

**ESS55: Earth's Atmosphere / Homework #3 (due 4/23/2009)**

**Multiple Choice**

*Identify the letter of the choice that best completes the statement or answers the question.*

- \_\_\_\_\_ 1. In the Northern Hemisphere, this day has the fewest hours of daylight:
- a. summer solstice
  - b. winter solstice
  - c. vernal equinox
  - d. autumnal equinox
- \_\_\_\_\_ 2. 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
- \_\_\_\_\_ 3. Which latitude below would experience the fewest hours of daylight on Dec. 22?
- a. 60° S
  - b. 20° S
  - c. 0° (Equator)
  - d. 20° N
  - e. 60° N
- \_\_\_\_\_ 4. 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
- \_\_\_\_\_ 5. In the middle latitudes of the Northern Hemisphere on June 22, the sun:
- a. rises in the east and sets in the west
  - b. rises in the southeast and sets in the southwest
  - c. rises in the northeast and sets in the northwest
  - d. rises in the northeast and sets in the southwest
  - e. rises in the southeast and sets in the northwest
- \_\_\_\_\_ 6. Which of the following helps to explain why even though northern latitudes experience 24 hours of sunlight on June 22, they are not warmer than latitudes further south?
- a. solar energy is spread over a larger area in northern latitudes
  - b. some of the sun's energy is reflected by snow and ice in the northern latitudes
  - c. increased cloud cover reflects solar energy in the northern latitudes
  - d. solar energy is used to melt frozen soil in the northern latitudes
  - e. all of the above
- \_\_\_\_\_ 7. The sun is directly overhead at Mexico City (latitude 19°N):
- a. once a year
  - b. twice a year
  - c. four times a year
  - d. never

Name: \_\_\_\_\_

- \_\_\_\_\_ 8. On what day would you expect the sun to be overhead at Lima, Peru (latitude 12° S)?
- August 15
  - December 22
  - February 4
  - March 10
  - April 21
- \_\_\_\_\_ 9. The maximum in daytime surface temperature typically occurs \_\_\_\_\_ the earth receives its most intense solar radiation.
- before
  - after
  - exactly when
- \_\_\_\_\_ 10. Radiational cooling typically occurs
- during the afternoon
  - at night
  - during the late morning
- \_\_\_\_\_ 11. The strongest radiation inversions occur when
- skies are overcast
  - skies are partly cloudy
  - skies are clear
  - precipitation is falling
- \_\_\_\_\_ 12. When it is January and winter in the Northern Hemisphere, it is \_\_\_\_\_ and \_\_\_\_\_ in the Southern Hemisphere.
- January and summer
  - January and winter
  - July and winter
  - July and summer
- \_\_\_\_\_ 13. The most important reason why summers in the Southern Hemisphere are not warmer than summers in the Northern Hemisphere is that:
- the earth is closer to the sun in January
  - the earth is farther from the sun in July
  - over 80% of the Southern Hemisphere is covered with water
  - the sun's energy is less intense in the Southern Hemisphere
- \_\_\_\_\_ 14. For maximum winter warmth, in the Northern Hemisphere, large windows in a house should face:
- north
  - south
  - east
  - west
- \_\_\_\_\_ 15. To protect fruit trees from frost, it is important to keep the air as still as possible.
- true
  - false
- \_\_\_\_\_ 16. During a radiation inversion, wind machines
- bring warm air down toward the surface
  - lift cool, surface air to higher altitudes
  - mix the air near the ground
  - all of the above

Name: \_\_\_\_\_

- \_\_\_\_\_ 17. The main reason(s) for warm summers in middle latitudes is that:
- the earth is closer to the sun in summer
  - the sun is higher in the sky and we receive more direct solar radiation
  - the days are longer
  - all of the above
  - only (b) and (c) are correct
- \_\_\_\_\_ 18. The earth is tilted at an angle of  $23.5^\circ$  with respect to the plane of its orbit around the sun. If the amount of tilt were increased to  $40^\circ$ , we would expect in middle latitudes:
- hotter summers and colder winters than at present
  - cooler summers and milder winters than at present
  - hotter summers and milder winters than at present
  - cooler summers and colder winters than at present
  - no appreciable change from present conditions
- \_\_\_\_\_ 19. Although the polar regions radiate away more heat energy than they receive by insolation in the course of a year, they are prevented from becoming progressively colder each year by the:
- conduction of heat through the interior of the earth
  - concentration of earth's magnetic field lines at the poles
  - circulation of heat by the atmosphere and oceans
  - the insulating properties of snow
  - release of latent heat to the atmosphere when polar ice melts
- \_\_\_\_\_ 20. Suppose you drive to and from work on a street that runs east to west. On what day would you most likely have the sun shining directly in your eyes while driving to and from work?
- summer solstice
  - winter solstice
  - autumnal equinox
  - during the summer months
- \_\_\_\_\_ 21. In July, at middle latitudes in the Northern Hemisphere, the day is \_\_\_\_\_ long and is \_\_\_\_\_ with each passing day.
- less than 12 hours, getting longer
  - less than 12 hours, getting shorter
  - more than 12 hours, getting longer
  - more than 12 hours, getting shorter
- \_\_\_\_\_ 22. In meteorology, the word insolation refers to:
- a well-constructed, energy-efficient home
  - the solar constant
  - incoming solar radiation
  - an increase in solar output
- \_\_\_\_\_ 23. During the afternoon the greatest temperature difference between the surface air and the air several meters above occurs on a:
- clear, calm afternoon
  - clear, windy afternoon
  - cloudy, calm afternoon
  - cloudy, windy afternoon
- \_\_\_\_\_ 24. The greatest variation in daily temperature usually occurs:
- at the ground
  - about 5 feet above the ground
  - at the top of a high-rise apartment complex
  - at the level where thermals stop rising

Name: \_\_\_\_\_

- \_\_\_\_\_ 25. In most areas the warmest time of the day about 5 feet above the ground occurs:
- around noon
  - in the afternoon between 2 and 5 pm
  - in the early evening after 6 pm
  - just before the sun sets
- \_\_\_\_\_ 26. In clear weather the air next to the ground is usually \_\_\_\_\_ than the air above during the night, and \_\_\_\_\_ than the air above during the day.
- colder, warmer
  - colder, colder
  - warmer, colder
  - warmer, warmer
- \_\_\_\_\_ 27. During an equinox:
- the days and nights are of equal length except at the poles
  - at noon the sun is overhead at the equator
  - the earth is not tilted toward nor away from the sun
  - all of the above
- \_\_\_\_\_ 28. The primary cause of a radiation inversion is:
- infrared radiation emitted by the earth's surface
  - infrared radiation absorbed by the earth's surface
  - solar radiation absorbed by the earth's surface
  - solar radiation reflected by the earth's surface
  - infrared radiation absorbed by the atmosphere and clouds
- \_\_\_\_\_ 29. Lines connecting points of equal temperature are called:
- isobars
  - isotherms
  - thermals
  - thermographs
- \_\_\_\_\_ 30. The largest annual ranges of temperatures are found:
- at polar latitudes over land
  - at polar latitudes over water
  - at middle latitudes near large bodies of water
  - at the Equator
  - in the Northern Central Plains of the United States