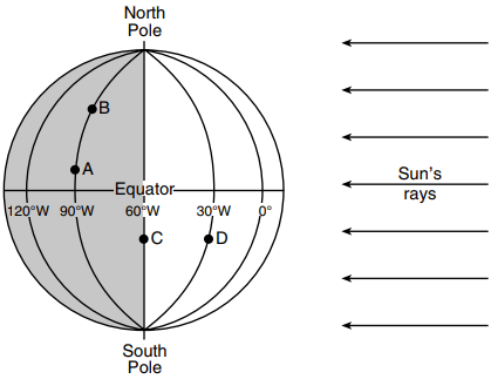
Time of year	NYS hours of daylight	Equator hours of daylight	Vertical Ray (90°)	N. Pole hours of daylight	S. Pole hours of daylight	Sun's altitude in NYS
Summer Solstice _____						
Fall Equinox _____						
Winter Solstice _____						
Spring Equinox _____						

Regents Questions:

1. Which diagram best represents the tilt of Earth's axis that causes the Northern Hemisphere seasons shown? (Diagrams are not drawn to scale.)



Base your answers to questions 2 through 4 on the diagram and on your knowledge of Earth science. The diagram represents Earth on the first day of a season. The equator, several lines of longitude, and the North and South Poles have been labeled. Letters A through D represent locations on Earth's surface.

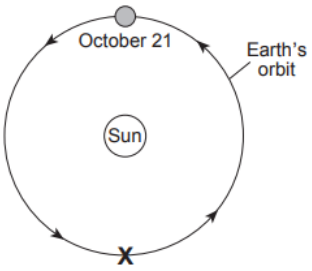


2. Identify one possible date that is represented by the position of Earth in this diagram.

3. State whether the relative altitude of Polaris at location A is lower or higher than at location B. Explain why this difference is observed.

4. State the solar time at location D if the solar time at location C is 6:00 a.m. Indicate a.m. or p.m. in your answer.

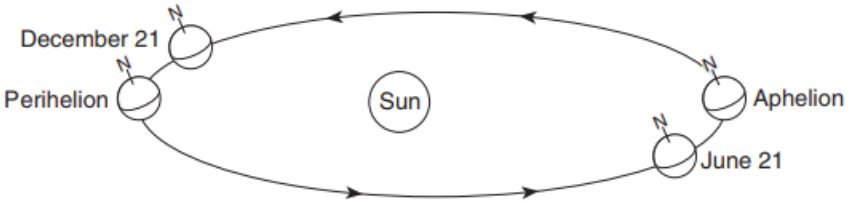
5. The diagram represents the orbital position of Earth on October Which Northern Hemisphere season is occurring when Earth reaches position X?



(Not drawn to scale)

a. winter b. summer c. spring d. fall

Base your answers to questions 6 and 7 on the diagram, which represents an exaggerated model of the shape of Earth's orbit, and on your knowledge of Earth science. The positions of Earth in its orbit on December 21 and June 21 are indicated. The positions of perihelion (when Earth is closest to the Sun) and aphelion (when Earth is farthest from the Sun) are also indicated. Both perihelion and aphelion occur approximately two weeks after the dates shown.



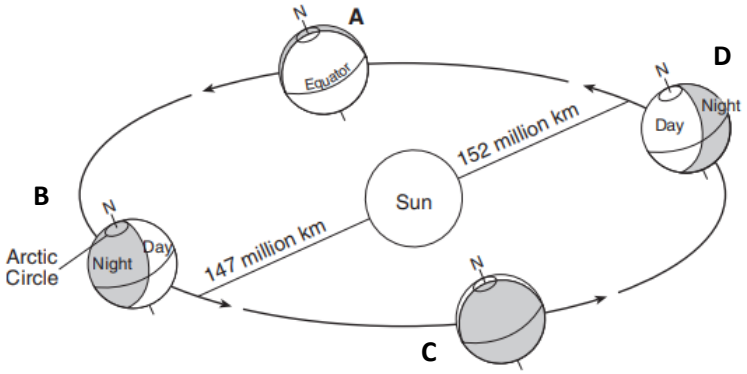
(Not drawn to scale)

6. What does perihelion mean? _____ Aphelion? _____

7. How many months after Earth's perihelion position does Earth's aphelion position occur?

8. Explain why warm summer temperatures occur in New York State when Earth is at aphelion.

Base your answers to questions 9 through 14 on the diagram and on your knowledge of Earth science. The diagram represents Earth's position in its orbit on the first day of each of the four seasons, one of which is labeled A. The North Pole is labeled N. Earth's closest distance to the Sun and Earth's farthest distance from the Sun are labeled in kilometers.



(Not drawn to scale)

9. How many hours (h) of daylight are received at the Arctic Circle when Earth is at position A?

a. 0 h b. 18 h c. 12 h d. 24 h

10. When Earth is closest to the Sun, which season is occurring in the Northern Hemisphere?

a. spring b. fall c. summer d. winter

11. What would most likely happen to New York State's summer and winter temperatures if the tilt of Earth's axis increased from 23.5° to 30°?

a. Both the summers and winters would become cooler.
b. Both the summers and winters would become warmer.
c. The summers would become cooler and the winters would become warmer.
d. The summers would become warmer and the winters would become cooler.

