

## 2014–15 8<sup>TH</sup> EARTH SCIENCE SEMESTER ONE FINAL

8<sup>th</sup> grade Earth Science Teachers:

*This Semester One Final is new. Please study it carefully before you begin teaching this year so you can properly prepare your students. They must complete a number of Catastrophic Events labs before they take the Final in January (see the Hands-on Section of Pacing Chart, p. 13). They must also move through the NGSS Core Ideas Section of the Pacing Chart for September through January (see p.17 of the Pacing Chart) before taking the Final in January .*

*This Final includes Multiple Choice (45 points) and Short Answer (25 points) for a total of 70 points. Part of the Short Answer includes a Demonstration you must do for the class. That Demonstration is explained on pages 103-105 of your Catastrophic Events Teacher's Edition.*

*Please let me know if you find errors of any kind on the Final so I can pass that information around to all the 8<sup>th</sup> grade teachers.*

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## Multiple Choice

Identify the choice that best completes the statement or answers the question. One point for each correct answer.

1. What might cause scientists to change a scientific theory?
  - a. Some people might disagree with it
  - b. It covers too broad of a topic
  - c. New evidence contradicts it
  - d. It is too old
2. During an experiment, which factors must be controlled so that researchers can draw a logical conclusion from the experiment?
  - a. variables
  - b. hypothesis
  - c. inquires
  - d. theories
3. A well-tested explanation for a wide range of observations or experimental results is called a scientific \_\_\_\_\_
  - a. Inquiry
  - b. hypothesis
  - c. theory
  - d. law
4. How do the major earth systems (geosphere, atmosphere, hydrosphere and biosphere) relate to each other?
  - a. the major systems of the Earth are separate entities and do not interact with each other.
  - b. the major systems of the Earth are always interacting with each other. They affect each other because they are interconnected.
  - c. what happens in the biosphere affects the atmosphere but not the other spheres
  - d. the Earth's major systems were interconnected and affected each other only in the past
5. Earth scientists must use \_\_\_\_\_ to describe their theories about parts of the earth they cannot directly observe or test, like the core.
  - a. models
  - c. textbooks

b. laws

d. photographs

6. Matter like the elements carbon and nitrogen move through the earth systems in

a. packets

c. systems

b. cycles

d. seasons

7. What is constantly flowing from one earth system to another?

a. fossils

c. air

b. geology

d. energy

8. Warmer air is less dense than colder air so it rises. The colder air sinks down. These movements of air in our atmosphere are called

