# Pre-Post Questionnaire for Weather and Climate

The purpose of the following questionnaire is to help your professors improve their courses and teaching methods.

It is designed to measure change in student knowledge and understanding of concepts that is a result of attending the course. You will therefore take the same test prior to and after the course of study.

You will remain anonymous, but please provide the following information about yourself that will enable us to assess how student preparation and prior achievement influences learning.

Course attending: ……
Last four digits of student ID: ……

Undergrad: (circle one) Freshman, Sophomore, Junior, Senior
Major or proposed major ……

SAT score: (circle one)
Math:200-300, 310-400, 410-500, 510-600, 610-700, 710-800
Verbal:200-300, 310-400, 410-500, 510-600, 610-700, 710-800

ACT score: (circle one)
Math:5-8, 9-12, 13-16, 17-20, 21-24, 25-28, 29-32, 33-36
English:5-8, 9-12, 13-16, 17-20, 21-24, 25-28, 29-32, 33-36
Science:5-8, 9-12, 13-16, 17-20, 21-24, 25-28, 29-32, 33-36

Grad: research area ……
GRE score:
Analytical:
Verbal:

Gender: Male or Female?

Please answer all questions.

There are four possible answers to each question. In some cases you may not find an answer that totally agrees with your understanding. If this is the case, choose what you regard as 'the best'.

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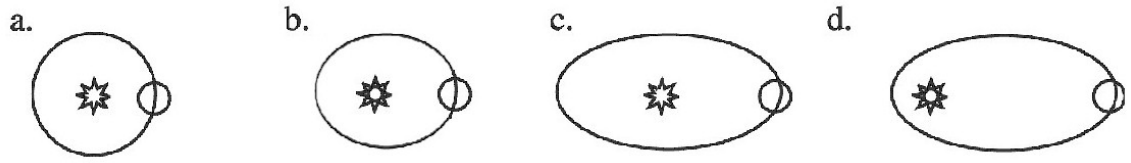
1. Which of the following diagrams most accurately represents the shape of the earth's orbit around the sun looking 'down' on the solar system?




2. On a spherical earth, one degree of latitude would have a length equal to one degree of longitude:

(a) at all points on the globe
(b) at the poles
(c) at the equator
(d) nowhere on the globe

3. Areas in the middle of large continents typically have more extreme seasonal differences in temperature compared to areas near the coast because:

(a) there are generally more clouds near the coast
(b) land-locked areas are usually at lower elevation than coastal areas
(c) coastlines are usually surrounded by mountains that block air masses
(d) temperatures of the coastal ocean change more slowly than those of the adjacent land

4. It is generally colder on the top of a mountain than at sea level because:

(a) solar radiation is reflected by the snow
(b) mountains receive the same amount of solar radiation but at higher altitudes
(c) decreasing pressure at higher altitudes cools rising warm air
(d) mountains are insulated from space by a thinner atmospheric layer

5. A degree of earth latitude is a distance of about:
(a) 1km
(b) 10km
(c) 100km
(d) 1000km

6. ‘Greenhouse’ gases contribute to global warming because they:
(a) trap visible and ultra-violet light from the sun
(b) increase the amount of warm moisture in the air
(c) trap infrared radiation emitted from the earth
(d) increase pollution and therefore create heat-trapping smog near the ground

7. Which answer best explains why it is hotter in the summer than in the winter?:

(a) earth is closer to the sun in summer than winter
(b) the sun burns more brightly in summer than in winter
(c) the earth’s spin axis is tilted toward the sun in summer
(d) the hemisphere experiencing summer is closer to the sun than in the winter

8. It is typically warmer in the tropics than over the pole because:

(a) there is lots of heat-trapping water vapor in the tropics
(b) the tropics are nearer to the sun than the pole
(c) vast tropical oceans absorb solar radiation and release it to the atmosphere
(d) the incoming radiation per unit area is greater at the equator than at the pole