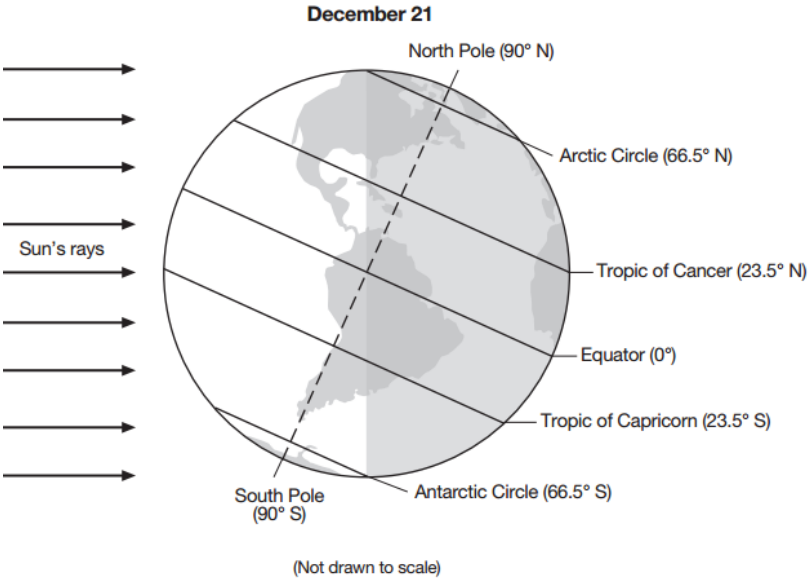
12. Which change in seasons occurs in the Northern Hemisphere at position A?
    a. Winter is ending and spring is beginning.
    b. Summer is ending and fall is beginning.
    c. Spring is ending and summer is beginning.
    d. Fall is ending and winter is beginning.

13. Approximately how many days (d) does it take Earth to travel from position A to position C?
    a. 91 d b. 274 d c. 182 d d. 365 d

14. At which two positions will an observer in New York State experience approximately 12 hours of daylight during one rotation of Earth?
    a. A and B b. B and C c. A and C d. B and D

ASSESS YOURSELF ON THIS LESSON: _____/14
If you missed more than 3, do the Additional Practice. If not, go on to the next hw video!!!

Base your answers to questions 1 through 2 & the BONUS on the diagram, which shows Earth as viewed from space on December 21. Some latitudes are labeled.

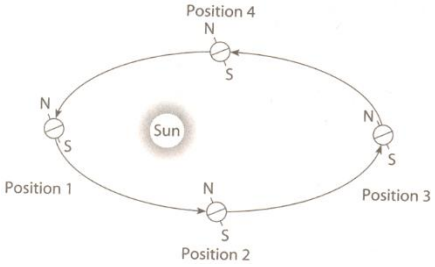


1. On the diagram, place an X at a location on Earth's surface where the Sun was directly overhead at some time on December 21.

2. State one factor, other than the tilt of Earth's axis, that causes seasons to change on Earth.

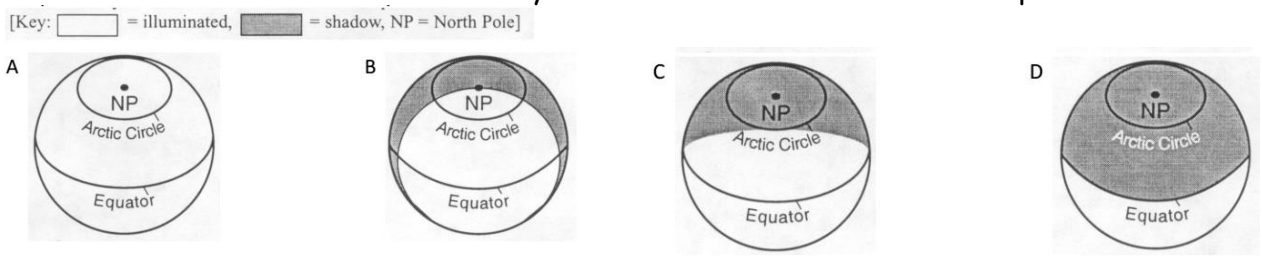
BONUS REVIEW QUESTION: At which latitude is Polaris observed at an altitude of 66.5°?

3. Which position in the following diagram best represents Earth on the first day of summer in the Northern Hemisphere?
    A. 1 B. 2 C. 3 D. 4



4. On June 21, at which latitude would an observer find the Sun directly overhead?
    A. 23 ½° North B. 90° South C. 23 ½° South D. 0°

5. Which diagram most correctly shows the portion of Earth that is illuminated by sunlight and the portion that is in shadow on the first day of summer in the Northern Hemisphere?



6. New York State has several more hours of daylight in summer than in winter. Which statement helps explain this observation?
   A. The speed of the Earth in its orbit changes.
   B. The distance between the Earth and the Sun varies.
   C. The Earth is tilted on its axis.
   D. The diameter of the Sun appears to change.

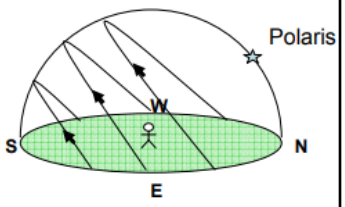
ASSESS YOURSELF ON THIS ADDITIONAL PRACTICE: _____/6
If you missed more than 2 you should see me for extra help and/or re-watch the lesson video.