a. convection currents

c. relative humidity

b. atmospheric pressure

d. frontal boundaries

9. The main source of heat energy required to produce severe weather on earth is

a. radioactive heat from the earth's core

c. automobiles and factories

b. electromagnetic energy from the sun

d. thermal energy from volcanoes

10. Heat is transferred all around the Earth and helps to produce weather by the processes of

a. conduction, convection, and radiation

c. global warming

b. nuclear fission and fusion

d. plate tectonics

11. Air in some places above the earth is warmer than air in other places because of

a. nuclear fusion in the sun's core

c. convection currents in the earth's mantle

b. radioactive decay in the earth's core

d. uneven heating of the earth from the sun

12. A place where two great air masses of different temperatures meet may cause severe weather. This area is called

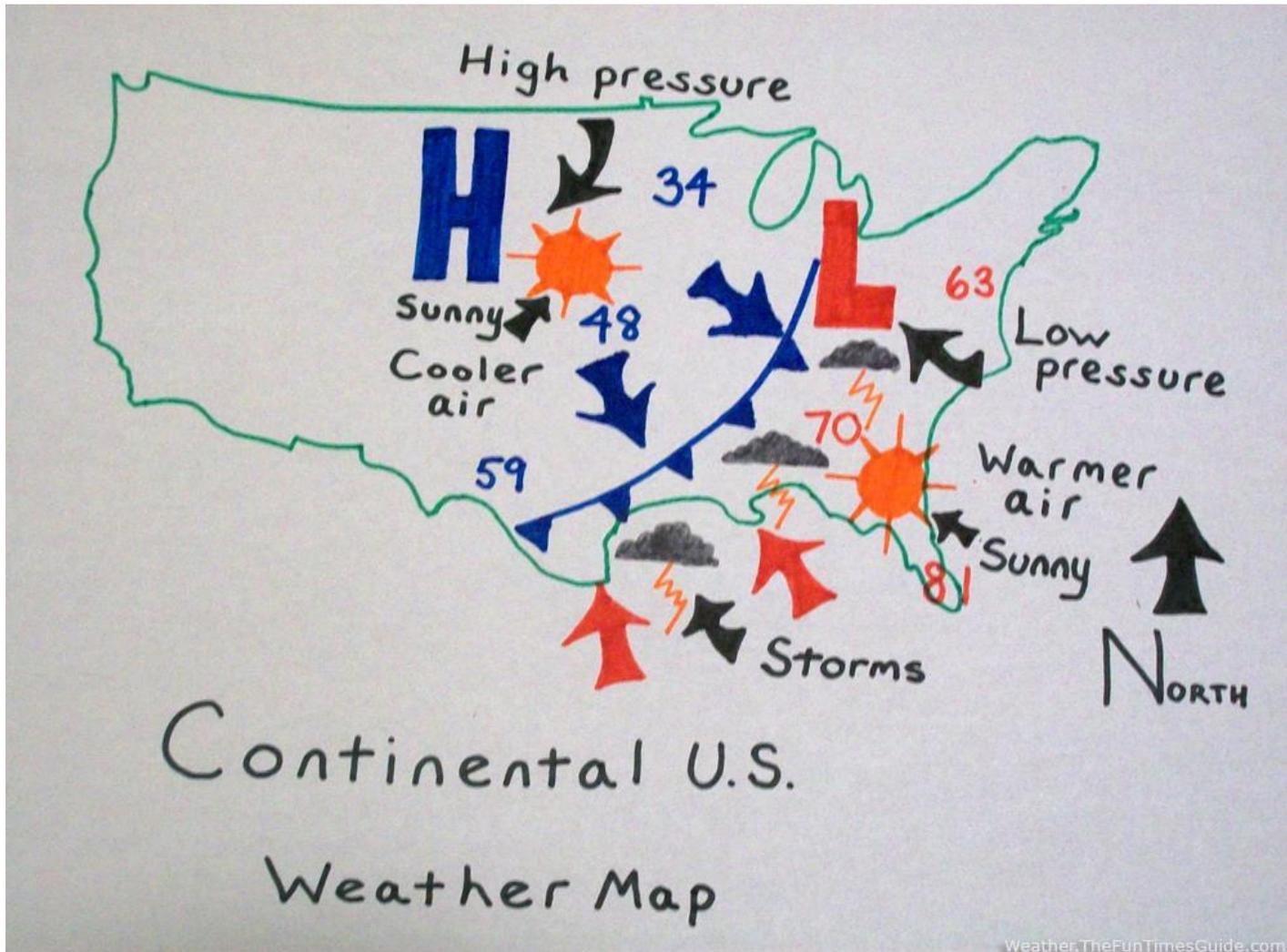
a. adiabatic heating

c. a line of precipitation

b. a convection current

d. a frontal boundary

13. Look at the model below. What does the line with the teeth represent?



- a. a warm front
- b. high humidity
- c. a cold front
- d. an occluded front

14. Evidence seems to indicate that our planet is undergoing a period of

- a. catastrophic events
- b. glacial formation
- c. mass extinctions
- d. global climate change

15. Volcanic eruptions, changes in sunlight, meteorite impacts, and ice age cycles are some of the \_\_\_\_\_ that could be affecting global temperature changes.

- a. natural mechanisms
- b. human inventions
- c. unnatural mechanisms
- d. pollution sources

16. \_\_\_\_\_ is a natural mechanism which traps heat around the earth, making life possible.

