

Science 1206
Unit 2: Weather Dynamics
Worksheet 11: Seasons and the Angle of the Sun



Much of the Earth's weather, especially our changing seasons are caused by:

1) Tilt of the Earth

- Earth is tilted at 23.5 degrees on its axis
- This rotation is what caused day and night

2) Earth's revolution around the sun

- It takes 365.25 days for the Earth to make a complete revolution around the sun.

Sub-solar point the point where the sun's rays strike the earth at a 90 degree angle.

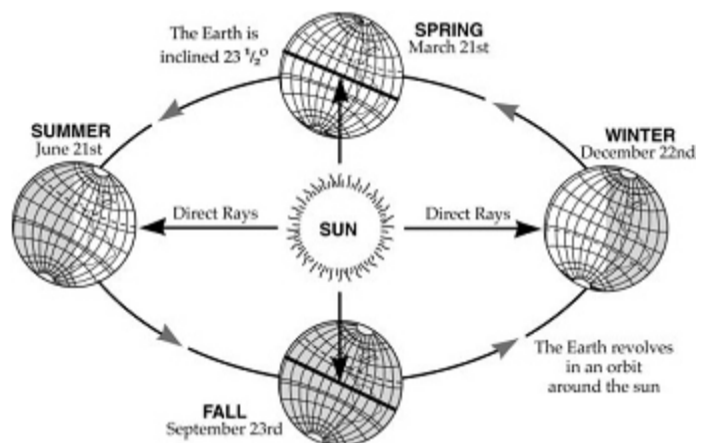
The beginning of each season is marked by:

1) Solstice : Sun stands still (does not move any further North or South)

Summer: day of maximum daylight hours
Winter: day of minimum daylight hours

2) Equinox Day and night are equal length

The following important dates on the next slides are for the Northern Hemisphere (the opposite occurs in Southern Hemisphere)



Summer Solstice :

- June 21, the first day of summer
- Northern Hemisphere is at its maximum tilt toward the sun
- It is the maximum daylight period
- Sun is over the Tropic of Cancer (Northern Hemisphere)
- So the sun's rays are hitting the Northern Hemisphere most directly .
- Sun's rays have their maximum intensity since they are concentrated over a smaller surface

Autumnal Equinox

- September 23, the first day of fall
- Sun is directly over the equator
- The sun is above the horizon for 12 hours and below the horizon for 12 hours

Winter Solstice :

- occurs December 21 => the first day of winter
- Northern Hemisphere is at its maximum tilt away from the sun
- Minimum daylight period (Short day or long night)
- Sun is over the Tropic of Capricorn (southern Hemisphere). So the sun's rays are hitting the Northern Hemisphere at a steep angle.
- Sun's rays have their minimum intensity since they are spread over a larger surface

Vernal Equinox

- Occurs on March 21.
- On this day the solar point is directly over the equator.
- All parts of the earth will have a 12 hour day and a 12 hour night. It is Spring in the northern hemisphere.

PART A: Multiple Choice

1. When does the sub-solar point strike the most southerly point on the Earth's surface?
 - (A) December 21
 - (B) March 21
 - (C) June 21
 - (D) September 23

2. What is the affect of the Earth's rotation around its own axis?
 - (A) does not affect either day and night, or seasonal change
 - (B) causes seasonal change only
 - (C) causes day and night only
 - (D) causes both seasonal change, and day and night

3. What is the affect of the Earth's revolution around the sun?
 - (A) does not effect either day and night or seasonal change
 - (B) affects seasonal change only
 - (C) affects day and night only
 - (D) affects both seasonal change and day and night

4. What season is it in the southern hemisphere when it is summer in the northern hemisphere?
 - (A) Spring
 - (B) Summer
 - (C) Winter
 - (D) Fall

5. What is the angle in inclination of the Earth's axis?
 - (A) 0°
 - (B) 23.5°
 - (C) 66.5°
 - (D) 90°

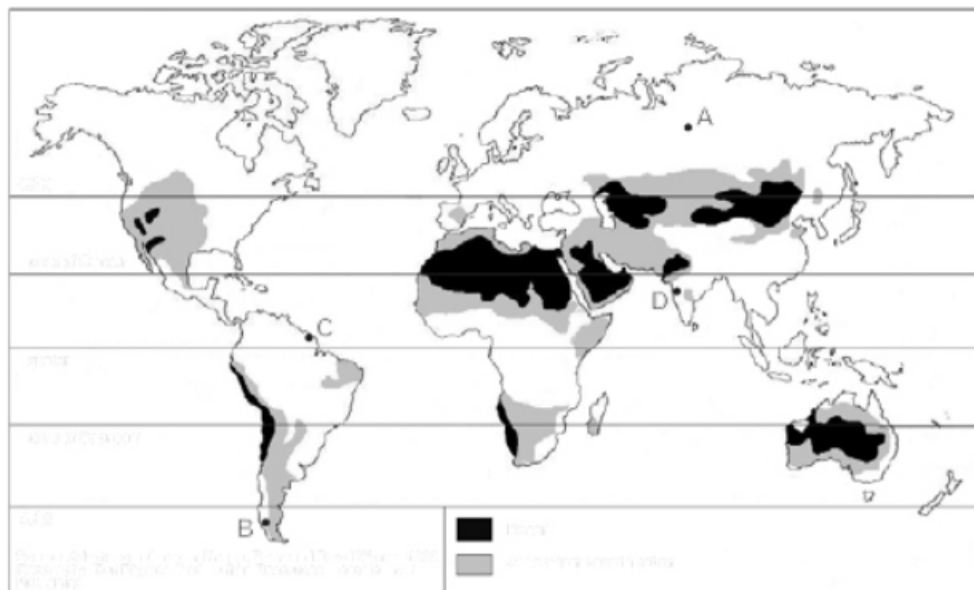
6. What term refers to Earth's orbit around the sun?
 - (A) equinox
 - (B) revolution
 - (C) rotation
 - (D) solstice