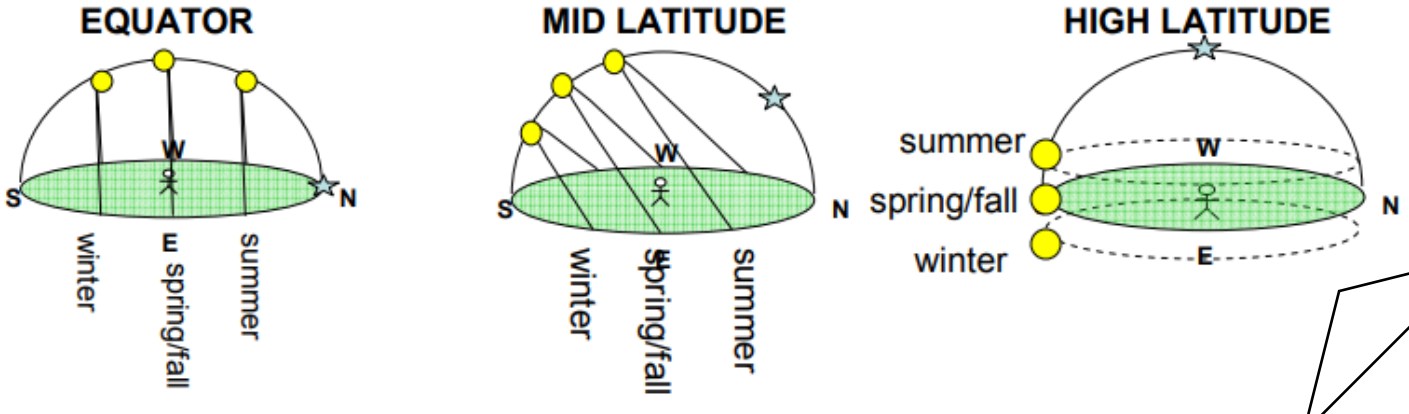
Lesson 8: Celestial Motion

Objective:
- I can describe the difference between apparent and real motion
- I can say how quickly the Earth rotates & in what direction.
- I can name the star that the North Pole always points to.
- I can state what is special about Polaris.
- I can draw the sun's path for the different seasons.
- I can explain how the sun's height effects the shadow.

Rotation is the spinning of Earth on its axis 15° per hour. It causes daylight and night and the apparent motion of the sun around the Earth. One complete rotation takes one day, approximately 23 hours, 56 min, 4 sec. Evidence of rotation includes the Coriolis Effect (the deflection of winds and ocean currents), circumpolar stars (stars around Polaris), star trails (the apparent motion of stars in the night sky) & the Foucault Pendulum.

- **Apparent Motion of the Sun**
  - the Sun appears to rise in the eastern part of the sky and set in the west, because Earth rotates West to East
  - the sun appears to move at a rate of 15°/hour
  - the tilt of the Earth on its axis causes the Sun's rising and setting positions to change during different seasons
  - the sun is NEVER directly overhead in NYS - it is ALWAYS due south at solar noon
  - The apparent daily motion (motion of celestial objects during the course of a day) changes with the observer's latitude



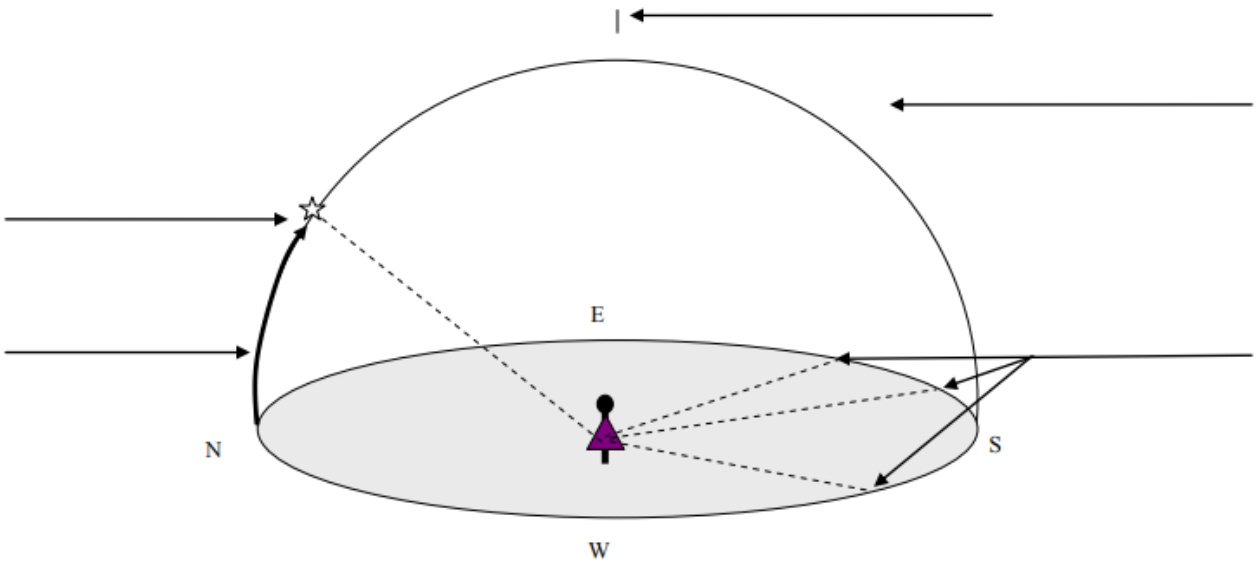


PRACTICE PACKET: TOPIC 8 CLIMATE

1. What is rotation? _____
2. How fast does the Earth rotate? _____
3. What does "apparent motion of the sun" mean? _____
4. What causes us to see the sun rise & set if it isn't actually moving? _____

   _____
5. How long does one complete rotation take? _____
6. Where does the sun appear to rise? _____ set? _____
7. Why? _____
8. How many times is the sun directly overhead in NYS? _____
9. Why is there a dotted line for winter at high latitude? _____

Locating objects in the sky: The diagram below represents a model of the sky (celestial sphere) for an observer. Use the description next to each term below to label the diagram.



