

PRACTICE EXAM 13

1. What is the ultimate driving force behind nearly all weather?
 - A. The uneven heating of the Earth by the sun
 - B. The rotation of the moon around the Earth
 - C. The magnetic field of the planet
 - D. The burning of fuel by aircraft engines

2. In the standard atmosphere, what is the sea-level pressure?
 - A. 30.00 inches of mercury
 - B. 28.92 inches of mercury
 - C. 29.92 inches of mercury
 - D. 31.00 inches of mercury

3. Air generally flows from areas of high pressure toward areas of low pressure, creating what?
 - A. Precipitation only
 - B. Temperature inversions
 - C. Wind
 - D. Static electricity

4. In the Northern Hemisphere, wind circulates around a low-pressure area in which manner?
 - A. Clockwise and outward
 - B. Counterclockwise and inward
 - C. Straight inward in radial lines

D. Clockwise and inward

5. High pressure is generally associated with which type of weather?

A. Descending air and fair conditions

B. Rising air and heavy precipitation

C. Severe thunderstorm development

D. Widespread low ceilings and fog

6. What is the dewpoint?

A. The pressure at which clouds dissipate

B. The temperature to which air must be cooled to become saturated

C. The altitude at which icing always begins

D. The temperature at which winds become calm

7. A small temperature-dewpoint spread indicates what?

A. Strong, gusty surface winds

B. Rapidly rising pressure

C. Clear skies and excellent visibility

D. Air near saturation, with likely fog or low clouds

8. Stable air, when lifted, tends to produce which type of weather?

A. Towering cumulus and showery precipitation

B. Severe turbulence and good visibility

C. Stratiform clouds, steady precipitation, and smooth air

D. Strong vertical currents and clear air

9. Unstable air, when lifted, tends to produce which type of weather?

A. Layered stratus and steady drizzle

B. Cumuliform clouds, showers, and turbulence

C. Smooth air with poor visibility

D. A persistent temperature inversion

10. A temperature inversion is a layer in which what occurs?

A. Temperature decreases rapidly with altitude

B. Winds are always strongest

C. Pressure rises sharply with height

D. Warmer air lies above cooler air, trapping moisture and haze

11. An air mass is best described as which of the following?

A. A large body of air with relatively uniform temperature and moisture

B. A narrow band of intense precipitation

C. A rotating column of air around a low

D. The boundary between two pressure systems

12. A cold front is characterized by which set of features?

A. A shallow slope and slow movement

B. A broad area of layered clouds well ahead

C. Persistent drizzle over many hours

D. A steep slope, fast movement, and a narrow band of intense weather

13. A warm front is characterized by which set of features?

A. A steep slope and fast movement

B. A narrow band of thunderstorms

C. A shallow slope, slow movement, and broad layered precipitation ahead

D. Rapid clearing immediately behind it

14. An occluded front forms when what happens?

A. Two warm air masses merge

B. A high-pressure system stalls

C. The air becomes completely stable

D. A faster cold front overtakes a warm front

15. The clearest sign that a front has passed is usually what?

A. A sudden rise in humidity only

B. A change in wind direction

C. A complete absence of clouds

D. An increase in the dewpoint spread alone

16. Which three ingredients are required for a thunderstorm to form?

A. Sufficient moisture, an unstable atmosphere, and a lifting force

B. Cold air, high pressure, and clear skies

C. Stable air, descending currents, and dry conditions

D. Low humidity, an inversion, and calm winds

17. Which stage of a thunderstorm is the most hazardous?

A. The mature stage, with coexisting updrafts and downdrafts

B. The cumulus stage, with updrafts only

C. The dissipating stage, with downdrafts only

D. The pre-cumulus stage, before any cloud forms

18. The FAA recommends avoiding a severe thunderstorm by at least what distance?

A. 5 nautical miles

B. 20 nautical miles

C. 10 nautical miles

D. 2 nautical miles

19. Structural icing requires which combination of conditions?

A. Clear, dry air at any temperature

B. Visible moisture well above freezing

C. Smoke or haze with no moisture

D. Visible moisture at temperatures at or below freezing

20. Radiation fog most commonly forms under which conditions?

A. Windy days with broken clouds

B. Warm air moving over a cooler sea

C. Strong frontal lifting along a cold front

D. Clear, calm nights as the ground cools

21. Advection fog forms when what occurs?

- A. Moist air moves over a cooler surface
- B. The ground radiates heat on a calm night
- C. Air is forced up a mountain slope
- D. Cold air moves over warmer water

22. A microburst is best described as what?

- A. A small, intense downdraft producing a violent wind shift
- B. A gentle, widespread updraft beneath stratus
- C. A slow rotation of air around a low
- D. A steady crosswind near the surface