- a. Convection
- b. Climate change
- c. The greenhouse effect
- d. Adiabatic heating

17. Why have scientists collected lots of weather data for hundreds of years to build climate change models?

- a. climate change models never change
- b. models can help scientists make predictions
- c. more data make models less accurate
- d. to prove that climate never changes

18. Oceans interact greatly with the atmosphere. They trade heat energy back and forth and spread it nicely all around the earth. Heat moves from the oceans to the atmosphere through the process of

- a. evaporation
- b. condensation
- c. precipitation
- d. increasing salinity

19. Because oceans retain (hold) a lot of heat, they are called great \_\_\_\_\_ of thermal energy.

- a. wasters
- b. producers
- c. reservoirs
- d. sources

20. Huge areas of the ocean move like rivers in very predictable patterns. These great rivers of water carry lots of heat and actually warm the lands nearby. They are called ocean

- a. hotspots
- b. ridges
- c. reservoirs
- d. currents

21. Choose two factors that can make water denser, so that it sinks down and pushes warmer water up:

- a. more pollution and higher temperature
- b. colder temperature and more salinity
- c. less salinity and higher temperature
- d. warmer temperature and less pressure

22. Fossil fuels are derived from plants and animals of the past. They are also:

- a. nonrenewable and limited in availability
- b. locked up inside the earth and unavailable
- c. unlimited resources
- d. a never-ending supply of gasoline and natural gas

23. Elements (matter) and energy move through earth's systems (biosphere, hydrosphere, geosphere, atmosphere). How do the matter and energy move from system to system?
- a. at a pace of about every ten years
  - b. in cycles that repeat over and over again
  - c. Only during catastrophic events
  - d. at the same rate all over the earth
24. Geologists believe that non-renewable natural resources such as coal and oil
- a. are a never-ending source of energy
  - b. will eventually run out
  - c. can be replaced at a rapid rate
  - d. are the only sources worth developing
25. Which of the following does not keep moving around the earth's systems?
- a. fresh water
  - b. volcanic activity
  - c. Carbon dioxide
  - d. energy
26. The quality and purity of Earth's water systems are most greatly affected by:
- a. earthquakes
  - b. commercial fishing
  - c. land use decisions
  - d. night and day
27. Water evaporates from the ocean (hydrosphere) into the atmosphere where it condenses into clouds. From the clouds the rain pours down upon the geosphere. Some of it runs-off over the land into streams, rivers, lakes and oceans. But some of it infiltrates down through the soil and rock and stays underground to become
- a. gas and oil reserves
  - b. groundwater
  - c. saline water
  - d. coal
28. What two great forces provide the energy to move water through the earth's systems?
- a. catastrophic events and severe weather
  - b. heat from earth's core and earthquakes
  - c. wind and air pressure
  - d. sunlight and gravity
29. Lots of people use groundwater for drinking. What happens when too many wells are dug into one aquifer and more water is pumped up than rainfall can recharge?
- a. the impermeable rock dries up
  - b. The aquifer becomes unsustainable
  - c. the unsaturated zone grows smaller
  - d. the water table rises
30. Which of the following factors that affect our environmental resources can we do something about?

- a. natural environmental cycles
- b. human activity
- c. volcanic activity
- d. plate tectonics

31. In what ways are a hurricane and tornado alike?

- a. Both are usually around 650 km across.
- b. Both form over warm, tropical waters.
- c. Both contain winds that spiral very rapidly.
- d. The path of destruction for both is usually equal in diameter.

32. What is the main source of energy for weather on the earth?

- a. Precipitation
- b. Air
- c. Metals
- d. The sun

Read the four statements below:

*(1) Water evaporates from the earth's surface as it changes from a liquid to a gas.*

*(2) Water vapor rises with rising, warm air.*

*(3) At higher altitudes, where temperatures are cool, vapor (along with dust particles) condenses into droplets of water that form clouds.*

*(4) Low-pressure conditions also help clouds form.*

33. Which of the above statements describe parts of the water cycle and how clouds form?

Choose the letter of the best answer below the statements:

