Chapter 1--The Earth and Its Atmosphere

Question 1  Multiple Choice  0 points
Question The primary source of energy for the earth's atmosphere is:
Answer ✓ energy from within the earth.
✓ the sun.
erupting volcanoes.
lightning discharges associated with thunderstorms.
lateral heat released during the formation of hurricanes.

Question 2  Multiple Choice  0 points
Question The most abundant gases in the earth's atmosphere by volume are:
Answer ✓ carbon dioxide and nitrogen.
oxen and water vapor.
✓ nitrogen and oxygen.
oxen and helium.
oxen and ozone.

Question 3  Multiple Choice  0 points
Question A single breath of air contains about:
Answer ✓ 10^22 molecules.
✓ 10^22 ions.
none of these

Question 4  Multiple Choice  0 points
Question Water vapor is:
Answer ✓ a gas.
a cloud droplet.
a rain drop.
a snowflake.
all of these

Question 5  Multiple Choice  0 points
Question In a volume of air near the earth's surface, ____ occupies 78 percent and ____ nearly 21 percent.
Answer ✓ nitrogen, oxygen
hydrogen, oxygen
oxygen, hydrogen
nitrogen, water vapor
hydrogen, helium

Question 6  Multiple Choice  0 points
Question The earth's rotation has ____ to do with the behavior of atmospheric storms.
Answer ✓ nothing
little
✓ much

Question 7  Multiple Choice  0 points
Question Which of the following is considered a variable gas in the earth's atmosphere?
Answer ✓ water vapor
nitrogen
oxygen
argon
helium

Question 8  Multiple Choice  0 points
Question The gas that shows the most variation from place to place and from time to time in the lower atmosphere is which of the following?
Answer ✓ ozone (O_3)
carbon dioxide (CO_2)
✓ water vapor (H_2O)
methane (CH_4)
Question 9
Multiple Choice 0 points
Question Water vapor:
Answer ✓ is invisible.
colors the sky blue.
makes clouds white.
is very small drops of liquid water.

Question 10
Multiple Choice 0 points
Question Typically, water vapor occupies about what percentage of the air's volume near the earth's surface?
Answer about 78 percent
about 21 percent
close to 10 percent
✓ less than 4 percent
none of these

Question 11
Multiple Choice 0 points
Question The only substance near the earth's surface that is found naturally in the atmosphere as a solid, liquid, and a gas is:
Answer carbon dioxide.
water.
molecular oxygen.
ozone.
carbon.

Question 12
Multiple Choice 0 points
Question In the atmosphere, tiny solid or liquid suspended particles of various composition are called:
Answer ✓ aerosols.
carcinogens.
greenhouse gases.
microbes.
one of these

Question 13
Multiple Choice 0 points
Question The most abundant greenhouse gas in the earth's atmosphere is:
Answer carbon dioxide (CO\(_2\)).
nitrous oxide (N\(_2\)O).
✓ water vapor (H\(_2\)O).
methane (CH\(_4\)).
chlorofluorocarbons (CFCs).

Question 14
Multiple Choice 0 points
Question Since the turn of this century, CO\(_2\) in the atmosphere has:
Answer ✓ been increasing in concentration.
been decreasing in concentration.
remained at about the same concentration from year to year.
disappeared entirely.

Question 15
Multiple Choice 0 points
Question The greenhouse gas that has been increasing in concentration, at least partly due to deforestation, is:
Answer ✓ carbon dioxide (CO\(_2\)).
chlorofluorocarbons (CFCs).
water vapor (H\(_2\)O).
ozone (O\(_3\)).
all of these

Question 16
Multiple Choice 0 points
Question Which below is not considered a greenhouse gas?
Answer ✓ carbon dioxide (CO\(_2\)).
nitrous oxide (N\(_2\)O).
water vapor (H\(_2\)O).
methane (CH\(_4\)).
oxxygen (O\(_2\)).
Question 17  Multiple Choice  0 points
Which of the following processes acts to remove carbon dioxide from the atmosphere?
- lightning
- deforestation
- photosynthesis
- burning fossil fuels
- none of the above

Question 18  Multiple Choice  0 points
The outpouring of gases from the earth's hot interior is called:
- evaporation.
- outgassing.
- photodissociation.
- the hydrologic cycle.

