MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) The term *meteorology*: 1) _____
A) is the study of the atmosphere and its related weather systems.
B) can be used interchangeably with *climate* because they have the same meaning.
C) is the study of the long-term average weather conditions at a given location.
D) is the study of meteors and their effects on the atmosphere.

2) An interacting group of parts that is fueled by energy and works to accomplish the movement of matter or energy is called: 2) _____
A) a collection. B) a sphere. C) a system. D) a threshold.

3) Which of the following describes a system's response to *positive feedback*? 3) _____
A) The system's operation is enhanced or changed.
B) The system maintains status quo and continues to operate as usual.
C) The system reacts in an unpredictable manner.
D) The system slows down and produces less.

4) Which of the following outlines the steps of the scientific method in the correct order? 4) _____
A) develop hypothesis; test hypothesis; accept/modify/reject hypothesis; collect data
B) test hypothesis; develop hypothesis; collect data; accept/modify/reject hypothesis
C) collect data; develop hypothesis; test hypothesis; accept/modify/reject hypothesis
D) collect data; test hypothesis; develop hypothesis; accept/modify/reject hypothesis

5) Dust in the atmosphere is NOT associated with which of the following: 5) _____
A) reflection of solar energy
B) the solar constant
C) condensation and cloud formation
D) optical phenomena such as red sky at sunset

6) On the average, for every 1 km increase in altitude in the *troposphere* the air temperature: 6) _____
A) rises by day and drops by night.
B) rises about 6.5 degrees Celsius.
C) drops about 6.5 degrees Celsius.
D) remains unchanged for the first 500 m and then drops.

7) The most important source of the free oxygen in our atmosphere is: 7) _____
A) deforestation.
B) volcanic degassing.
C) green plants that carry on photosynthesis.
D) the dissociation of water vapor in the upper atmosphere.

8) The vertical temperature structure of the *troposphere* is described by 8) _____
A) its density.
B) air temperature.
C) the barometric pressure.
D) the lapse rate.
E) the wind speed.

9) Water vapor represents what fraction of the air near the earth's surface? 9) _____
A) about 10 percent
B) about 20 percent
C) less than 4 percent
D) 0 - 100 percent
E) 40 - 100 percent

10) The least dense portion of the solid Earth is the 10) _____
A) crust. B) center. C) core. D) mantle.

11) The earth system 11) _____
A) is powered solely by the Sun. B) includes parts that affect one another.
C) influences the Martian atmosphere. D) is the highest level of system possible.

12) Photosynthesis 12) _____
A) releases oxygen into the atmosphere.
B) releases carbon dioxide into the atmosphere.
C) was prevalent during the first years of the earth's atmosphere.
D) is carried out primarily by bacteria.

13) The *troposphere* is most likely to be thickest 13) _____
A) over the South Pole.
B) over the Arctic Circle.
C) at about 45 degrees north and 45 degrees south.
D) over the North Pole.
E) over the equator.

14) The hottest layer of the atmosphere is the 14) _____
A) thermosphere. B) stratosphere. C) troposphere. D) mesosphere.

15) The *aurora* that is visible in the southern hemisphere is the 15) _____
A) aurora australis. B) ionic aurora.
C) antarctic aurora. D) aurora borealis.

16) Which of the following spheres is composed exclusively of water? 16) _____
A) hydrosphere B) atmosphere C) lithosphere D) biosphere

17) The *ozone layer* is found in the 17) _____
A) thermosphere.
B) ionosphere.
C) stratosphere.
D) troposphere.
E) mesosphere.

18) The summit of Mt. Everest (8.85 km) is found in the 18) _____
A) troposphere. B) stratosphere. C) thermosphere. D) mesosphere.

19) Radiosondes have been used regularly since 19) _____
A) 1776.
B) the early 1940s.
C) the late 1920s.
D) the mid 1960s.
E) World War II.

20) Which of the following is NOT true of radiosondes? 20) _____
A) They are launched hourly from nearly every weather station in the United States.
B) They are carried aloft by weather balloons.
C) They are critical sources of data for weather forecasters.
D) They send meteorological data to the ground via radio transmitters.