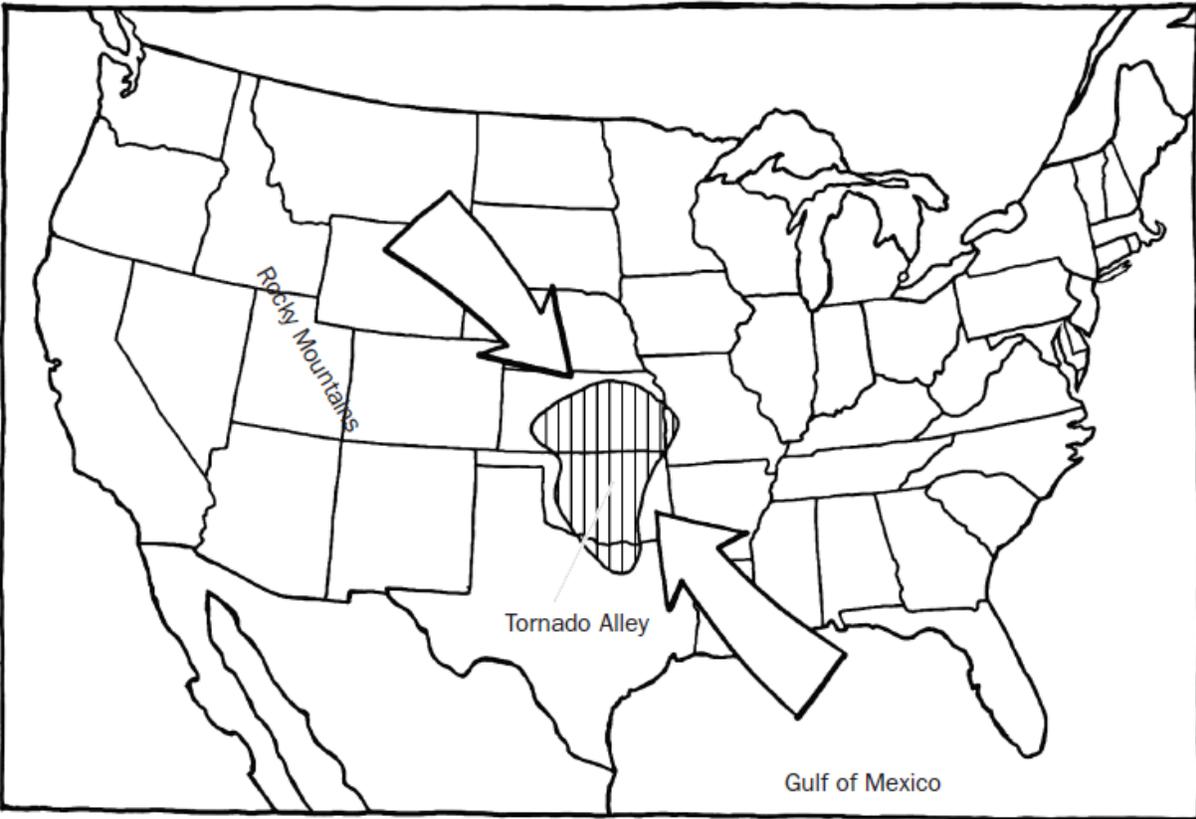
- a. 1 and 2
- b. 1 and 3
- c. 1, 2, and 4
- d. All four statements are true.

34. Which term describes a circulation of air or water that forms from uneven heating?

- a. Convection current
- b. Conduction current
- c. Radiation current
- d. Emission current

35. Which statement describes an event that may cause a tornado to develop?
- Air in a low-pressure system rises above warm water.
  - Two air masses of sharply different temperature and humidity meet
  - Tropical sea air sweeps in to replace the rising air, causing condensation.
  - None of the above.
36. Every few years the waters in the eastern Pacific Ocean become warmer. This event changes weather patterns worldwide, causing droughts, floods, blizzards, hurricanes, and tornadoes. What is the name of this event?
- Willy Willy
  - Tiros I
  - El Niño
  - Typhoon
37. Which of the following are used to study and forecast most weather-related events?
- Doppler radar
  - Satellites and satellite images
  - Weather maps
  - All of the above
38. The Gulf Stream is warm ocean water that forms in the Gulf of Mexico, travels past Florida, and moves north along the East Coast of the United States. How does this warm current of water affect weather in Boston, Massachusetts, which is on the East Coast of the United States?
- It brings warmer temperatures to Boston.
  - It brings cooler temperatures to Boston.
  - It cools Boston only at night.
  - It cools Boston only during the day.

Look at the map showing Tornado Alley.