Celestial sphere - imaginary dome surrounding Earth

Altitude - the height above Earth's surface
- Celestial objects are measured in degrees
- Label the arrow pointing to the arrow altitude.

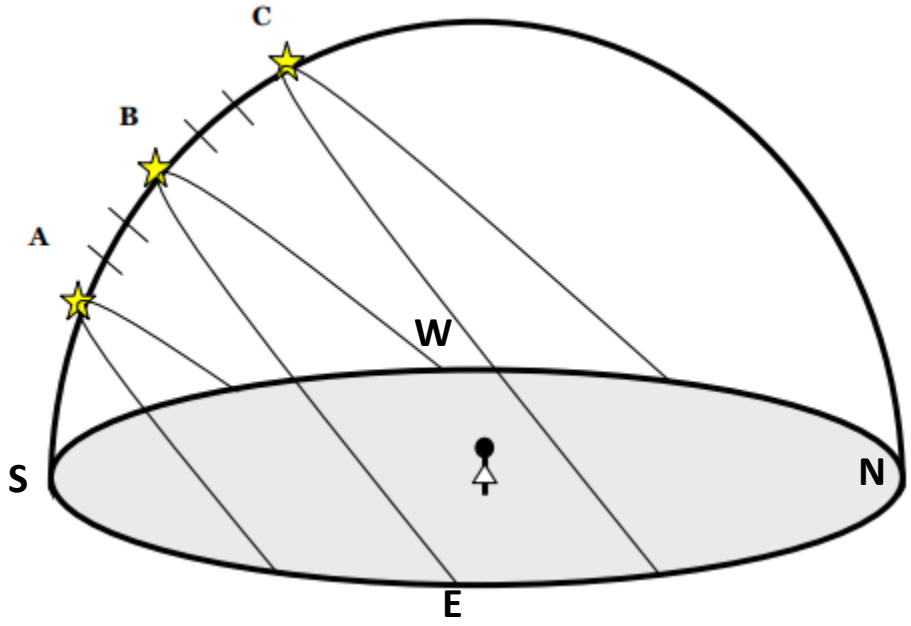
Polaris – the altitude equals an observers latitude in the Northern Hemisphere (label the star Polaris)

Zenith - the point located directly overhead of an observer
- altitude is 90°

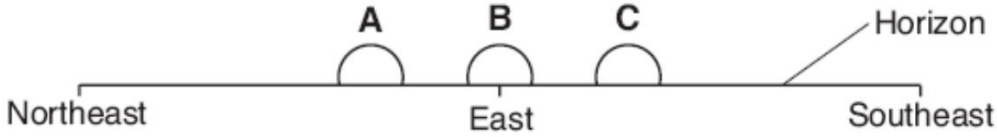
Azimuth - the angular measurement around Earth's surface
- measured in degrees starting with due North located at 0° Azimuth and moving clockwise around the horizon.
- Label the line that is pointing to the three dotted lines to show azimuth

PRACTICE PACKET: TOPIC 8 CLIMATE

This diagram illustrates the path of the sun and the altitude of the noon sun on the celestial sphere for an observer in New York State (latitude 43°N) at the beginning of each season. Label each star with the month for the path it represents. For each mark between the stars, label the corresponding month of the year. **Each mark will have two months** of the year. **Hint**: locate *December* and move *upward* labeling the months until *June*, then go *down* until you reach December.



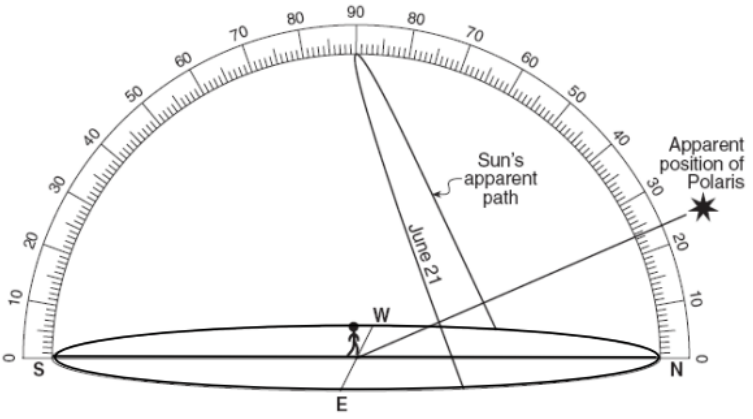
1. Which letter represents the path and altitude of the noon sun on . . .
   December 21? _____
   March 21? _____
   June 21? _____
   September 23? _____
2. In November, the noon sun would most likely be between points _____ and _____
3. In August, the noon sun would most likely be between points _____ and _____
4. In May, the noon sun would most likely be between points _____ and _____
5. In January, the noon sun would most likely be between points _____ and _____
6. In April, the noon sun would most likely be between points _____ and _____
7. In February, the noon sun would most likely be between points _____ and _____
8. In July, the noon sun would most likely be between points _____ and _____
9. In October, the noon sun would most likely be between points _____ and _____
10. Path ____ represents the first day of _____ (June 21). Where does the sun rise? Give compass directions. _____
11. In juNE in the Northern Hemisphere the sun rises North East. Why did I capitalize NE in juNE? _____
12. Path ____ represents the first day of _____ & _____(March 21 & September 23). Where does the sun rise? Give compass directions. _____
13. On the Equinox in the Northern Hemisphere the sun rises directly East. Why did I capitalize E in Equinox? _____
14. Path ____ represents the first day of _____ (December 21). Where does the sun rise? Give compass directions. _____
15. In deSEmber in the Northern Hemisphere the sun rises South East. Why did I capitalize SE (and misspell) deSEmber? _____
16. The student drew the following diagram that shows the positions of sunrise, A, B, and C, during a one-year period. Label the locations with the correct dates that sunrise would be in that position.