23. Windshear is best defined as which of the following?

- A. A steady wind from a constant direction
- B. The normal decrease of wind with altitude
- C. A gradual change in temperature with height
- D. A sudden, drastic change in wind speed or direction over a short distance

24. Why is windshear especially dangerous at low altitude during takeoff and landing?

- A. There is little altitude available to recover
- B. The engine produces less power near the ground
- C. The compass becomes unreliable near the surface

D. The flaps cannot be extended at low altitude

25. Mechanical turbulence is caused by what?

A. Wind flowing over terrain, buildings, or obstructions

B. The sun heating the ground unevenly

C. The jet stream at high altitude

D. Aircraft flying through their own wake

26. Convective (thermal) turbulence is produced by what?

A. The boundary between two wind layers

B. Wind blowing across a mountain ridge

C. The wake of a large aircraft

D. Rising columns of warm air on sunny days

27. Clear air turbulence (CAT) is most often associated with what?

A. Thunderstorm downdrafts

B. Mechanical mixing near the surface

C. The jet stream at higher altitudes

D. Radiation fog at dawn

28. As altitude increases in the lower atmosphere, temperature normally does what?

A. Decreases at about 2°C per 1,000 feet

B. Increases steadily with height

C. Remains constant up to 18,000 feet

D. Rises then falls unpredictably

29. The capacity of air to hold water vapor depends primarily on what?

A. The barometric pressure alone

B. The wind speed at the surface

C. The temperature of the air

D. The altitude above sea level

30. Steam fog forms under which condition?

A. Warm, moist air moving over a cooler land surface

B. Cold air moving over warmer water

C. A temperature inversion over a city

D. Moist air rising along a warm front

31. Which best describes the weather associated with the warm sector ahead of a slow-moving warm front?

A. A narrow band of thunderstorms and rapid clearing

B. Gradually lowering ceilings and visibilities with steady precipitation

C. Severe turbulence and hail

D. Clear skies with gusty winds

32. A stationary front is best described as which of the following?

A. A front moving rapidly across the region

B. A cold front overtaking a warm front

C. A boundary where neither air mass is advancing

D. A rotating system around a low-pressure center

33. Why is an embedded thunderstorm particularly dangerous?

A. It produces only light rain

B. It is always visible and easily avoided

C. It is hidden within stratiform cloud and cannot be seen visually

D. It forms only at very high altitudes

34. Icing on an airframe is hazardous because it does what?

A. Destroys the airfoil shape, adds weight, increases drag, and reduces lift

B. Improves lift by smoothing the wing

C. Reduces the aircraft's weight

D. Increases engine power output

35. Upslope fog forms when what occurs?

A. The ground radiates heat at night

B. Warm air moves over a cooler ocean

C. Moist air is forced up rising terrain and cools

D. Cold air moves over a warm lake

36. Wind around a high-pressure system in the Northern Hemisphere circulates in which manner?

A. Counterclockwise and inward

B. Straight inward toward the center

C. Counterclockwise and outward

D. Clockwise and outward

37. Which condition is most favorable for the formation of cumuliform clouds?

- A. Unstable, moist air being lifted
- B. A strong temperature inversion
- C. Stable air over a cold surface
- D. Descending air in a high-pressure system

38. A pilot expecting smooth flight, layered clouds, and possibly reduced visibility is likely flying in what kind of air?

- A. Highly unstable air
- B. Air within a thunderstorm
- C. Stable air
- D. Air ahead of a fast cold front

39. During the cumulus stage of a thunderstorm, the cell is dominated by what?

- A. Strong downdrafts and surface precipitation
- B. Hail and severe turbulence
- C. Continuous updrafts as the cloud builds
- D. Dissipation as the storm rains out

40. Why does warm air generally bring the possibility of more moisture than cold air?

- A. Warm air is denser and traps water
- B. Warmer air can hold more water vapor
- C. Cold air evaporates water faster

D. Warm air has lower humidity by definition

41. Closely spaced isobars on a surface chart indicate what?

- A. Light and variable winds
- B. A region of stable, fair weather
- C. The absence of pressure systems
- D. A steep pressure gradient and strong winds

42. The standard temperature at sea level in the standard atmosphere is what?

- A. 0°C (32°F)
- B. 15°C (59°F)
- C. 25°C (77°F)
- D. 20°C (68°F)

43. Why can a morning that begins clear develop dense radiation fog quickly?

- A. The wind increases sharply at dawn
- B. The temperature can rapidly reach the dewpoint as the ground cools overnight
- C. The pressure drops suddenly at sunrise
- D. The sun immediately saturates the air

44. The dissipating stage of a thunderstorm is dominated by what?

- A. Building cumulus and updrafts
- B. Coexisting updrafts and downdrafts
- C. Downdrafts as the storm rains itself out

D. The first formation of precipitation aloft

45. A pilot encountering turbulence should slow to maneuvering speed (V_a) for what reason?

A. The wing will stall and relieve the load before the structure is overstressed

B. The engine runs more smoothly at that speed

C. The propeller becomes more efficient

D. The autopilot engages only below V_a

46. Which front typically brings a sharp temperature drop, gusty winds, and a short period of intense weather as it passes?