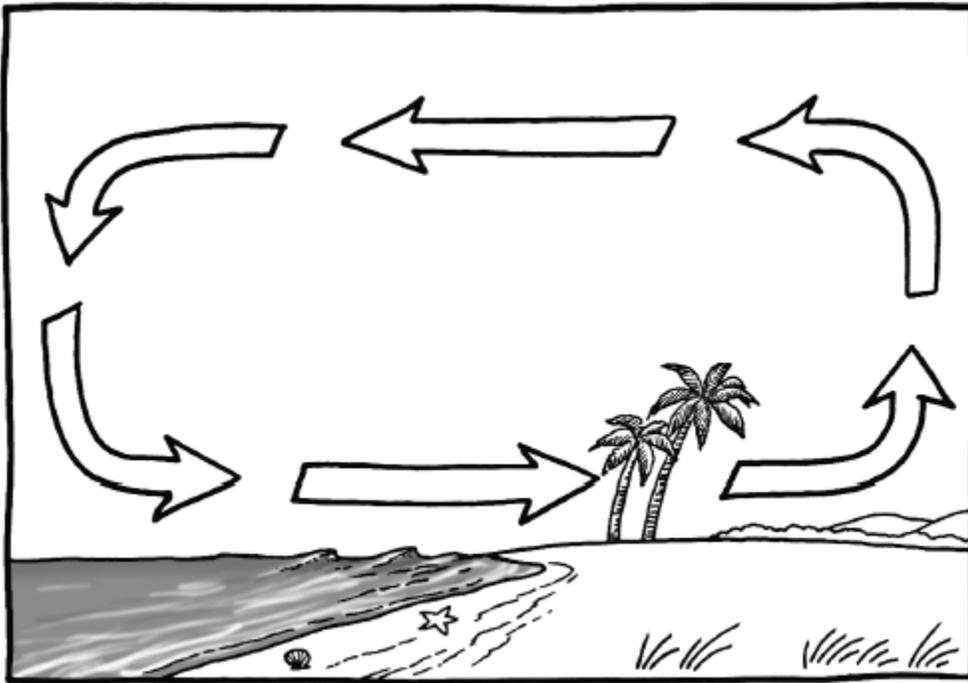
39. Use the map to decide which states are most affected by tornadoes and make up portions of Tornado Alley:

- a. Rhode Island, Massachusetts, Connecticut, New York
- b. Georgia, Alabama, North Carolina, South Carolina
- c. Texas, Oklahoma, Kansas, Missouri
- d. California, Alaska, Washington

40. Why do more tornadoes form in Tornado Alley than any other place on the earth?

- a. Tornado Alley is along the equator, and more tornadoes form along the equator.
- b. In Tornado Alley, warm, moist air masses from the south meet cool, dry air masses from the north more frequently than other places on the earth.
- c. In Tornado Alley, warm, moist air masses from the north meet cold, dry air masses from the south.
- d. In Tornado Alley, warm air from the ocean causes condensation.

Look at the illustration, which shows air movement along a beach during the early summer. Use the illustration to answer questions 41 and 42.



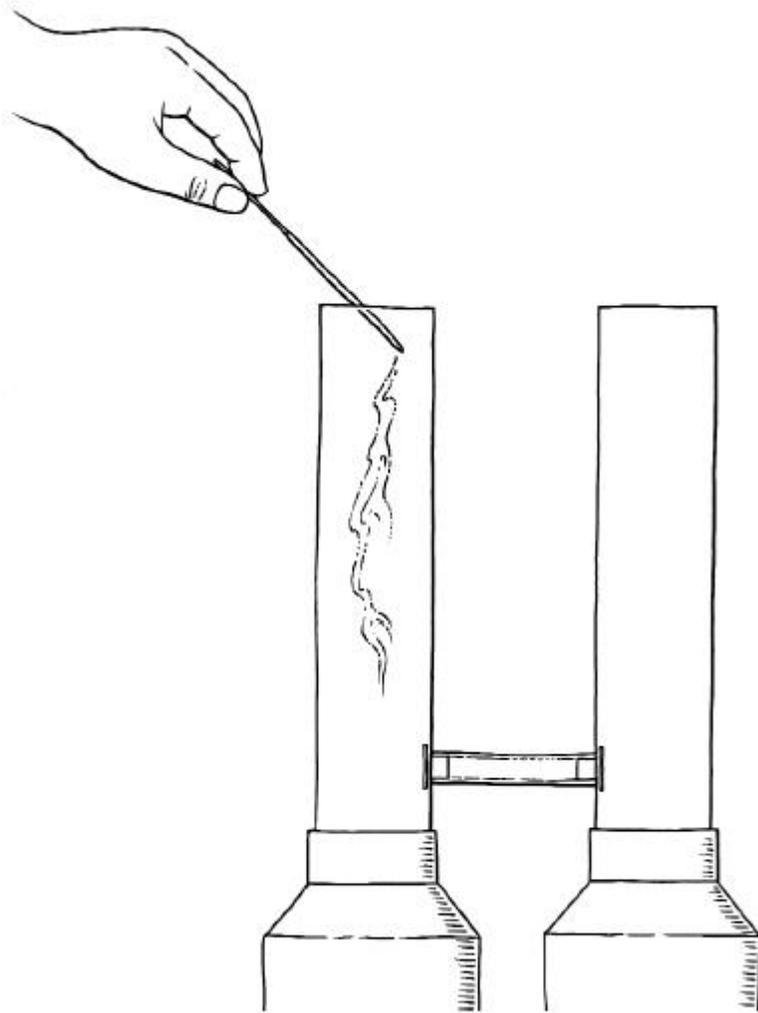
41. What type of wind pattern is shown in the diagram?