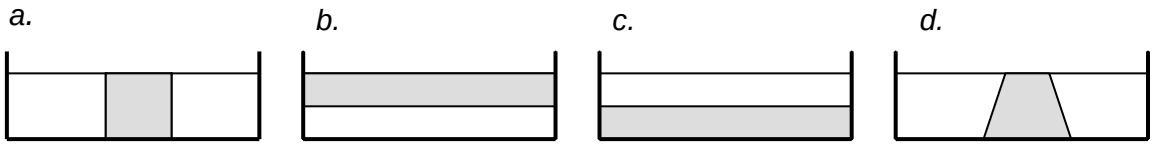
9. A typical difference in air temperature at the surface of the earth between the equator and the pole is:

(a) 1 degree Celsius
(b) 3 degrees Celsius
(c) 30 degrees Celsius
(d) 100 degrees Celsius

10. Cloud is formed:

(a) when air flows on the down-slope of an obstacle (such as a hill or mountain) increasing its pressure and causing it to warm, releasing moisture and forming cloud.
(b) when air is warmed by the sun causing it to release moisture which therefore condenses as cloud
(c) only during intense storms, hurricanes and tornadoes
(d) when moist air rises, cools and its water vapor condenses out to form water droplets

11. A cylinder of dyed, dense water (shaded gray in the diagram below) is suddenly released in to a tank of resting, lighter fluid (white in the diagram). The two fluids are immiscible. Which of the following diagrams best illustrates the state of affairs after equilibrium has been established?




12. How will a buoyant air parcel saturated with water vapor behave in relation to a dry air parcel of the same buoyancy?

(a) It will not rise as high because of the added weight of water.
(b) It will not rise as high because the specific heat of water vapor absorbs the heat of the air as it rises, reducing its buoyancy.
(c) It will rise higher because latent heat contained within the water vapor is released in the formation of rain, giving the parcel buoyancy.
(d) It will rise higher because it is saturated with water vapor, imbuing it with more momentum, which will carry it higher than a dry air parcel.

13. Which statement about global-scale winds is most true?

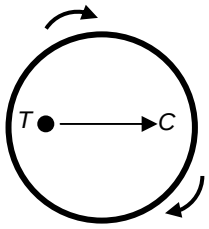
Winds are

(a) largest in the horizontal plane
(b) largest in the vertical plane
(c) largest parallel to lines of latitude
(d) of a similar magnitude in all directions

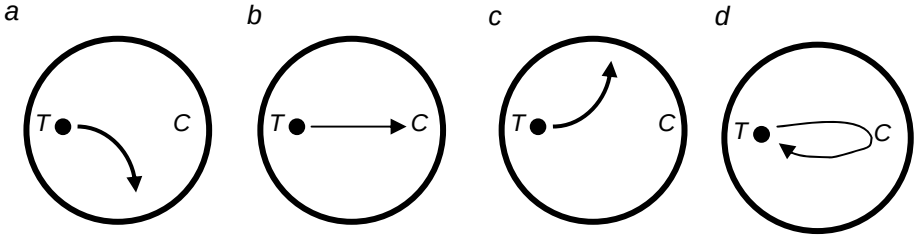
14. What are the two main ‘ingredients’ that create weather systems?:

(a) earth rotation and pole-equator temperature gradient
(b) land-sea contrast and solar heating
(c) evaporation and precipitation
(d) earth rotation and seasonal heating and cooling.

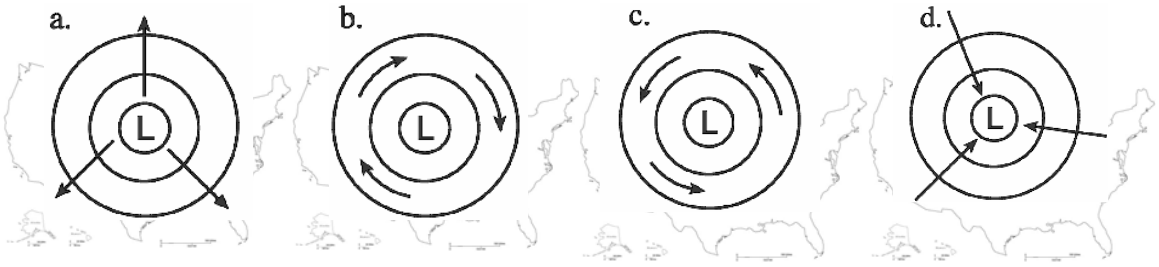
15. Two people are on a table which is turning clockwise. One (T in the diagram) throws a ball along a straight line, toward the other (C in the diagram). Before the ball gets to C the turntable has rotated a quarter turn.