Question 19  Multiple Choice  0 points
The earth's first atmosphere was composed primarily of:
- carbon dioxide and water vapor.
- hydrogen and helium.
- oxygen and water vapor.
- argon and nitrogen.

Question 20  Multiple Choice  0 points
The primary source of oxygen for the earth's atmosphere during the past half billion years or so appears to be:
- volcanic eruptions.
- photosynthesis.
- photodissociation.
- exhalations of animal life.
- transpiration.

Question 21  Multiple Choice  0 points
The most abundant gas emitted from volcanoes is:
- nitrogen.
- sulfur dioxide.
- helium.
- carbon dioxide.
- water vapor.

Question 22  Multiple Choice  0 points
Hypoxia is a condition caused by:
- lack of oxygen going to the brain.
- over exposure to ultraviolet radiation.
- the combined effects of heat and humidity.
- rapid changes in atmospheric pressure.
- extreme cold.

Question 23  Multiple Choice  0 points
___ holds a planet's atmosphere close to its surface.
- Radiation
- Gravity
- Cloud cover
- Moisture
- Pressure

Question 24  Multiple Choice  0 points
The amount of force exerted over an area of surface is called:
- density.
- weight.
- temperature.
- pressure.

Question 25  Multiple Choice  0 points
Much of Tibet lies at altitudes over 18,000 feet where the pressure is about 500 mb. At such altitudes, the Tibetans are above roughly:
- 10 percent of the air molecules in the atmosphere.
25 percent of the air molecules in the atmosphere.
50 percent of the air molecules in the atmosphere.
75 percent of the air molecules in the atmosphere.
90 percent of the air molecules in the atmosphere.

Question 26 - Multiple Choice 0 points
Question: Which of the following are NOT units of pressure?
Answer:
- millibars ✔
- newtons
- inches of mercury (Hg)
- pascals

Question 27 - Multiple Choice 0 points
Question: The unit of pressure most commonly found on a surface weather map is:
Answer:
- inches of mercury (Hg).
- millibars or hectopascals. ✔
- pounds per square inch.
- millimeters of mercury (Hg).

Question 28 - Multiple Choice 0 points
Question: Which of the following weather elements ALWAYS decreases as we climb upward in the atmosphere?
Answer:
- wind
- temperature ✔
- pressure
- moisture
- all of these

Question 29 - Multiple Choice 0 points
Question: The number or mass of air molecules in a given space or volume is called:
Answer:
- density. ✔
- pressure.
- temperature.
- weight.

Question 30 - Multiple Choice 0 points
Question: Which of the following is a planet whose atmosphere is mainly nitrogen and oxygen?
Answer:
- Venus
- Mars
- Earth ✔
- Jupiter
- Mercury

Question 31 - Multiple Choice 0 points
Question: The atmosphere of ____ is composed primarily of carbon dioxide (CO₂).
Answer:
- Earth
- Mars ✔
- Jupiter
- none of these
- all of these

Question 32 - Multiple Choice 0 points
Question: The gas responsible for the greenhouse effect on Venus is:
Answer:
- carbon dioxide (CO₂). ✔
- oxygen (O₂).
- ozone (O₃).
- nitrogen (N₂).
- water vapor (H₂O).

Question 33 - Multiple Choice 0 points
Question: The planet with a strong greenhouse effect, whose surface temperature averages 480°C (900°F) is:
Answer:
- Earth.
- Venus. ✔
- Mars.
- Pluto.
- none of these
Question 34  •  Multiple Choice  0 points
Question In the stratosphere, the air temperature normally:
Answer decreases with increasing height.
✓ increases with increasing height.
both increases and decreases depending on the season. cannot be measured.

Question 35  •  Multiple Choice  0 points
Question The earth’s atmosphere is divided into layers based on the vertical profile of:
Answer air pressure.
✓ air temperature.
air density.
wind speed.

Question 36  •  Multiple Choice  0 points
Question Carbon dioxide is a naturally-occurring component of the atmosphere.
Answer ✓ true
false

Question 37  •  Multiple Choice  0 points
Question Almost all of the earth’s weather occurs in the:
Answer exosphere.
stratosphere.
mesosphere.
thermosphere.
✓ troposphere.

