ESS55: EARTH'S ATMOSPHERE / Homework #2 / (due 4/19/2016)

Name_____Student ID:_____version:_____

Please fill in your answer(s)

(1)	A	B	C	D	E	(21)	A	B	C	D	E	(41)	A	B	C	D	E
(2)	A	B	C	D	E	(22)	A	B	C	D	E	(42)	A	B	C	D	E
(3)	A	B	C	D	E	(23)	A	B	C	D	E	(43)	A	B	C	D	E
(4)	A	B	C	D	E	(24)	A	B	C	D	E	(44)	A	B	C	D	E
(5)	A	B	C	D	E	(25)	A	B	C	D	E	(45)	A	B	C	D	E
(6)	A	B	C	D	E	(26)	A	B	C	D	E	(46)	A	B	C	D	E
(7)	A	B	C	D	E	(27)	A	B	C	D	E	(47)	A	B	C	D	E
(8)	A	B	C	D	E	(28)	A	B	C	D	E	(48)	A	B	C	D	E
(9)	A	B	C	D	E	(29)	A	B	C	D	E	(49)	A	B	C	D	E
(10)	A	B	C	D	E	(30)	A	B	C	D	E	(50)	A	B	C	D	E
(11)	A	B	C	D	E	(31)	A	B	C	D	E						
(12)	A	B	C	D	E	(32)	A	B	C	D	E						
(13)	A	B	C	D	E	(33)	A	B	C	D	E						
(14)	A	B	C	D	E	(34)	A	B	C	D	E						
(15)	A	B	C	D	E	(35)	A	B	C	D	E						
(16)	A	B	C	D	E	(36)	A	B	C	D	E						
(17)	A	B	C	D	E	(37)	A	B	C	D	E						
(18)	A	B	C	D	E	(38)	A	B	C	D	E						
(19)	A	B	C	D	E	(39)	A	B	C	D	E						
(20)	A	B	C	D	E	(40)	A	B	C	D	E						

Multiple Choice Exam Questions

1. Which of the following provides a measure of the average speed of air molecules?
    a. pressure
    b. temperature
    c. density
    d. heat

2. Which of the following is the poorest conductor of heat?
    a. still air
    b. water
    c. ice
    d. snow
    e. soil

3. The horizontal transport of any atmospheric property by the wind is called
    a. advection.
    b. radiation.
    c. conduction.
    d. latent heat.
    e. reflection.

4. The amount of heat energy required to bring about a small change in temperature is called the
    a. radiative equilibrium.
    b. dead heat.
    c. specific heat.
    d. latent heat.

5. The atmospheric greenhouse effect is produced mainly by the
    a. absorption and re-emission of visible light by the atmosphere.
    b. absorption and re-emission of ultraviolet radiation by the atmosphere.
    c. absorption and re-emission of infrared radiation by the atmosphere.
    d. absorption and re-emission of visible light by clouds.
    e. absorption and re-emission of visible light by the ground.

6. Suppose last night was clear and calm. Tonight low clouds will be present. From this you would conclude that tonight's minimum temperature will be
    a. higher than last night's minimum temperature.
    b. lower than last night's minimum temperature.
    c. the same as last night's minimum temperature.
    d. above freezing.

7. Sunlight that bounces off a surface is said to be ____ from the surface.
    a. radiated
    b. absorbed
    c. emitted
    d. reflected

8. In the Northern Hemisphere, which of the following days has the fewest hours of daylight?
    a. summer solstice

b. winter solstice
c. vernal equinox
d. autumnal equinox

9. 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

10. The maximum in daytime surface temperature typically occurs ____ the earth receives its most intense solar radiation.
a. before
b. after
c. exactly when

11. For maximum winter warmth, in the Northern Hemisphere, large windows in a house should face
a. north.
b. south.
c. east.
d. west.

12. During a radiation inversion, wind machines
a. bring warm air down toward the surface.
b. lift cool, surface air to higher altitudes.
c. mix the air near the ground.
d. all of the above

13. The earth is tilted at an angle of 23.5° with respect to the plane of its orbit around the sun. If the amount of tilt were increased to 40°, we would expect in middle latitudes
a. hotter summers and colder winters than at present.
b. cooler summers and milder winters than at present.
c. hotter summers and milder winters than at present.
d. cooler summers and colder winters than at present.
e. no appreciable change from present conditions.