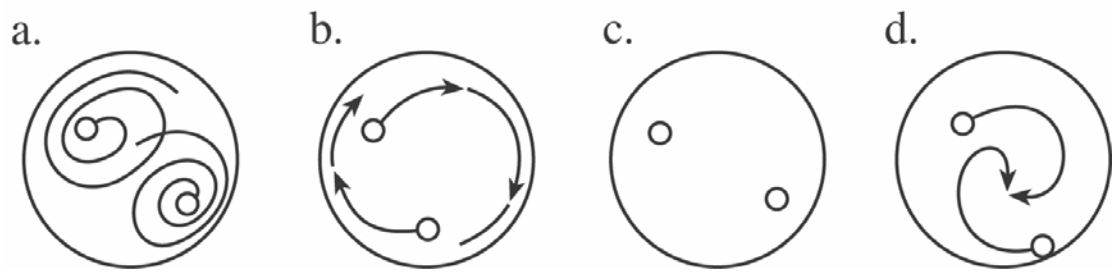

Which of the following diagrams best describes the trajectory of the ball, as seen from the people on the turntable?




16. Which of the following diagrams most accurately represents the sense of circulation around a low pressure system in the northern hemisphere?



17. A tank is placed on a turntable rotating anticlockwise, filled with water and left until it settles down. Two blobs of dye are introduced, without disturbing the fluid. Which of the following diagrams most accurately represents the subsequent evolution of the dye patches as viewed from a camera co-rotating with the rotating table?