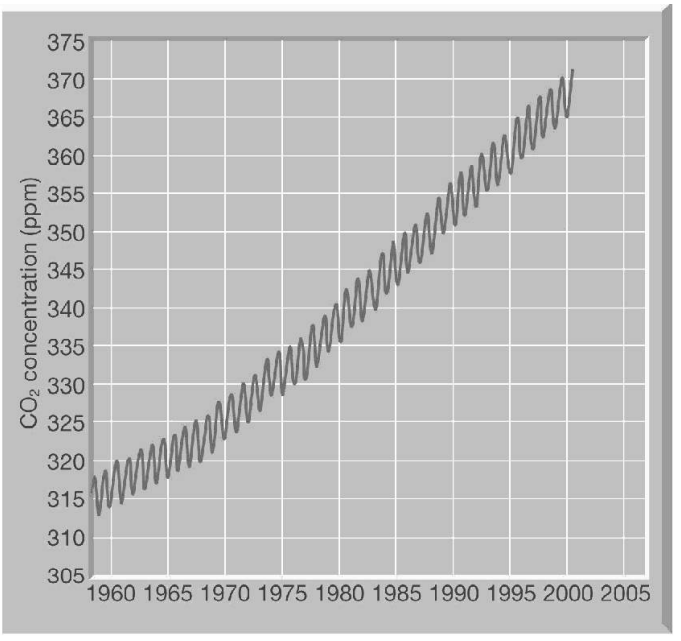
21) Which one of the following is not a term used to designate one of the "spheres" of the earth's environment? 21) _____
A) hydrosphere
B) geosphere
C) biosphere
D) lithosphere
E) atmosphere

22) *Air* may best be described as: 22) _____
A) an element.
B) a compound.
C) cool and breezy.
D) one of four basic substances that composes all things.
E) a mixture.

23) Which one of the following is the MOST abundant gas in the atmosphere? 23) _____
A) argon
B) hydrogen
C) carbon dioxide
D) oxygen
E) nitrogen

24) Scientists believe that a growing amount of this gas in the atmosphere will probably bring about a warming of the lower atmosphere. 24) _____
A) argon
B) hydrogen
C) carbon dioxide
D) nitrogen
E) oxygen

Consider the following diagram, and then answer the question below.



25) What best explains the 'bumps' seen in the seen in the CO_2 concentrations on the graph above? 25) _____

A) Greater amounts of CO_2 released by the burning of fossil fuels for heat during the winter.
B) A cyclic pattern in the eruption of volcanoes, causing more CO_2 to be released each spring.
C) Changes in plant growth that result in less CO_2 being absorbed during the dormant season
D) Higher levels of traffic producing more CO_2 during the summer travel season

26) Which of the following is NOT a variable component of the atmosphere? 26) _____

A) aerosols B) water vapor C) ozone D) carbon dioxide

27) This variable atmospheric component can exist in all three states of matter (solid, liquid, and gas) at the temperatures and pressures that normally exist on Earth. 27) _____

A) water B) ozone C) oxygen D) methane E) nitrogen

28) This atmospheric component absorbs damaging ultraviolet radiation from the Sun. 28) _____

A) nitrogen B) neon C) ozone D) argon E) helium

29) Ninety percent of our atmosphere lies below an altitude of about: 29) _____

A) 16 km. B) 6 km. C) 65 km. D) 31 km. E) 100 km.

30) With an *increase* in altitude, air pressure: 30) _____

A) increases at a constant rate.
B) decreases at a constant rate.
C) decreases at a decreasing rate.
D) decreases at an increasing rate.
E) increases at a decreasing rate.

31) Atmospheric pressure is caused by: 31) _____
A) the weight of the air above. B) the air's motion.
C) Earth's magnetic field. D) solar radiation.