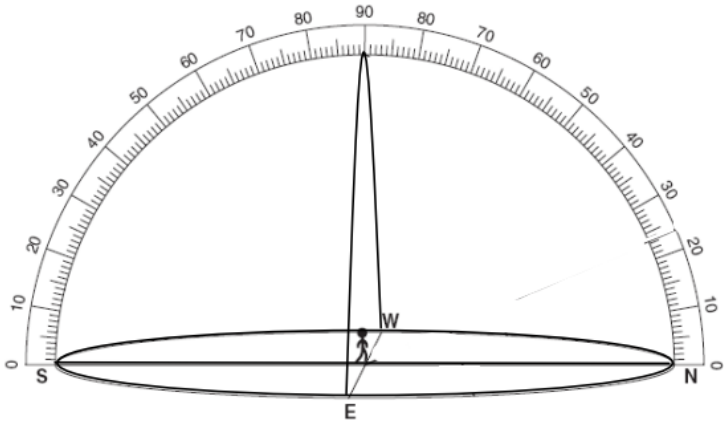
PRACTICE PACKET: TOPIC 8 CLIMATE

- For each location given determine the altitude of the noon sun at the beginning of each season. The first date given for each location is when the vertical rays are at the Zenith (90°).
- Draw and label the path of the sun for each season. Remember these lines are parallel to each other.
- For direction of noon sun, choose "overhead", "north" (northern sky) or "south" (southern sky) - look at the diagram

Location: Tropic of Cancer 23 ½ °N		
Date	Altitude of noon Sun	Direction of Noon Sun
June 21		
Moves lower in the sky	- 23.5°	
September 23		
Moves lower in the sky	- 23.5°	
December 21		
Moves higher in the sky	+ 23.5°	
March 21		



Location: Equator 0 °		
Date	Altitude of noon Sun	Direction of Noon Sun
September 23		
Moves lower in the sky	- 23.5°	
December 21		
Moves higher in the sky	+ 23.5°	
March 21		
Moves lower in the sky	- 23.5°	
June 21		

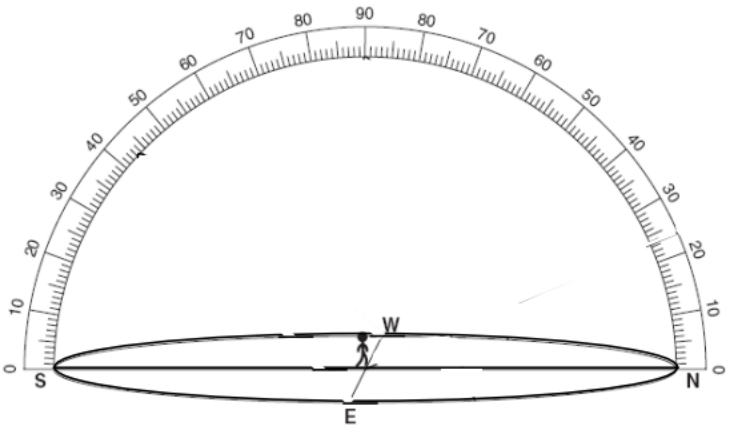


To determine the altitude of the noon sun for different locations use the steps below. (Elmira 42°N)

- What is the latitude of Elmira NY? _____
- What is the latitude of the Tropic of Cancer? _____
- What is the **difference** between the two latitudes? _____
- What is the altitude of the noon sun at the Tropic of Cancer on June 21? _____
- **Subtract** the difference between the latitudes from the altitude of the noon sun on the Tropic of Cancer. This is the altitude of the noon sun in NYS on June 21. _____

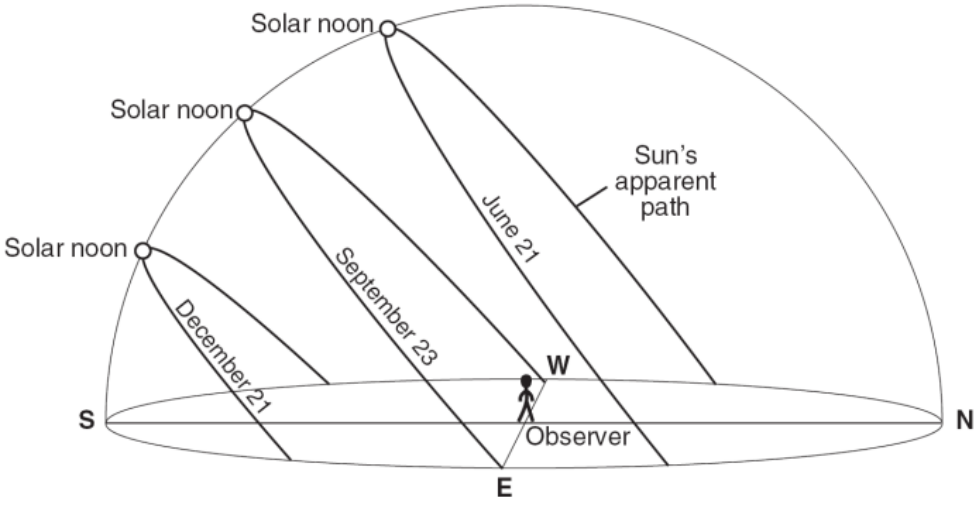
PRACTICE PACKET: TOPIC 8 CLIMATE

Location: Elmira 42 °N		
Date	Altitude of noon Sun	Direction of Noon Sun
June 21		
Moves lower in the sky	- 23.5°	
September 23		
Moves lower in the sky	- 23.5°	
December 21		
Moves higher in the sky	+ 23.5°	
March 21		