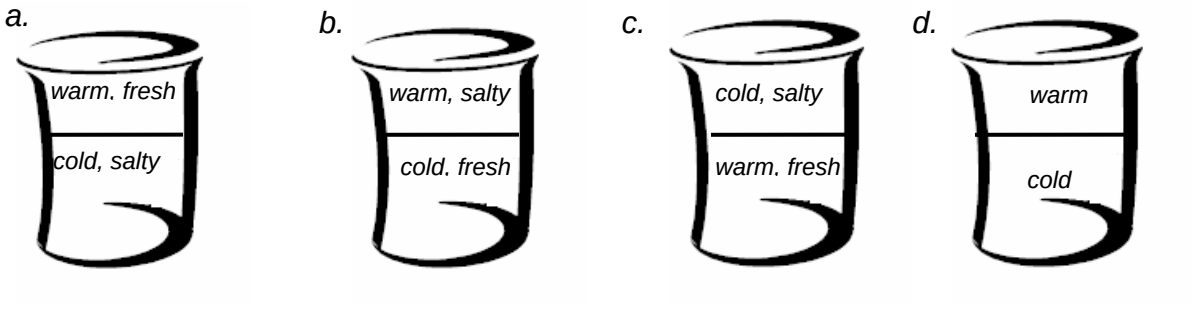



18. Which statement about global-scale winds is most true?

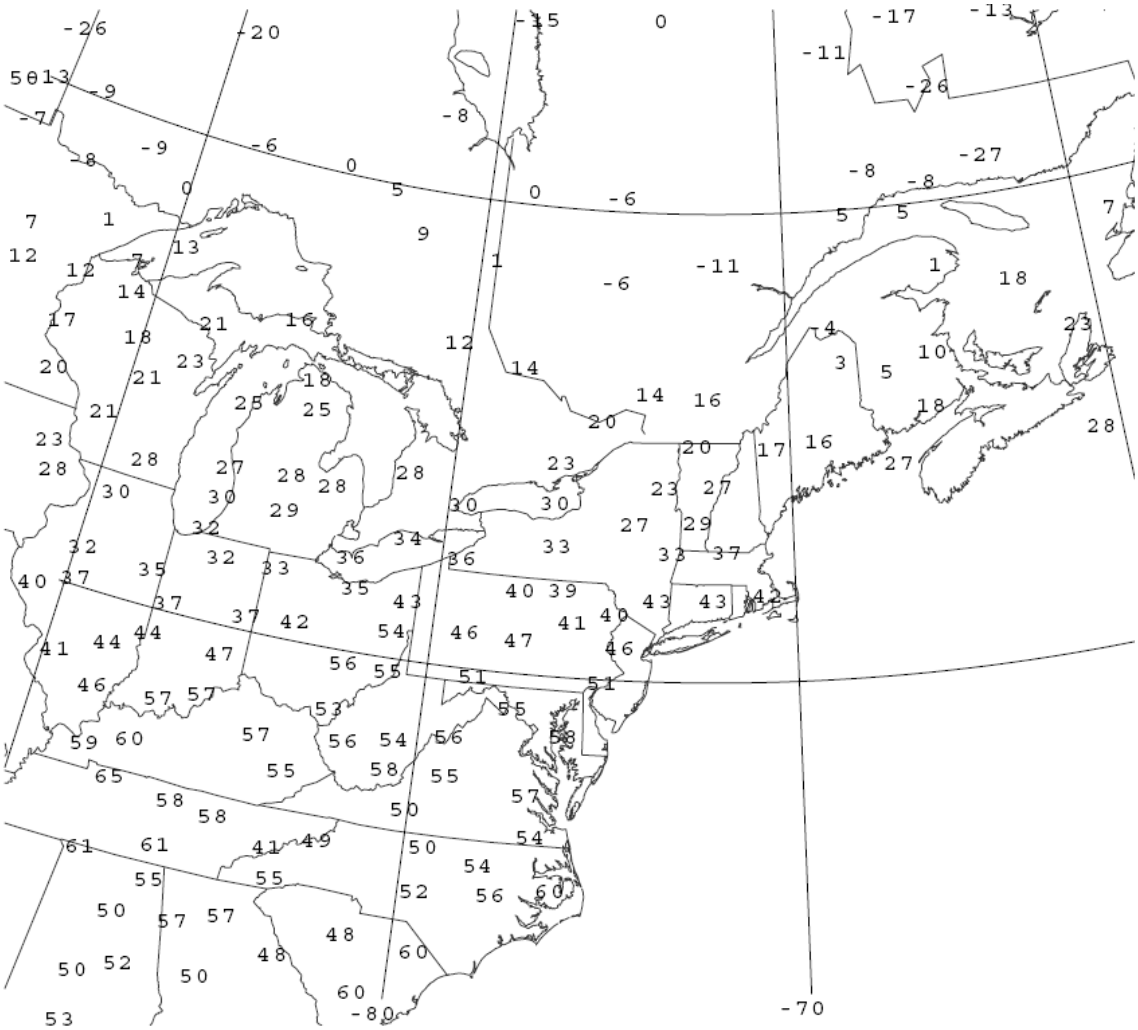
Winds over the Unites States generally blow:

(a) from east to west
(b) from west to east
(c) from south to north
(d) vertically

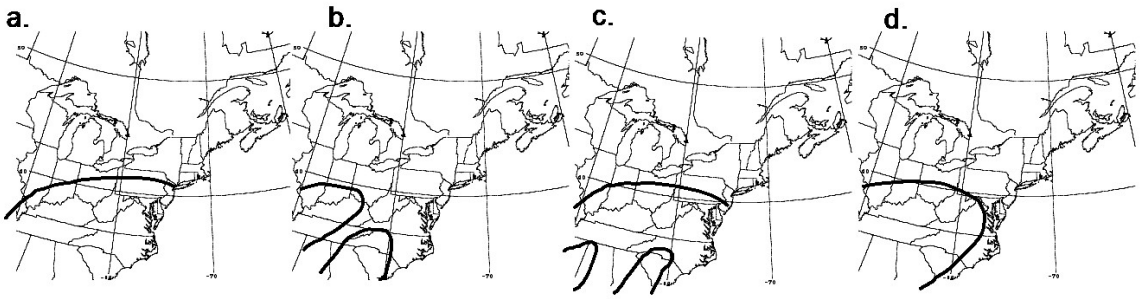
19. Warm water is less dense than cold water: fresh water is less dense than salty water. Which of the following arrangements of fluid in a laboratory beaker will definitely overturn due to the action of gravity?



