Earth’s Atmosphere

Use this key to check answers and read the explanations.

1. Which gas makes up the largest share of dry air near Earth’s surface?
   - A. Nitrogen
   - B. Oxygen
   - C. Argon
   - D. Carbon dioxide

   Correct answer: A. Nitrogen
   Nitrogen makes up about 78 percent of dry air. Oxygen is the second most abundant gas.

2. Which atmospheric layer contains most of the clouds and storms that affect us at the surface?
   - A. Mesosphere
   - B. Stratosphere
   - C. Troposphere
   - D. Exosphere

   Correct answer: C. Troposphere
   Most water vapor is in the troposphere, the layer closest to the ground where most weather takes place.

3. A balloon has climbed through the tropopause. Which layer is it entering?
   - A. Mesosphere
   - B. Stratosphere
   - C. Thermosphere
   - D. Exosphere

   Correct answer: B. Stratosphere
   The tropopause is the boundary between the troposphere below and the stratosphere above.

4. Most of the ozone that forms Earth’s protective ozone layer is found in which atmospheric layer?
   - A. Thermosphere
   - B. Troposphere
   - C. Mesosphere
   - D. Stratosphere

   Correct answer: D. Stratosphere
   Ozone is found at several heights, but most atmospheric ozone is in the stratosphere.

5. What generally happens to atmospheric pressure as you climb from sea level to the top of a high mountain?

A. It increases.
B. It decreases.
C. It stays the same.
D. It becomes zero at the summit.

Correct answer: B. It decreases.
There is less air overhead at higher elevation. The smaller weight of that air gives a lower pressure.

6. Why do composition charts often specify that their percentages are for dry air?

A. The amount of water vapor varies with conditions.
B. Nitrogen disappears whenever water vapor is present.
C. Only dry air has atmospheric pressure.
D. Oxygen changes into water vapor on humid days.

Correct answer: A. The amount of water vapor varies with conditions.
Water vapor has a variable share of the atmosphere. Dry-air percentages remove that variable when comparing the other gases.

7. Which part of incoming sunlight does stratospheric ozone help keep from reaching the ground?

A. Radio waves from the Sun
B. Visible green light
C. All infrared radiation
D. Ultraviolet radiation

Correct answer: D. Ultraviolet radiation
Stratospheric ozone absorbs most ultraviolet-B radiation and, together with oxygen, removes ultraviolet-C radiation before it reaches the surface.

8. In which layer do many incoming meteoroids burn up and become visible as meteors?

A. Stratosphere
B. Troposphere
C. Mesosphere
D. Exosphere

Correct answer: C. Mesosphere
Many small meteoroids produce their bright streaks high in the mesosphere as they encounter atmospheric gas.

9. In which atmospheric layer do sparse gas particles travel long distances before colliding, and can some escape into space?

A. Exosphere
B. Troposphere
C. Stratosphere
D. Mesosphere

Correct answer: A. Exosphere
The exosphere is the outermost region. It gradually thins into space.

10. At a location where the tropopause is 12 kilometers high, a balloon records rising air temperature as it climbs from 20 to 35 kilometers. Which layer and process best match?

A. Exosphere, where water condenses to form most clouds
B. Troposphere, where air pressure rises with altitude
C. Mesosphere, where the air is heated by ocean currents
D. Stratosphere, where ozone absorbs ultraviolet radiation

Correct answer: D. Stratosphere, where ozone absorbs ultraviolet radiation
These heights are in the stratosphere. Absorption of ultraviolet energy by ozone helps temperature rise with height in that layer.

11. A gauge reads 1,000 hectopascals at sea level and 500 hectopascals at a higher station. Assuming gravity is nearly constant, what does the second reading tell you?

A. Exactly half the oxygen in the air has changed into nitrogen.
B. The air temperature at the second station is half as high.
C. The weight of air per unit area overhead is about half as large.
D. The second station is halfway to the top of the atmosphere.

Correct answer: C. The weight of air per unit area overhead is about half as large.
Pressure reflects the weight per unit area of the air column above the gauge. It does not determine a fixed altitude fraction or gas composition.

12. An atmospheric profile shows a steady temperature drop from 55 to 85 kilometers and then a rise above 90 kilometers. Which named boundary is near the cold point?

A. Tropopause
B. Mesopause
C. Stratopause
D. Surface inversion

Correct answer: B. Mesopause
The mesopause is the cold boundary between the mesosphere, where the temperature generally falls with height, and the warmer thermosphere above it.

13. A diagram labels both the thermosphere and the ionosphere across much of the same height range. Why can both labels apply?

A. The labels mark two atmospheric layers that have no overlap.
B. Both names are for two separate locations at Earth’s surface.
C. The ionosphere is exactly another name for the entire atmosphere.
D. Thermosphere describes a temperature region. Ionosphere describes a region with many charged particles.

Correct answer: D. Thermosphere describes a temperature region. Ionosphere describes a region with many charged particles.
The naming systems describe different properties. Solar radiation helps create ions and free electrons over a range of heights that overlaps several temperature-defined layers.

14. Following sunset, which change is expected in an ionospheric region with little direct solar illumination?

A. Fewer new ions and electrons are produced by sunlight.
B. Most nitrogen molecules immediately become ozone.
C. The temperature layers all merge into a single boundary.
D. Sunlight ionizes more of the local gas than at midday.

Correct answer: A. Fewer new ions and electrons are produced by sunlight.
When direct solar radiation falls, it produces fewer new ions and electrons. The resulting changes differ across regions and heights.

15. Why can a very thin part of the thermosphere have a high measured temperature and still transfer relatively little heat to an object passing through it?

A. Temperature measures only pressure and says nothing about particle motion.
B. Every collision cools the object regardless of its speed.
C. Individual particles can move very fast while few particles strike the object.
D. Thermospheric gas is dense enough to prevent any contact.

Correct answer: C. Individual particles can move very fast while few particles strike the object.
Gas temperature reflects typical particle motion. With very few particles, collisions transfer comparatively little energy.