Regents Questions:

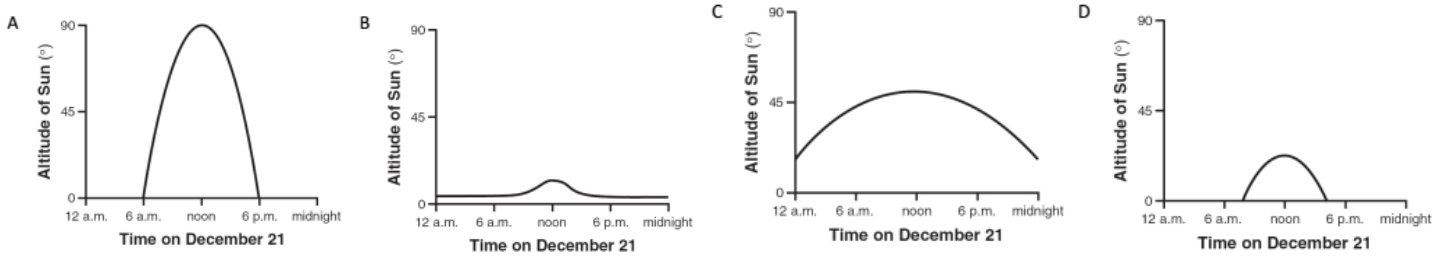
Base your answers to questions **1** through **4** on diagram below, which represents the Sun's apparent paths and the solar noon positions for an observer at 42° N latitude on December 21, September 23, and June 21



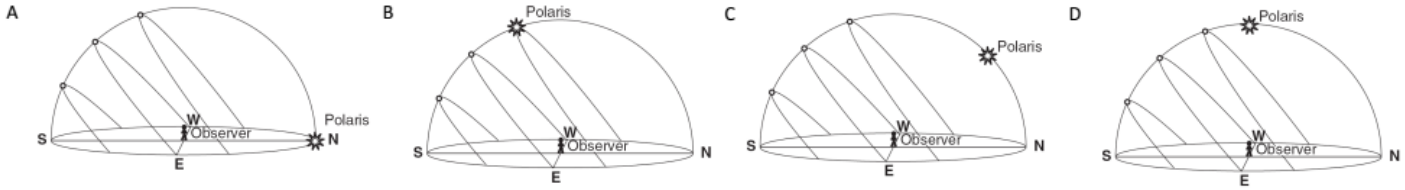
1. In which direction will sunrise occur on June 21?
   a. north of due west
   b. north of due east
   c. south of due west
   d. south of due east

2. How many hours occurred between sunrise and solar noon on September 23?
   a. 6 b. 8 c. 12 d. 24

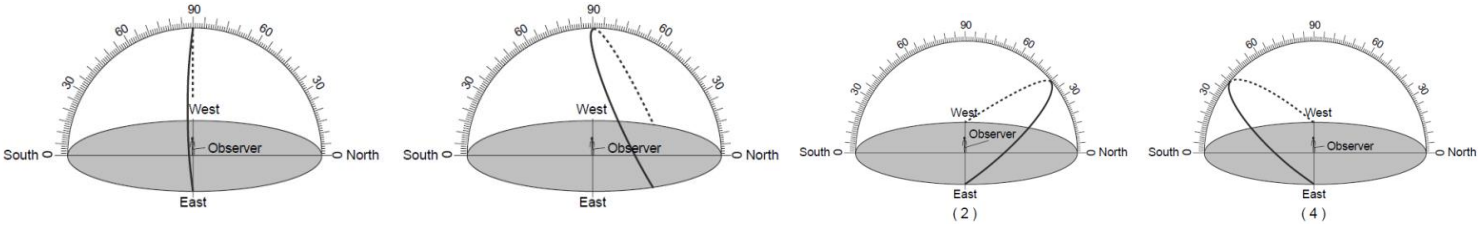
3. Which graph best shows the altitude of the Sun, as measured by the observer located at 42° N, at various times on December 21?



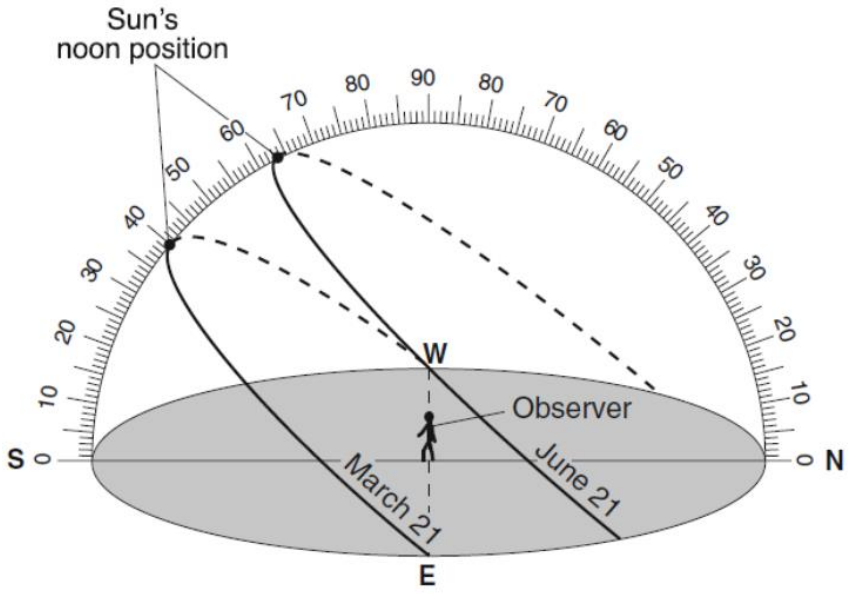
4. Which diagram best shows the location of *Polaris* relative to the observer?