14. 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
a. conduction of heat through the interior of the earth.
b. concentration of earth's magnetic field lines at the poles.
c. circulation of heat by the atmosphere and oceans.
d. the insulating properties of snow.
e. release of latent heat to the atmosphere when polar ice melts.

15. In July, at middle latitudes in the Northern Hemisphere, the day is ____ long and is ____ with each passing day.
a. less than 12 hours, getting longer
b. less than 12 hours, getting shorter

c. more than 12 hours, getting longer
d. more than 12 hours, getting shorter

16. During the afternoon, the greatest temperature difference between the surface air and the air several meters above occurs on a
a. clear, calm afternoon.
b. clear, windy afternoon.
c. cloudy, calm afternoon.
d. cloudy, windy afternoon.

17. The greatest variation in daily temperature usually occurs
a. at the ground.
b. about 5 feet above the ground.
c. at the top of a high-rise apartment complex.
d. at the level where thermals stop rising.

18. The daily minimum temperature is usually observed
a. at the time of sunset.
b. near midnight.
c. several hours before sunrise.
d. around sunrise.
e. several hours after sunrise.

19. 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.
a. colder, warmer
b. colder, colder
c. warmer, colder
d. warmer, warmer

20. At what time during a 24-hour day would a radiation temperature inversion best be developed?
a. at sunset
b. near sunrise
c. toward the end of the morning
d. between 3 and 5 p.m. when the air temperature reaches a maximum

21. Ideal conditions for a strong radiation inversion are a
a. clear, calm, dry, winter night.
b. clear, calm, moist, summer night.
c. cloudy, calm, moist, winter night.
d. cloudy, windy, moist, summer night.
e. clear, windy, dry, summer night.

22. An important reason for the large daily temperature range over deserts is
a. there is little water vapor in the air to absorb and re-radiate infrared radiation.
b. the light-colored sand radiates heat very rapidly at night.
c. dry air is a very poor heat conductor.
d. free convection cells are unable to form above the hot desert ground.
e. the ozone content of desert air is very low.

23. Two objects, A and B, have the same mass but the specific heat of A is larger than B. If both objects absorb equal amounts of energy,
    a. A will become warmer than B.
    b. B will become warmer than A.
    c. both A and B will warm at the same rate.
    d. A will get warmer, but B will get colder.

24. Which of the following is NOT a reason why water warms and cools much more slowly than land?
    a. Solar energy penetrates more deeply into water.
    b. Heat energy is mixed in a deeper layer of water.
    c. Water has a higher heat capacity.
    d. A portion of the solar energy that strikes water is used to evaporate it.
    e. It takes more heat to raise the temperature of a given amount of soil 1°C than it does to raise the temperature of water 1°C.

25. Over the earth as a whole, one would expect to observe the smallest variation in temperature from day to day and from month to month
    a. at the North Pole.
    b. in the center of a large land mass.
    c. along the Pacific coast of North America.
    d. high in the mountains in the middle of a continent.
    e. on a small island near the equator.

26. When a liquid thermometer is held in direct sunlight,
    a. it will accurately measure the air temperature.
    b. it will measure a much higher temperature than that of the air.
    c. it will measure a much lower temperature than that of the air.
    d. it will measure the temperature of the sun rather than the air.

27. An ideal shelter for housing a temperature-measurement instrument should be
    a. white.
    b. black.
    c. in the shade.
    d. both white and in the shade.
    e. both black and in the shade.

28. During summer near the North Pole, the sun is above the horizon ____ in the mid-latitudes.
    a. for a longer period of time than
    b. for a shorter period of time than
    c. for the same amount of time as

29. On the summer solstice, the altitude of the noonday sun is highest
    a. near the North Pole.
    b. in the mid-latitudes of the northern hemisphere.
    c. in the mid-latitudes of the southern hemisphere.
    d. near the South Pole.

30. Longer days are generally associated with
    a. less insolation.

b. fewer heating degree days.
c. more insolation.