20. The map below shows surface observations of temperature (in degree Fahrenheit) over the eastern United States.



Which of the following arrangement of lines best depicts the position of the 50 degree Fahrenheit isotherm (contour of constant temperature)?



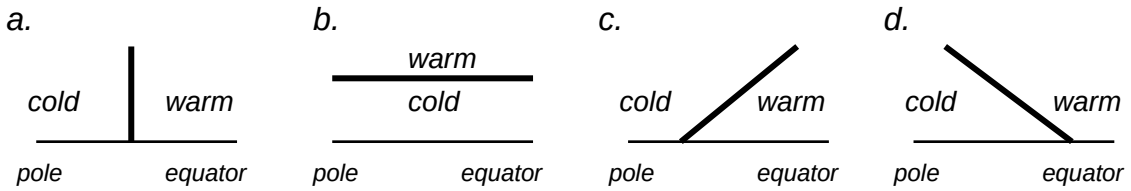
21. How does a horticultural greenhouse work?

(a) by trapping air inside which is warmed by the sun
(b) its glass window panes capture the sun's rays which re-radiate energy, warming the inside
(c) the glass panes reflect outgoing long-wave radiation back in to the interior space
(d) the main source of heat are heating elements inside the greenhouse.

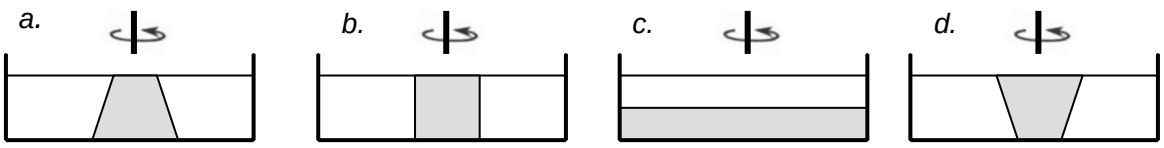
22. Pressure generally increases on moving down through the atmosphere toward the surface of the earth because:

(a) there is increasingly greater weight of air above
(b) the air is closer to the center of the earth
(c) gravity increases in strength as the center of the earth is approached
(d) the air becomes more dense and hence has greater pressure.

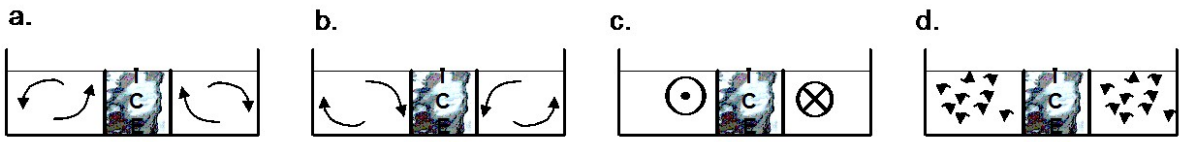
23. When cold air from the pole meets warm air from the tropics, the boundary between the two air masses looks most like:




24. A tank of water is placed on a rotating platform and left until it becomes still in the rotating frame of reference. A cylinder of dyed, heavier fluid (shaded gray in the diagram below) is then suddenly released in to the water in the rotating tank (shaded white). The two fluids are immiscible. Which of the following diagrams best illustrates the state of affairs after equilibrium has been established?



25. A can of iced water is gently placed in the middle of a tank of still water at room temperature and left for 5 minutes. Which of the following diagrams best describes the circulation that develops?




26. Roughly how long does it take for a hot-air balloon carried along by the atmospheric jet-stream to circumnavigate the globe?:

(a) 1 day
(b) 10 days
(c) 3 months
(d) 1 year

27. Imagine that we lived on a planet that had the shape of a rotating, tilted cylinder, as sketched below, circling the sun. No-one lived on the top or bottom, however.

Which of the following statements is most true?

In such a world:

(a) there would be no seasons
(b) the seasons would be the same at each latitude
(c) we would live in total darkness for 6 months and perpetual light for 6 months of the year
(d) those parts of the cylinder closest to the sun would be hottest.