A. A warm front

B. A stationary front

C. A cold front

D. A weak occluded front

47. Why does atmospheric pressure decrease with altitude?

A. The air becomes warmer with height

B. There is less air above to exert weight at higher altitudes

C. The Earth's rotation slows the air

D. Humidity increases with altitude

48. A pilot notes the temperature and dewpoint are both 12°C at the surface. What does this most strongly suggest?

A. Strong, dry winds developing

B. Rapidly improving visibility

- C. A steep pressure gradient
- D. Saturation, with fog or low clouds likely

49. Wind-shear turbulence occurs at what location?

- A. Only inside thunderstorm cells
- B. Only at the surface near buildings
- C. Only above 18,000 feet MSL
- D. At the boundaries between air layers of different wind or temperature

50. Why is the mature stage of a thunderstorm marked by the onset of surface precipitation?

- A. The updrafts have completely stopped
- B. The downdrafts and precipitation begin while strong updrafts still exist
- C. The storm has fully dissipated
- D. The cloud has not yet finished building

Answer Key & Explanations

1. A — Nearly all weather is driven by the uneven heating of the Earth by the sun and the atmosphere's response to it. This uneven heating creates the pressure and temperature differences that produce wind and weather.

2. C — In the standard atmosphere, sea-level pressure is 29.92 inches of mercury (1013.2 mb). This is the reference baseline for altimetry and performance.

3. C — Air flows from high pressure toward low pressure, creating wind. The Earth's rotation then deflects this flow through the Coriolis effect.

4. B — Around a Northern Hemisphere low, wind circulates counterclockwise and inward because of the pressure gradient and Coriolis deflection. Lows are associated with rising air and unsettled weather.

5. A — High pressure is generally associated with descending air and fair weather. Low pressure, by contrast, brings rising air, clouds, and precipitation.

6. B — The dewpoint is the temperature to which air must be cooled to become saturated, at which point condensation forms. A small temperature-dewpoint spread signals near-saturation.

7. D — A small temperature-dewpoint spread means the air is near saturation, indicating likely fog or low clouds. Watching the spread close warns of reducing visibility.

8. C — Stable air resists vertical motion, so when lifted it produces stratiform clouds, steady precipitation, and smooth air, often with haze. Unstable air produces cumuliform clouds and turbulence.

9. B — Unstable air promotes vertical motion, so when lifted it produces cumuliform clouds, showery precipitation, and turbulence, generally with good visibility. Stable air, by contrast, gives layered clouds and smooth flight.

10. D — A temperature inversion is a layer in which warmer air lies above cooler air, trapping moisture, smoke, and haze beneath it. It is associated with stable air and poor visibility.

11. A — An air mass is a large body of air with relatively uniform temperature and moisture characteristics acquired from its source region. As it moves, it modifies the weather it brings.

12. D — A cold front has a steep slope, moves fast, and produces a narrow band of intense weather followed by rapid clearing. A warm front, by contrast, is shallow and slow.

13. C — A warm front has a shallow slope, moves slowly, and spreads broad layered precipitation and lowering ceilings well ahead of it. A cold front brings fast, narrow, intense weather.

14. D — An occluded front forms when a faster cold front overtakes a warm front, combining their weather. It blends the characteristics of both front types.

15. B — The clearest sign of frontal passage is a change in wind direction, usually with temperature and pressure changes. The wind shift is the most reliable indicator.

16. A — A thunderstorm requires sufficient moisture, an unstable atmosphere, and a lifting force to start the air rising. Remove any one ingredient and the storm cannot develop.

17. A — The mature stage is the most hazardous because strong updrafts and downdrafts coexist with heavy precipitation, hail, and severe turbulence. The cumulus and dissipating stages are less dangerous.

18. B — The FAA recommends avoiding severe thunderstorms by at least 20 nautical miles, because hail and severe turbulence can extend well beyond the visible cloud. Embedded storms are especially dangerous.

19. D — Structural icing requires visible moisture at temperatures at or below freezing. Ice then distorts the airfoil, adds weight, and increases drag.

