Weather Stations, Pressure and Fronts

Use this key to check answers and read the explanations.

1. A weather station needs the amount of rain that fell overnight, measured as a depth. Which instrument supplies that reading?

A. Rain gauge
B. Wind vane
C. Thermometer
D. Anemometer

Correct answer: A. Rain gauge
A rain gauge collects precipitation so its amount can be reported as a depth, such as millimeters.

2. A station reports a north wind. From which direction is the wind coming?

A. East
B. South
C. North
D. West

Correct answer: C. North
A wind is named for where it comes from. A north wind blows from the north toward the south.

3. A weather map marks the boundary between a warm, moist air mass and a colder air mass. What is that boundary called?

A. A wind gust
B. A front
C. A dew point
D. A pressure reading

Correct answer: B. A front
A front is a boundary separating air masses with different characteristics, often different temperatures.

4. A map shows a pressure center of 1,002 hectopascals. The surrounding pressure is 1,008 hectopascals or more. How is the center classified?

A. A center with the same pressure as its surroundings
B. A high-pressure center
C. A place with zero air pressure
D. A low-pressure center

Correct answer: D. A low-pressure center
A low is identified relative to the surrounding area. The center reading is below all the surrounding values given.

5. A weather report gives both air temperature and dew point. What does the dew point tell you?

A. The highest air temperature measured that day

B. The temperature at which the air would become saturated if cooled at the same pressure without changing its water-vapor content

C. The amount of rain that has already fallen

D. The temperature at which every water droplet freezes

Correct answer: B. The temperature at which the air would become saturated if cooled at the same pressure without changing its water-vapor content

When air cools to its dew point at constant pressure and water-vapor content, it reaches saturation. Further cooling can lead to condensation.

6. A fictional station records 42 degrees Fahrenheit at 7 a.m., 57 at 2 p.m. and 51 at 7 p.m. What is the difference between the highest and lowest of these three readings?

A. 15 degrees Fahrenheit

B. 9 degrees Fahrenheit

C. 6 degrees Fahrenheit

D. 19 degrees Fahrenheit

Correct answer: A. 15 degrees Fahrenheit

The highest recorded value is 57 and the lowest is 42. Their difference is 15 degrees Fahrenheit.

7. A fictional station reports 1,009 hectopascals at 9 a.m., 1,005 at noon and 1,001 at 3 p.m. How did the pressure change from the first to the last reading?

A. It rose by 4 hectopascals.

B. It fell by 4 hectopascals.

C. It rose by 8 hectopascals.

D. It fell by 8 hectopascals.

Correct answer: D. It fell by 8 hectopascals.

The first and last readings differ by 8. Because the last value is lower, the pressure fell.

8. Two fictional stations both read 70 degrees Fahrenheit. Station A has a dew point of 68 degrees and Station B has a dew point of 50 degrees. At which station is relative humidity higher?

A. They have the same relative humidity.

B. Station B

C. Station A

D. Dew point cannot help compare humidity at the same air temperature.

Correct answer: C. Station A

At the same air temperature, a higher dew point means the air is closer to saturation. Station A has the smaller gap between temperature and dew point.

9. A moving boundary passes a fictional station. Temperature falls from 73 to 56 degrees Fahrenheit, and tracking shows the colder air mass moving into the warmer one. What kind of front passed?

A. Cold front
B. Warm front
C. Stationary front
D. Occluded front

Correct answer: A. Cold front
The key observation is which air mass is advancing. The colder air is replacing the warmer air, so this is a cold front.

10. A boundary moves east as warmer air advances toward cooler air ahead of it. Which description fits a typical warm front?

A. The two air masses stop advancing for the front to form.
B. The warmer air slides beneath the cooler air ahead.
C. The cooler air must advance west over the warmer air.
D. The warmer air rises over the cooler air ahead.

Correct answer: D. The warmer air rises over the cooler air ahead.
Cooler air is typically denser. At a warm front the advancing warm air usually glides up over that cooler air.

11. A fictional weather map shows a boundary between cooler air to the north and warmer air to the south. Six hours later the boundary is in the same place, and neither air mass has advanced into the other. Which label fits best?

A. Warm front
B. Cold front
C. Stationary front
D. Occluded front

Correct answer: C. Stationary front
A stationary front is a boundary that moves little because neither air mass is steadily replacing the other. The two observations fit that pattern.

12. A fictional gauge records 18 millimeters of rain in three hours during interval A and 10 millimeters in one hour during interval B. Which average rainfall rate is higher, and by how much?

A. Interval A by 8 millimeters per hour
B. Interval B by 4 millimeters per hour
C. Interval A by 4 millimeters per hour
D. The averages are the same.

Correct answer: B. Interval B by 4 millimeters per hour
Interval A averages 18 divided by 3, or 6 millimeters per hour. Interval B averages 10 millimeters per hour, which is 4 more per hour.

13. A fictional coastal station reports a raw pressure of 1,008 hectopascals. A mountain station reports 848. What should a mapmaker compare to locate weather pressure systems across both elevations?

A. Only the difference between wind speeds
B. Only the unadjusted station pressures
C. Only the air temperatures at the two stations
D. Pressures adjusted to a common sea-level reference

Correct answer: D. Pressures adjusted to a common sea-level reference
Pressure normally falls with elevation. A sea-level adjustment puts readings from different elevations on a common reference for a surface weather map.

14. In fictional region A, pressure changes from 1,004 to 1,012 hectopascals across 60 kilometers. In region B, it changes from 1,000 to 1,012 across 180 kilometers. Where is the average pressure change per kilometer larger?

A. Region A, where it is twice as large
B. Region B, where it is twice as large
C. Region B, because its total change is 12 hectopascals
D. Both are equal because the highest pressure is the same

Correct answer: A. Region A, where it is twice as large
Region A changes by 8 hectopascals over 60 kilometers. Region B changes by 12 over 180, which is 4 over 60. Region A has twice the average gradient.

15. In a fictional map sequence, an eastward-moving cold front is at kilometer 20 and a warm front ahead is at kilometer 50. Later they meet at kilometer 90 and the warm air between them is lifted. What kind of front forms when the cold front overtakes the warm front?

A. A sea-breeze front
B. A stationary front
C. An occluded front
D. A warm front

Correct answer: C. An occluded front
The earlier map puts the cold front behind the warm front. When it catches up and the warm air is lifted, the combined boundary is an occluded front.