5. Which diagram represents the apparent path of the Sun on March 21 for an observer at the equator?



Base your answers to questions 6 through 9 on the diagram and data table below. The diagram represents the Sun's apparent paths as viewed by an observer located at 50° N latitude on June 21 and March 21. The data table shows the Sun's maximum altitude for the same two dates of the year. The Sun's maximum altitude for December 21 has been left blank.



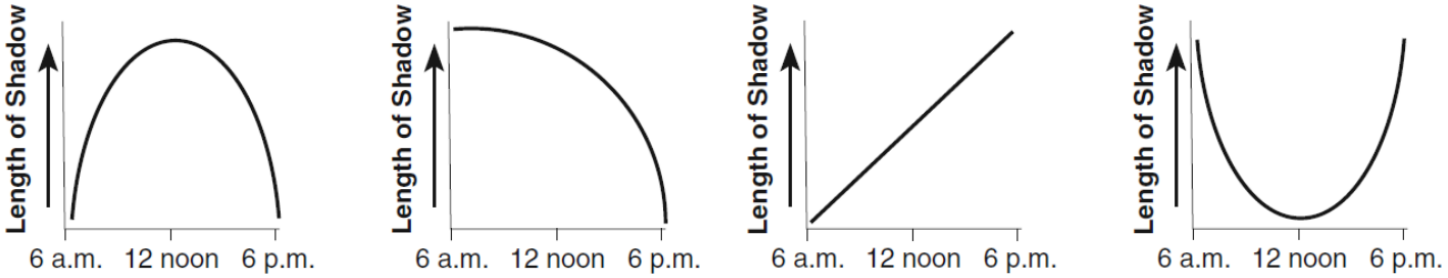
Data Table

Date	Sun's Maximum Altitude
June 21	63.5°
March 21	40°
December 21	

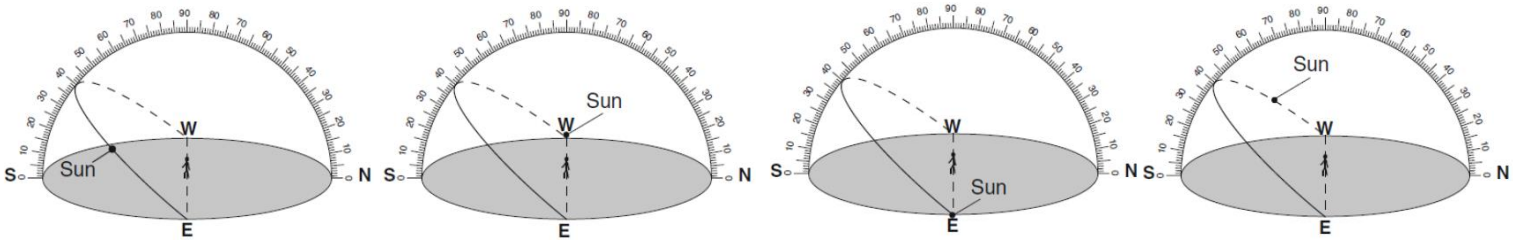
6. Which value should be placed in the data table for the Sun's maximum altitude on December 21?
   a. 16.5° b. 23.5° c. 40° d. 90°

7. Which statement best compares the intensity and angle of insolation at noon on March 21 and June 21?
   a. The intensity and angle of insolation are greatest on March 21.
   b. The intensity and angle of insolation are greatest on June 21.
   c. The intensity of insolation is greatest on June 21 and the angle of insolation is greatest on March 21.
   d. The intensity of insolation is greatest on March 21 and the angle of insolation is greatest on June 21.

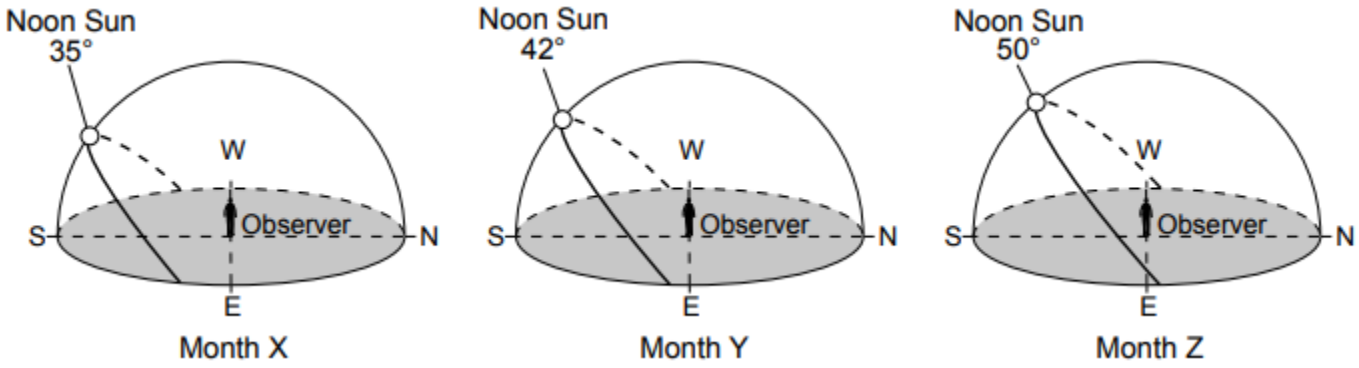
8. Which graph best represents the relationship between the time of day and the length of a shadow cast by the observer on March 21?