32) When chlorofluorocarbons (CFCs) are subjected to sunlight, _____ is released which acts to destroy ozone molecules. 32) _____
A) nitrogen
B) hydrogen
C) chlorine
D) carbon dioxide
E) carbon

33) Which of the following is the MOST important atmospheric component with regard to the earth's climate? 33) _____
A) ozone
B) nitrogen
C) argon
D) oxygen
E) water vapor

34) The four *thermal* layers of the atmosphere in order beginning from the surface are: 34) _____
A) thermosphere, stratosphere, mesosphere, troposphere
B) troposphere, stratosphere, mesosphere, thermosphere
C) stratosphere, troposphere, mesosphere, thermosphere
D) mesosphere, stratosphere, thermosphere, troposphere

35) The "weather sphere" is in the 35) _____
A) mesosphere. B) stratosphere. C) troposphere. D) thermosphere.

36) The lowest temperatures in the atmosphere exist in the 36) _____
A) troposphere. B) stratosphere. C) thermosphere. D) mesosphere.

37) Ozone is concentrated in the 37) _____
A) stratosphere. B) thermosphere. C) troposphere. D) mesosphere.

38) The heterosphere and ionosphere are *both* found in the 38) _____
A) stratosphere. B) troposphere. C) mesosphere. D) thermosphere.

39) A primary difference between the concepts of weather and climate is the 39) _____
A) type of weather elements measured. B) temperature scale used.
C) measuring technique used. D) time period involved.

40) Which of these was NOT involved with the formation and evolution of our present atmosphere? 40) _____
A) outgassing B) photosynthesis C) cooling D) stratification

41) The approximate altitude of auroral displays is 41) _____
A) above 500 km.
B) about 50 km.
C) below 30 km.
D) 80 - 400 km.
E) above 1000 km.

42) The *ionosphere* is an atmospheric region defined on the basis of 42) _____
A) temperature structure. B) pressure.
C) electrical charges. D) composition.

43) Which of these is NOT a significant factor in the role played by particles or dust in the atmosphere? 43) _____
A) cloud formation B) ozone production
C) absorption of sunlight D) reflection of sunlight

44) The *normal lapse rate* applies to the 44) _____
A) mesosphere. B) stratosphere. C) troposphere. D) thermosphere.

45) This country has the greatest variety of weather in the world. 45) _____
A) Australia
B) United States
C) China
D) Russia
E) South Africa

46) The majority of the water outside of the oceans is in the form of 46) _____
A) streams.
B) groundwater.
C) lakes.
D) glacial ice.
E) water vapor in the atmosphere.

47) The basic elements of weather and climate include all of the following, except: 47) _____
A) the pressure of the air.
B) the humidity of the air.
C) the type and amount of cloudiness.
D) the temperature of the air.
E) the chemical composition of the air.

48) Which one of the following gases has the greatest effect on weather? 48) _____
A) ozone
B) nitrogen
C) water vapor
D) oxygen
E) argon

49) Studies have shown that on average ozone depletion is greatest over this area. 49) _____
A) the Middle East
B) Australia
C) North America
D) Antarctica
E) Europe

50) Ozone: 50) _____
A) is rapidly depleting for reasons scientists do not yet fully understand.
B) protects life on Earth by filtering harmful UV radiation from sunlight.
C) is concentrated in the mesosphere.
D) is considered beneficial at the surface of the Earth.

51) The Montreal Protocol 51) _____
A) has already created a reduction in ozone-depleting gases in the atmosphere.
B) was not adhered to by the United States.
C) called for a 10 percent reduction in CFC production by the end of the century.
D) was designed primarily to address the problem of global warming.
E) is generally considered a diplomatic disaster by most environmentalists.

52) The first function of water vapor in the earth's original atmosphere was to 52) _____
A) provide needed nourishment for primitive plants.
B) increase the amount of carbon dioxide in the atmosphere.
C) fall as rain and thus cool the earth's surface.
D) create oxygen.
E) block the solar wind.

53) The most abundant gas in the Martian atmosphere is 53) _____
A) methane.
B) nitrogen.
C) water vapor.
D) carbon dioxide.
E) oxygen.

54) The aurora borealis will most likely be stronger 54) _____
A) above the South Pole.
B) when there is a lot of solar flare activity.
C) nearest the equator.
D) when there are few ions in the ionosphere.