Question 38  •  Multiple Choice  0 points
Question The most abundant gas in the stratosphere is:
Answer oxygen (O₂).
✓ nitrogen (N₂).
carbon dioxide (CO₂).
 ozone (O₃).
chlorofluorocarbons (CFCs).

Question 39  •  Multiple Choice  0 points
Question The hottest atmospheric layer is the:
Answer stratosphere.
mesosphere.
✓ thermosphere.
troposphere.

Question 40  •  Multiple Choice  0 points
Question Scientists are able to determine the air temperature in the thermosphere by:
Answer using radiosondes.
✓ using temperature probes in orbiting satellites.
observing changes in satellite orbits.
direct measurements in manned, high-altitude balloons.

Question 41  •  Multiple Choice  0 points
Question The atmospheric layer in which we live is called the:
Answer ✓ troposphere.
stratosphere.
thermosphere.
ionosphere.
exosphere.

Question 42  •  Multiple Choice  0 points
Question The temperature of the tropopause:
Answer is close to the temperature at the earth’s surface.
✓ is much colder than the temperature at the earth’s surface.
has never been measured.
is much warmer than the temperature at the earth’s surface.
is nearly the same as the sun’s temperature.
Question 43 - Multiple Choice 0 points
Question The instrument that measures temperature, pressure, and humidity at various altitudes in the atmosphere is the:
Answer barograph.
radiosonde.
aneroid barometer.
altimeter.

Question 44 - Multiple Choice 0 points
Question Warming in the stratosphere is mainly caused by:
Answer absorption of ultraviolet radiation by ozone.
release of latent heat energy during condensation.
chemical reactions between ozone and chlorofluorocarbons.
frictional heating caused by meteores.

Question 45 - Multiple Choice 0 points
Question In a temperature inversion:
Answer air temperature increases with increasing height.
air temperature decreases with increasing height.
air temperature remains constant with increasing height.
it is warmer at night than during the day.

Question 46 - Multiple Choice 0 points
Question The rate at which temperature decreases with increasing altitude is known as the:
Answer temperature slope.
lapse rate.
sounding.
thermocline.

Question 47 - Multiple Choice 0 points
Question Atmospheric concentrations of carbon dioxide tend to go up and down throughout the course of a year.
Answer true
false

Question 48 - Multiple Choice 0 points
Question The main reason nighttime radio broadcasts can be sent over long distances is because:
Answer the low D-level region of the ionosphere is weaker at night.
there is less interference because many radio stations do not broadcast at night.
radio stations put out more power.
radio waves propagate more efficiently through cooler, high density air.

Question 49 - Multiple Choice 0 points
Question The electrified region of the upper atmosphere is called the:
Answer thermosphere.
mesosphere.
stratosphere.
ionosphere.
troposphere.

Question 50 - Multiple Choice 0 points
Question The ionosphere is an atmospheric layer that contains a high concentration of ions. An ion is:
Answer an atom or molecule that has lost or gained an electron.
another term for ozone.
atomic oxygen.
a radioactive element.

Question 51 - Multiple Choice 0 points
Question Most of the ionosphere is found in what atmospheric layer?
Answer troposphere
stratosphere
mesosphere
ionosphere

Question 52 - Multiple Choice 0 points
The gas that absorbs most of the harmful ultraviolet radiation in the stratosphere is:  
Answer: ozon.
Question 61  •  Multiple Choice  •  0 points

Question: Storms vary in size (diameter). Which list below arranges storms from largest to smallest?
Answer: hurricane, tornado, middle latitude cyclone, thunderstorm

Question 62  •  Multiple Choice  •  0 points

Question: A tropical storm system whose winds are in excess of 64 knots (74 mi/hr) is a:
Answer: hurricane.

Question 63  •  Multiple Choice  •  0 points

Question: Middle latitude storms are also known as:
Answer: extratropical cyclones.

Question 64  •  Multiple Choice  •  0 points

Question: A towering cloud, or cluster of clouds, accompanied by thunder, lightning, and strong, gusty winds is a:
Answer: thunderstorm.

Question 65  •  Multiple Choice  •  0 points

Question: At night, when the weather is extremely cold and dry, atmospheric pressure increases with increasing altitude.
Answer: atmospheric pressure decreases with increasing altitude.