20. D — Radiation fog forms on clear, calm nights as the ground radiates heat and cools the air above it to its dewpoint. It is common in low-lying areas around dawn.

21. A — Advection fog forms when moist air moves over a cooler surface, cooling to its dewpoint. It differs from radiation fog, which forms over cooling ground on calm nights.

22. A — A microburst is a small, intense downdraft, often associated with thunderstorms, that produces a violent wind shift. It can overwhelm a light airplane's climb capability.

23. D — Windshear is a sudden, drastic change in wind speed or direction over a short distance. It can occur at any altitude and is most dangerous near the ground.

24. A — Windshear is especially dangerous at low altitude during takeoff and landing because there is little altitude available to recover. A sudden wind change can exceed the airplane's performance margin.
25. A — Mechanical turbulence is caused by wind flowing over terrain, buildings, or obstructions. It differs from thermal turbulence, which comes from rising warm air.
26. D — Convective (thermal) turbulence is produced by rising columns of warm air on sunny days. It is common over heated terrain in the afternoon.
27. C — Clear air turbulence is most often associated with the jet stream at higher altitudes. It occurs in cloudless air, giving no visual warning.
28. A — In the lower atmosphere, temperature normally decreases at about 2°C per 1,000 feet, the standard lapse rate. This underlies performance and altimetry calculations.
29. C — The capacity of air to hold water vapor depends primarily on its temperature, with warmer air holding more. This is why cooling air toward its dewpoint produces condensation.
30. B — Steam fog forms when cold air moves over warmer water, causing moisture to evaporate and recondense. It is the opposite arrangement from advection fog.
31. B — Ahead of a slow-moving warm front, ceilings and visibilities gradually lower with steady precipitation. The broad, layered weather extends well in advance of the surface front.
32. C — A stationary front is a boundary where neither air mass is advancing, often producing prolonged unsettled weather. It differs from moving cold and warm fronts.
33. C — An embedded thunderstorm is hidden within stratiform cloud and cannot be seen visually, so it cannot be avoided by sight. This makes it especially treacherous.
34. A — Airframe icing destroys the airfoil shape, adds weight, increases drag, and reduces lift, a rapidly compounding hazard. It is why flight into visible moisture near freezing must be avoided.

35. C — Upslope fog forms when moist air is forced up rising terrain and cools to its dewpoint. It differs from radiation and advection fog in its lifting mechanism.
36. D — Around a Northern Hemisphere high, wind circulates clockwise and outward because of the pressure gradient and Coriolis deflection. Highs bring descending air and fair weather.
37. A — Cumuliform clouds form most readily when unstable, moist air is lifted, allowing it to continue rising. Stable air or inversions suppress such vertical development.
38. C — Smooth flight, layered clouds, and reduced visibility are characteristic of stable air. Unstable air, by contrast, produces turbulence and good visibility.
39. C — During the cumulus stage, the cell is dominated by continuous updrafts as the cloud builds. Precipitation at the surface marks the later mature stage.
40. B — Warmer air can hold more water vapor than cold air, so it carries the potential for more moisture. This is why cooling warm, moist air produces clouds and precipitation.
41. D — Closely spaced isobars indicate a steep pressure gradient and therefore strong winds. Widely spaced isobars indicate lighter winds.
42. B — The standard sea-level temperature in the standard atmosphere is 15°C (59°F). This is the reference value paired with 29.92 inches of mercury.
43. B — A clear morning can develop dense radiation fog quickly because the temperature can rapidly reach the dewpoint as the ground cools overnight. Once the spread closes, fog forms within minutes.
44. C — The dissipating stage is dominated by downdrafts as the storm rains itself out. The updrafts that sustained the cell have weakened.
45. A — Slowing to maneuvering speed in turbulence ensures the wing stalls and relieves the load before the structure is overstressed. This protects the airframe.

46. C — A cold front typically brings a sharp temperature drop, gusty winds, and a short period of intense weather as it passes. Warm and stationary fronts produce more gradual, prolonged weather.

47. B — Atmospheric pressure decreases with altitude because there is less air above to exert weight at higher altitudes. This is why the altimeter senses altitude through pressure.

48. D — A temperature and dewpoint that are equal indicate saturation, making fog or low clouds likely. The closed spread is a strong signal of reduced visibility.

49. D — Wind-shear turbulence occurs at the boundaries between air layers of different wind or temperature. It is distinct from mechanical and thermal turbulence.

50. B — The mature stage is marked by surface precipitation beginning while strong updrafts still exist, producing the coexistence of updrafts and downdrafts. This combination makes it the most hazardous stage.