55) The primary function of the *Tropical Rainfall Measuring Mission* is to: 55) _____
A) aid in the reconstruction of past climates in the tropics.
B) provide satellite data about precipitation in the low latitudes, over both land and water.
C) utilize remote sensing to measure precipitation amounts in uninhabitated rain forests.
D) forecast the tracks of hurricanes in the Northern Hemisphere.

TRUE/FALSE. Write 'T' if the statement is true and 'F' if the statement is false.

56) The thermosphere is the coldest layer of the atmosphere. 56) _____

57) Weather occurs in the thermosphere. 57) _____

58) The largest hole in the ozone layer was observed in 1974. 58) _____

59) Nearly all of planet Earth's mass is in the region known as the hydrosphere. 59) _____

60) Carbon dioxide's importance in the atmosphere is solely due to its absorption and release of latent heat. 60) _____

61) Ozone is actually a form of the element hydrogen. 61) _____

62) Ozone is continually created in our atmosphere by solar radiation. 62) _____

63) Ozone is a significant atmospheric component in the greenhouse effect. 63) _____

64) The troposphere is part of the homosphere. 64) _____

65) The stratosphere is an example of a temperature inversion. 65) _____

66) Compared to Earth, the density of the martian atmosphere is very high. 66) _____

67) Compared to Earth, the density of the martian atmosphere is very high. 67) _____

68) The tropopause is found where the air temperature stops decreasing with height. 68) _____

69) The oceans cover about 50 percent of the earth's surface. 69) _____

70) Weather and climate are synonymous terms. 70) _____

71) Although carbon dioxide is present only in small amounts, it is still more significant meteorologically than the other more abundant gases composing dry air. 71) _____

72) "Average weather" is an adequate definition of climate. 72) _____

73) The depletion of stratospheric ozone is primarily a problem only in urban areas. 73) _____

74) At one time the earth's atmosphere contained no free oxygen. 74) _____

75) Scientific hypotheses are rejected when they do not agree with observed data. 75) _____

76) The atmosphere ends abruptly at an altitude of 30 kilometers. 76) _____

77) Benjamin Franklin was the first to discover that temperatures do not continually decrease with an increase in altitude. 77) _____

78) There is no well-defined thermopause. 78) _____

79) Auroral displays increase conspicuously at times when sunspots are most numerous. 79) _____

80) A scientific hypothesis may be regarded as a tentative explanation of observed facts or events. 80) _____

81) Vertical motion in the lower atmosphere is strongly related to the environmental lapse rate. 81) _____

82) The ionosphere is a region within the stratosphere. 82) _____

83) Weather influences people, but people don't influence weather. 83) _____

84) The biosphere interacts with the lithosphere, the hydrosphere, and the atmosphere. 84) _____

85) The rise of atmospheric carbon dioxide levels over the last century is due primarily to the burning of fossil fuels. 85) _____

86) Depletion of the ozone layer leads to increased amounts of UV radiation striking the surface of the earth. 86) _____

87) There is a sharp and definable boundary between the atmosphere and outer space. 87) _____

88) The environmental lapse rate is not constant. 88) _____

89) Satellites do not orbit in the thermosphere because the intense heat would quickly incinerate them. 89) _____

90) The ions in the ionosphere come primarily from oxygen and nitrogen. 90) _____

91) Earth is considered a *closed system* in terms of matter. 91) _____

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

92) If a scientific theory is to be accepted and considered useful, it must be able to: _____. 92) _____

93) The *stratosphere* is home to a layer of gas known as _____. 93) _____

94) The primary usefulness of satellites in observing the weather is their ability to provide _____. 94) _____

95) The state of the atmosphere at a given time and place defines the term _____. 95) _____

96) A lightweight instrument package that is carried aloft by a balloon and transmits data on temperature, pressure, and humidity is called a(n) _____. 96) _____

97) That portion of the atmosphere where the makeup of the air is uniform in terms of the proportions of its component gases is termed the _____. 97) _____

98) What causes the region of warmer temperatures found in the stratosphere? 98) _____

99) List four of the basic elements of weather and climate. 99) _____

100) The earth's physical environment is traditionally divided into three major parts, one solid, one liquid, and one gaseous. List these three parts. 100) _____

101) What are the two energy sources for the earth system? 101) _____