

\*\* denote questions that require a deeper understanding of some of the concepts addressed in previous questions.

- (1) Air pressure is a measure of the \_\_\_\_\_ overhead column of air. LP #6, slide #2
- (2) Air pressure \_\_\_\_\_ increases as one moves upward through the earth's atmosphere. LP #1, slides #10-11, LP #6, slide #2
- always
  - usually
  - rarely
  - never
- (3) Air temperature \_\_\_\_\_ decreases as one moves upward through the **troposphere**. LP #1, slides #12-13, 15-16
- always
  - usually
  - rarely
- (4) Humid, warm air is \_\_\_\_\_ less dense than dry, cold air, assuming the same number of molecules contained in a volume of air (a.k.a. an "air parcel"). LP #1, slides #5 & 10, LP #4, slide #22
- always
  - usually
  - rarely
  - never
- (5) \*\* Given identical surface pressure (e.g., 1000 millibars) at Station A and at Station B (both cities have identical elevations), with Station A having warm air and Station B having cold air next to the surface, air pressure at Station A will \_\_\_\_\_ change less rapidly with increasing height above the ground than will the air pressure at Station B. LP #6, slides #3-5
- always
  - usually
  - rarely
  - never
- (6) The speed of the wind (or air parcel movement) is **directly** related to the local horizontal change in pressure (horizontal pressure gradient force). LP #6, slides #28-31
- True
  - False

(7) If the horizontal pressure gradient force is the only force accelerating an air parcel, the wind moving the air parcel will be directed from \_\_\_\_\_ pressure toward \_\_\_\_\_ pressure. LP #6, slides #28-31

- a. high, low
- b. low, high
- c. it depends on whether we're in the Northern or Southern Hemisphere

(8) \*\* Given the initial starting conditions described in Question (5) and the information addressed in Questions (6)-(7), describe (and draw, if helpful) the resulting circulation that develops over a 1 – 6 hour period in the lower troposphere between Station A and Station B. LP #6, slides #3-6, 28-31

(9) The direction of spin of water draining from a toilet will reverse as one crosses the Equator in a ship. no reference in lecture notes

- a. True
- b. False

(10) If air parcels (and wind) are moving for a period approaching 12 – 24 hours or greater, what other horizontal 'force' must also be accounted for when determining the expected direction of air parcel movement? LP #6, slides #32-38

(11) Given a balance between the two horizontal forces described in Questions (7) and (10), what must be the direction of winds (air parcel movement or 'spin') about a surface low pressure system in the Northern Hemisphere? LP #6, slide #39

- a. clockwise
- b. counterclockwise

(12) What two additional horizontal forces are important under special conditions in also determining the expected direction of air parcel movement [hint #1; consider air flow near the earth's surface, hint #2; consider curved air flow]? LP #6, slide #27, 41, 44-45

(13) The impact of the force influencing air flow near the surface mentioned in Question (12) causes air parcels to move from \_\_\_\_\_ pressure toward \_\_\_\_\_ pressure. LP #6, slides #44, 49

- a. high, low
- b. low, high
- c. it depends on whether we're in the Northern or Southern Hemisphere

(14) When air parcels near the ground move closer together, accumulating mass, the net horizontal air flow pattern is called \_\_\_\_\_.

LP #6, slides #50-51, LP#8, slide #61

- a. convergence
- b. divergence

(15) Convergence of air near the ground \_\_\_\_\_ results in rising motion in the overhead column.

LP #6, slides #50-51

- a. always
- b. usually
- c. rarely
- d. never

(16) The air temperature of an air parcel undergoing ascent \_\_\_\_\_ decreases (cools).

LP #5, slide #3

- a. always
- b. usually
- c. rarely
- d. never

(17) When an air parcel has first reached saturation, its air temperature has cooled to its \_\_\_\_\_ temperature and its relative humidity is \_\_\_\_\_%.

LP #4, slides #12-13, 15

- a. convective, 50
- b. convective, 100
- c. dew-point, 50
- d. dew-point, 100

(18) Relative humidity is a good indicator of the absolute amount of water vapor contained in an air parcel.

LP #4, slides #12-15

- a. True
- b. False

(19) It is possible for the relative humidity of an air parcel to exceed its saturation value.

no reference in lecture notes

- a. True
- b. False

(20) It is possible for the temperature of a liquid water droplet in the atmosphere to drop below 32°F (0°C) while remaining in liquid form.

LP #5, slide #42

- a. True
- b. False

(21) \*\* Cloudy skies and precipitation are most likely observed in \_\_\_\_\_ pressure systems at the surface. Use the factors addressed in Questions (9)-(19) to support your response. LP #8, slides #49-55, 71

- a. high
- b. low
- c. it depends on whether we're in the Northern or Southern Hemisphere

Supporting arguments LP #8, slides #49-55, 71

(22) The coldest summer surface water temperatures along the west coast of the United States are found along the coast of \_\_\_\_\_ and are due to \_\_\_\_\_. LP #7, slides #53-54

- a. California, horizontal ocean circulations
- b. California, upwelling
- c. Washington, horizontal ocean circulations
- d. Washington, upwelling

(23) During a “normal” non-El Niño year, the (trade) winds circulate about the subtropical \_\_\_\_\_ pressure system at the surface off the west coast of Peru, causing surface waters to move offshore and \_\_\_\_\_ to replace the displaced surface water with much colder, nutrient rich water. These near-shore ocean conditions support a healthy anchovy population. LP #7, slides #37-39, 53-57

- a. high, horizontal ocean circulations
- b. high, upwelling
- c. low, horizontal ocean circulations
- d. low, upwelling

(24) \*\*Hypothesize the chain of events leading to a key observed departure from normal of a tropical Pacific Ocean surface temperature condition when an El Niño starts to assert itself in the late winter season of the Southern Hemisphere. As a starting point, define the “observed departure from normal of a tropical Pacific Ocean surface temperature condition” and where geographically this departure is observed using satellite observations of sea surface temperature. LP #7, slides #37-39, 53-57

(25) Atmospheric teleconnections, defined as “linkages between climate anomalies at some distance from each other,” during a strong El Niño episode generally implies that the southeastern United States will experience much \_\_\_\_\_ than normal \_\_\_\_\_ during the corresponding winter season. LP #7, slides #59 & 61

- a. higher, precipitation
- b. higher, temperatures
- c. lower, precipitation
- d. lower, temperatures