Question 66  •  Multiple Choice  •  0 points

Question: In the middle latitudes of the Northern Hemisphere, surface winds tend to blow ____ and ____ around an area of surface low pressure.
Answer: clockwise; inward

Question 67  •  Multiple Choice  •  0 points

Question: In the middle latitudes of the Northern Hemisphere, surface winds tend to blow ____ and ____ around an area of surface high pressure.
Answer: clockwise; inward

Question 68  •  Multiple Choice  •  0 points

Question: Where cold surface air replaces warm air, the boundary separating the different bodies of air is:
Answer: a cold front.

Question 69  •  Multiple Choice  •  0 points

Question: The difference in altitude (i.e., the thickness) is greatest in the layer bounded by:
Answer: 1 mb and 10 mb.
It's impossible to determine.

**Question 70** - Multiple Choice 0 points
**Question** On a weather map, sharp changes in temperature, humidity, and wind direction are marked by:
**Answer** ✓ a front.
    ✓ an anticyclone.
    ✓ a ridge.
    ✓ blowing dust.

**Question 71** - Multiple Choice 0 points
**Question** Which of the following is MOST likely associated with fair weather?
**Answer** ✓ high pressure area
    ✓ low pressure area
    ✓ a cold front
    ✓ blowing dust

**Question 72** - Multiple Choice 0 points
**Question** Areas of high atmospheric pressure are also known as:
**Answer** ✓ anticyclones.

**Question 73** - Multiple Choice 0 points
**Question** Condensation is more likely to occur:
**Answer** ✓ when the air cools.
    ✓ when the wind is calm.
    ✓ when winds blow from the ocean over land.
    ✓ at night.

**Question 74** - Multiple Choice 0 points
**Question** Clouds often form in the:
**Answer** ✓ rising air in the center of a low pressure area.
    ✓ rising air in the center of a high pressure area.
    ✓ sinking air in the center of a low pressure area.
    ✓ sinking air in the center of a high pressure area.

**Question 75** - Multiple Choice 0 points
**Question** Generally, weather in the middle latitudes tends to move from ____ to ____.
**Answer** ✓ west; east
    ✓ east; west
    ✓ north; south
    ✓ south; north

**Question 76** - Multiple Choice 0 points
**Question** Which relates to weather rather than climate?
**Answer** ✓ The average temperature for the month of January is 28°F.
    ✓ The lowest temperature ever recorded in Frozenlake, Minnesota is -57°F.
    ✓ The foggiest month of the year is December.
    ✓ I like the warm, humid summers.
    ✓ Outside it is cloudy and snowing.

**Question 77** - Multiple Choice 0 points
**Question** In an average year, more people die from ____ than from any other natural disaster.
**Answer** ✓ lightning
    ✓ earthquakes
    ✓ tornadoes
    ✓ flash floods and flooding
    ✓ droughts

**Question 78** - Multiple Choice 0 points
**Question** At the 500 mb level, the amount of oxygen inhaled in a single breath is ____ of that inhaled at sea-level.
**Answer** ✓ about the same
    ✓ about one-quarter
Question 79  ✅ Multiple Choice 0 points
Question Jupiter’s “Great Red Spot” is:
Answer  
- a huge crater.
- a huge spinning eddy.
- a huge volcano.
- a huge cloud of water vapor.

Question 80  ✅ Multiple Choice 0 points
Question Winds and temperatures throughout the troposphere and stratosphere are routinely measured:
Answer  
- by mercury barometer.
- by stethoscope.
- by ceilometer.
- by radiosonde.

Question 81  ✅ Multiple Choice 0 points
Question Based on the pressures shown in the figure below, 30 percent of the weight of the atmosphere lies:
Answer  
- above point C.
- between points B and C.
- between points A and C.
- between points A and B.