7. Which best describes the winter solstice in the Northern Hemisphere?
 - (A) noontime sun is directly overhead at its farthest point north
 - (B) noontime sun is directly overhead at its farthest point south
 - (C) occurs at the midpoint of winter
 - (D) occurs twice a year

8. What accounts for differences in temperature as the seasons change?
 - (A) directness of the sun's rays and length of days
 - (B) sun's closeness to Earth and regular variation in the sun's output
 - (C) longer days and the sun is closer to Earth
 - (D) regular variation in the sun's output and more direct sun's rays

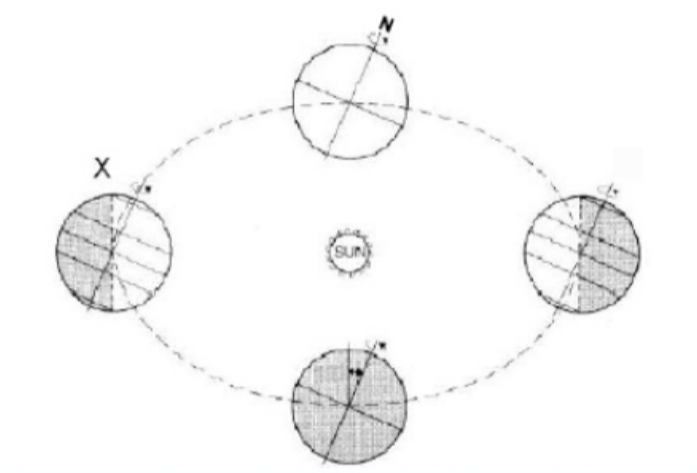
9. When it is autumn (fall) in Newfoundland, which location would have Spring?

- (A) A
- (B) B
- (C) C
- (D) D



10. In the diagram below, what season is the Northern Hemisphere experiencing when Earth is in the position indicated by X?

- (A) fall
- (B) spring
- (C) summer
- (D) winter

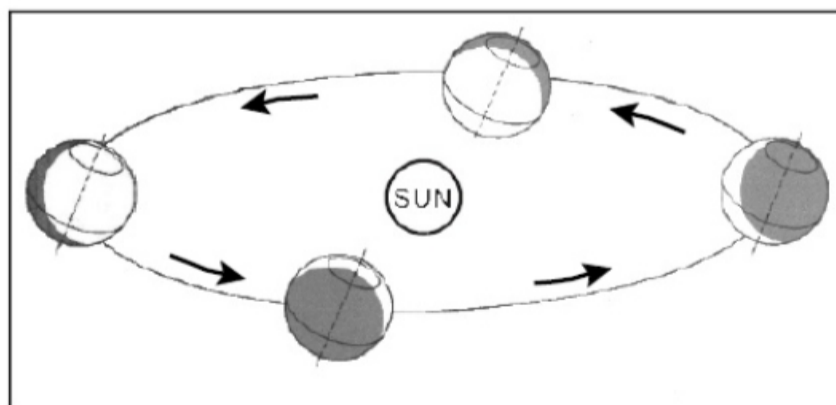


11. Which is responsible for the four seasons on Earth?

- (A) elevation
- (B) prevailing winds
- (C) revolution
- (D) rotation

12. What concept is best illustrated below?

- (A) coriolis effect
- (B) global warming
- (C) revolution
- (D) rotation



13. Which of the following is the cause of the change of seasons?

- (A) the process called rain-shadow effect
- (B) the sizes and shapes of land-surface features
- (C) the tilt of Earth's axis
- (D) the rotation of Earth

14. Why does the equator experience about the same temperatures year-round?
- (A) It tilts toward the sun and gets much more direct solar energy.
 - (B) It has no prevailing winds.
 - (C) It has no mountains to affect its climate.
 - (D) The sun's rays strike the equator at about the same angle all year
15. At the North Pole the sun will rise above the horizon on ____ and set below the horizon on ____.
- (A) June 22; September 23
 - (B) September 23; December 22
 - (C) March 21; September 23
 - (D) June 22; December 22
16. In the Northern Hemisphere, this day has the fewest hours of daylight:
- (A) summer solstice
 - (B) winter solstice
 - (C) vernal equinox
 - (D) autumnal equinox
17. During an equinox:
- (A) the days and nights are of equal length except at the poles
 - (B) at noon the sun is overhead at the equator
 - (C) the earth is not tilted toward nor away from the sun
 - (D) all of the above
18. During the winter solstice in the Northern Hemisphere:
- (A) astronomical winter begins in the Northern Hemisphere
 - (B) the noon sun is overhead at 23.5° S latitude
 - (C) at middle latitudes in the Northern Hemisphere, this marks the longest night of the year
 - (D) all of the above
19. Where are the days and nights of equal length all year long?
- (A) at 66.5°
 - (B) nowhere
 - (C) at 23.5°
 - (D) at the Equator
20. On which date does the sun first rise at the north pole?
- (A) December 21
 - (B) March 21
 - (C) June 21
 - (D) September 23

PART B: WRITTEN RESPONSE

1. Explain the difference between Earth revolving and Earth rotating.

2. Explain why even though the North Pole is tilted toward the Sun in summer its temperatures are still very cold.

3. In the Northern Hemisphere, on which date do we have the most hours of daylight?

4. In the Northern Hemisphere, on which date do we have the least hours of daylight?

5. Describe the position of Earth when a person might get a sunburn in

- a) Canada _____
- _____ b) Australia _____

6. _____ What other factors do you think influence the rate of warming of a particular spot on Earth's surface.