9. Which diagram represents the approximate location of the Sun at 3 p.m. on March 21?



Base your answers to questions 10 through 14 on the three Sun's path diagrams below and on your knowledge of Earth science. The diagrams represent the position of the noon Sun along its apparent daily path as seen by an observer on the first day of three consecutive months (X, Y, and Z). The observer was located in Utica, New York.



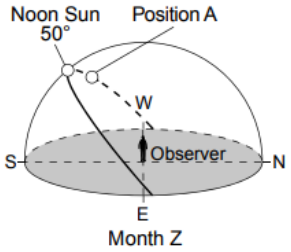
10. Which dates are represented by months X, Y, and Z?
    a. X-February 1, Y-March 1, Z-April 1
    b. X-May 1, Y-June 1, Z-July 1
    c. X-August 1, Y-September 1, Z-October 1
    d. X-November 1, Y-December 1, Z-January 1

11. Which characteristic of the Sun's apparent daily path stays constant from month X to month Z?
    a. locations of sunrise and sunset
    b. altitude of the noon Sun
    c. length of time that the Sun moves along its apparent path
    d. rate of the Sun's movement along its apparent path

12. For an observer in the Southern Hemisphere at 43° S latitude, the highest altitude of the noon Sun occurs when the Sun is above the
    a. eastern horizon
    b. western horizon
    c. northern horizon
    d. southern horizon

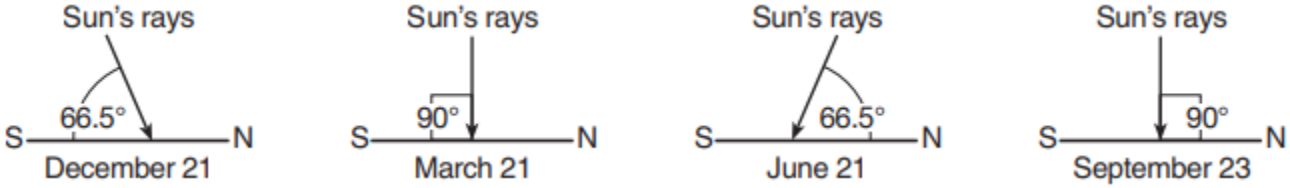
PRACTICE PACKET: TOPIC 8 CLIMATE

13. Position A represents the position of the Sun at another time of day during month Z. What is the time of day when the Sun is at position A?



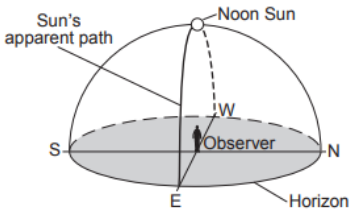
a. 1 p.m. c. 7 a.m.
b. 5 p.m. d. 11 a.m.

14. The diagrams below represent the compass direction and altitude of the Sun's rays at noon for a location on Earth on four different dates. What is the latitude of this location?



a. 0° b. 23.5° S c. 23.5° N d. 90° N

ASSESS YOURSELF ON THIS LESSON: _____/14
If you missed more than 3, do the Additional Practice. If not, go on to the next hw video!!!



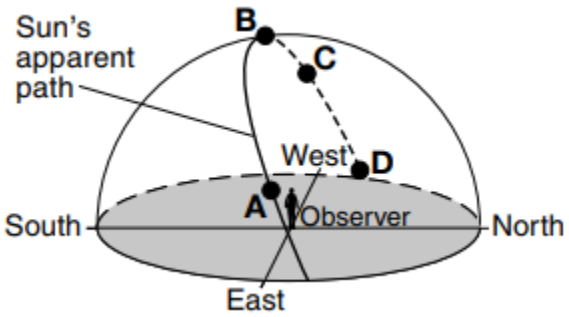
1. The model represents the apparent path of the Sun across the sky on March 21 as seen by an observer on Earth. At which latitude is the observer located?

a. 90° N b. 23.5° N c. 42° N d. 0°

2. During the month of January, at which location in New York State is the Sun lowest in the sky at solar noon?

a. Massena b. Utica c. Niagara Falls d. New York City

Base your answers to questions 3 through 5 on the diagram and on your knowledge of Earth science. The diagram represents the apparent path of the Sun through the sky as viewed by an observer in the Northern Hemisphere. Points A, B, C, and D represent four positions of the Sun.



3. This apparent path of the Sun through the sky is caused by

a. Earth's revolution around the Sun
b. the Sun's revolution around Earth
c. Earth's rotation on its axis
d. the Sun's rotation on its axis

4. The observer has the longest shadow when the Sun is at position

a. A b. B c. C d. D

5. What is the approximate time of day when the Sun is at position C?

a. 6 a.m. b. 3 p.m. c. 9 a.m. d. 6 p.m.

ASSESS YOURSELF ON THIS ADDITIONAL PRACTICE: _____/5
If you missed more than 2 you should see me for extra help and/or re-watch the lesson video.