Question 82  ✅ Multiple Choice 0 points
Question Which of the following processes remove CO$_2$ from the atmosphere?
Answer  
- volcanic activity
- deforestation
- soil decay
- photosynthesis

Question 83  ✅ Multiple Choice 0 points
Question The horizontal extent of the ozone hole can sometimes exceed the size of the Antarctic continent.
Answer  
- true
- false

Question 84  ✅ Multiple Choice 0 points
Question The ozone hole is an actual hole in the atmosphere, a region of complete vacuum.
Answer  
- true
- false

Question 85  ✅ Multiple Choice 0 points
Question Ozone in the stratosphere:
Answer  
- is a health hazard for people with respiratory illnesses.
- protects life from harmful ultraviolet radiation.
- is one of the main ingredients of photochemical smog.
- both b and c

Question 86  ✅ Multiple Choice 0 points
Question About ____ of the meteorologists and atmospheric scientists in the United States work in the field of weather forecasting.
Answer  
- one-tenth
- one-half
- three-quarters
- nine-tenths

Question 87  ✅ Multiple Choice 0 points
Question Rainfall intensity is measured by:
Answer  
- radiosonde.
anemometer.
✓ Doppler radar.
ceilometer.

Question 88 - Multiple Choice 0 points
Question If you were to take a breath of pure oxygen, from a tank, you'd be getting about ____ the amount of oxygen you'd get by
taking a normal breath of our atmosphere.
Answer
one-fifth
half
twice
three times
✓ five times

Question 89 - Multiple Choice 0 points
Question Standing at the top of a tall mountain, a breath of air would contain a lot fewer molecules than a breath of air taken at sea
level. But the proportion of oxygen in the two breaths of air, relative to the other constituents, would remain the same.
Answer ✓ true
false

Question 90 - Multiple Choice 0 points
Question If a time machine transported you to the early days of the earth's atmosphere, before plants and animals existed on our
planet, you would not be able to survive for more than a few minutes.
Answer ✓ true
false

Question 91 - Multiple Choice 0 points
Question There is a lot of mixing and overturning of air in which of the following atmospheric layers?
Answer
stratosphere✓
troposphere
troposphere
mesosphere
none of the above

Question 92 - Multiple Choice 0 points
Question As a radiosonde balloon ascends through the atmosphere, the balloon:
Answer
contracts.
✓ expands.
maintains a constant pressure.
none of these

Question 93 - Multiple Choice 0 points
Question Meteorology is considered a branch of:
Answer
mineralogical sciences.
✓ phenology.
phrenology.
✓ atmospheric sciences.

Question 94 - Multiple Choice 0 points
Question Heat waves are generally considered to be little more than a nuisance and are not responsible for considerable loss of life.
Answer ✓ true
false

Question 95 - Multiple Choice 0 points
Question Atmospheric storm systems can be:
Answer
only a few meters wide.
✓ about a kilometer wide.
about a kilometer wide.
several hundred kilometers wide.
all of these

Question 96 - Essay 0 points
Question Describe the various types of storms found in the earth's atmosphere. Can you find any correlation between storm size and
storm duration? What factors might determine a storm's severity?
Answer  

Question 97 - Essay 0 points
Question What instruments are used in meteorology? What role did the discovery of instruments play in the emergence of the science
Briefly describe some of the historical events that helped meteorology progress as a natural science from Aristotle to the present day.

Under what circumstances might a person breathe stratospheric air? How often is it likely to happen in a student's lifetime?

What causes air pressure? Why does air pressure decrease with increasing altitude?

Describe some of the processes that release and remove carbon dioxide from the atmosphere. Is there any evidence that suggests that these processes are not in balance?

There is currently concern that the amount of ozone in the stratosphere may be decreasing. Why would a decrease in ozone concentration be important? Describe some of the effects that a decrease in ozone concentration might have.

If the air temperature at the surface (0 feet) is 60°F, what would be the approximate air temperature at an altitude of 10,000 feet, assuming an average atmospheric lapse rate of 3.6°F per 1000 feet?

Draw a diagram showing how air temperature normally changes with height. Begin at the ground and end in the upper thermosphere. Be sure to label the four main layers. Give one important characteristic of each layer. Where on your diagram would the top of Mt. Everest, the ozone layer, and the ionosphere be found?

What are the principal gaseous components of the earth's atmosphere? Where do scientists believe these gases came from?

Why is there very little water vapor above the tropopause?

What information might you find on a surface weather map that is not readily apparent on a satellite photograph? What information could a satellite photograph provide that a surface chart could not?

Explain briefly why it is possible to transmit AM radio waves over larger distances at night than during the day.

Describe the relationship between gravity and weight.