31. Which of the following latitudes is closer to the earth's axis?
a. 0°N
b. 40°N
c. 60°N
d. 90°N

32. At any given time, ____ of the earth is illuminated by the sun.
a. one-fourth
b. one-third
c. one-half
d. two-thirds

33. In the northern hemisphere, north-facing hillsides have a ____ growing season than south-facing hillsides.
a. shorter
b. longer

34. In the northern hemisphere, a solar panel should be placed on the side of the roof facing
a. east.
b. west.
c. north.
d. south.

35. Maximum daily temperatures under hazy skies are typically _____ than those under clear skies.
a. greater than
b. less than

36. Water heats up ____ and cools off ____ than land.
a. more quickly, more quickly
b. more quickly, more slowly
c. more slowly, more quickly
d. more slowly, more slowly

37. White light is perceived when ____ strike the cones of the eye with nearly equal intensity.
a. a single long wavelength
b. a single short wavelength
c. all visible wavelengths
d. all short wavelengths
e. all long wavelengths

38. Imagine that this piece of paper is illuminated with white light and appears red. You see red light because the paper ____.
a. absorbs red and reflects other visible wavelengths
b. emits red light

c. reflects red and absorbs other visible wavelengths
d. disperses white light
e. transmits red light

39. Plants appear green to us because they ____.
a. absorb green wavelengths
b. reflect blue wavelengths
c. reflect green wavelengths
d. absorb all visible wavelengths
e. reflect all visible wavelengths

40. Red sunsets, blue moons, and milky-white skies are mainly the result of ____.
a. refraction
b. dispersion
c. reflection
d. scattering
e. diffraction

41. Air molecules selectively scatter visible light because ____.
a. they are smaller than the wavelength of visible light
b. they are much larger than the wavelength of visible light
c. they are the same size as the wavelength of visible light
d. they are unable to absorb electromagnetic waves
e. the electrons that orbit around the nucleus of atoms have a blue color

42. The blue color of the sky is due to ____.
a. selective scattering of visible light by air molecules
b. the filtering effect of water vapor in Earth's atmosphere
c. reflection of sunlight off Earth's oceans
d. transmission of visible light through the ozone layer in Earth's stratosphere
e. absorption of short wavelengths by air molecules

43. What color would the sky be if air molecules selectively scattered only the longest wavelengths of

visible light?

a. white
b. blue
c. red
d. black
e. violet

44. When we look at a cloud, it appears white because countless cloud droplets ____.

a. absorb all wavelengths of visible sunlight
b. reflect all wavelengths of visible sunlight into space
c. scatter all wavelengths of visible sunlight away from Earth
d. scatter all wavelengths of visible sunlight toward Earth
e. scatter all wavelengths of visible sunlight in all directions

45. Each air molecule of oxygen and nitrogen is a selective scatterer in that each scatters longer waves of visible light much more effectively than shorter waves.

a. True
b. False

46. If the setting Sun appears red, you may conclude that ____.

a. the Sun's surface temperature has cooled somewhat at the end of the day
b. the longest wavelengths of visible light are striking your eyes
c. the next day's weather will be stormy
d. you will not be able to see the Moon that night
e. the shortest wavelengths of visible light are striking your eyes

47. The sky will begin to turn milky white ____.

a. when the concentration of ozone begins to reach dangerous levels
b. when small particles such as dust and salt become suspended in the air
c. when the relative humidity decreases below about ten percent
d. on an oppressively hot day of the year
e. when an inferior mirage occurs

48. When the atmosphere becomes loaded with particles, only the ____ red wavelengths are able to

penetrate the atmosphere, and we see a ____ Sun.

a. longest; red
b. shortest; red
c. longest; blue
d. shortest; white
e. longest; yellow

49. If Earth did not have an atmosphere, the sky would appear ____ during the day.

a. white
b. black
c. red
d. blue
e. violet

50. A star much hotter than our Sun radiates more energy at ____.

a. shorter wavelengths and appears redder
b. shorter wavelengths and appears bluer
c. longer wavelengths and appears redder
d. longer wavelengths and appears bluer
e. about the same wavelengths and appears whiter