- a. Trade wind
- b. Sea breeze
- c. Land breeze
- d. Doldrums

42. Is it day or night? How do you know?

- a. It is day. Air is rising above the warm land. Land warms more quickly than ocean water when sunshine (electromagnetic radiation) hits it.
- b. It is night. At night the ocean water loses its heat more quickly than the land. Because the water is cooling so quickly, the air above it gets cooler and sinks down.
- c. It can be either day or night, because land is always warmer than water. Air always blows from the sea to the land.
- d. I cannot tell whether it is day or night because there is not enough evidence in the illustration.

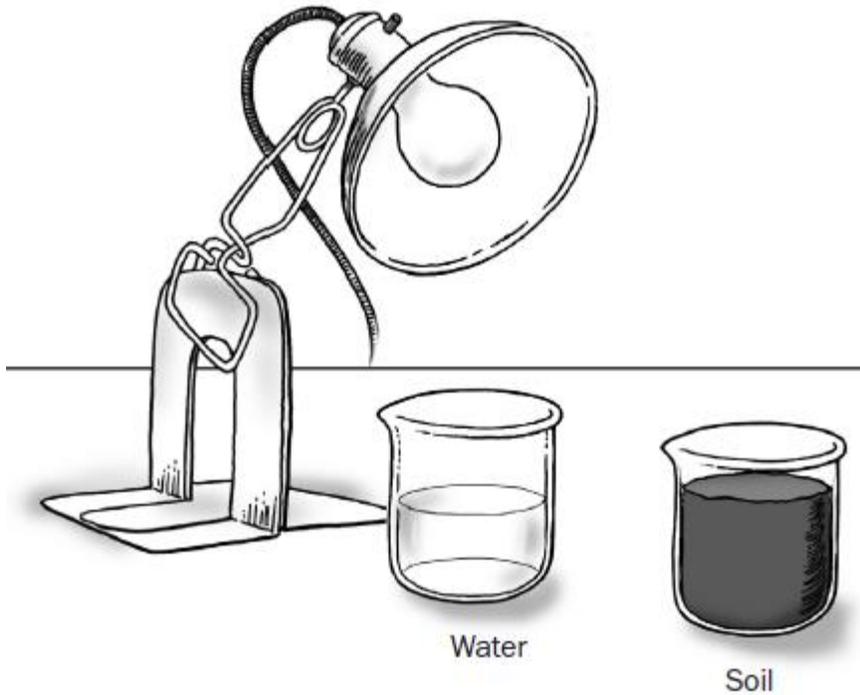
Use the illustration of the Convection Tubes to answer Question 43.



43. Tara connects two Convection Tubes. She adds smoke to one cylinder. The smoke immediately sinks to the bottom of the cylinder and moves into the second cylinder and then rises. Which of the following statements describes Tara's setup?

- a. She connected two cylinders with warm air. She added smoke at the top of one.
- b. She connected two cylinders with cold air. She added smoke at the top of one.
- c. She connected one cylinder with cold air to another with warm air. She added smoke at the top of the cold air cylinder.
- d. She connected one cylinder with warm air to another with cold air. She added smoke at the top of the warm air cylinder.

Use the illustration of the soil and water investigation to answer Question 44.

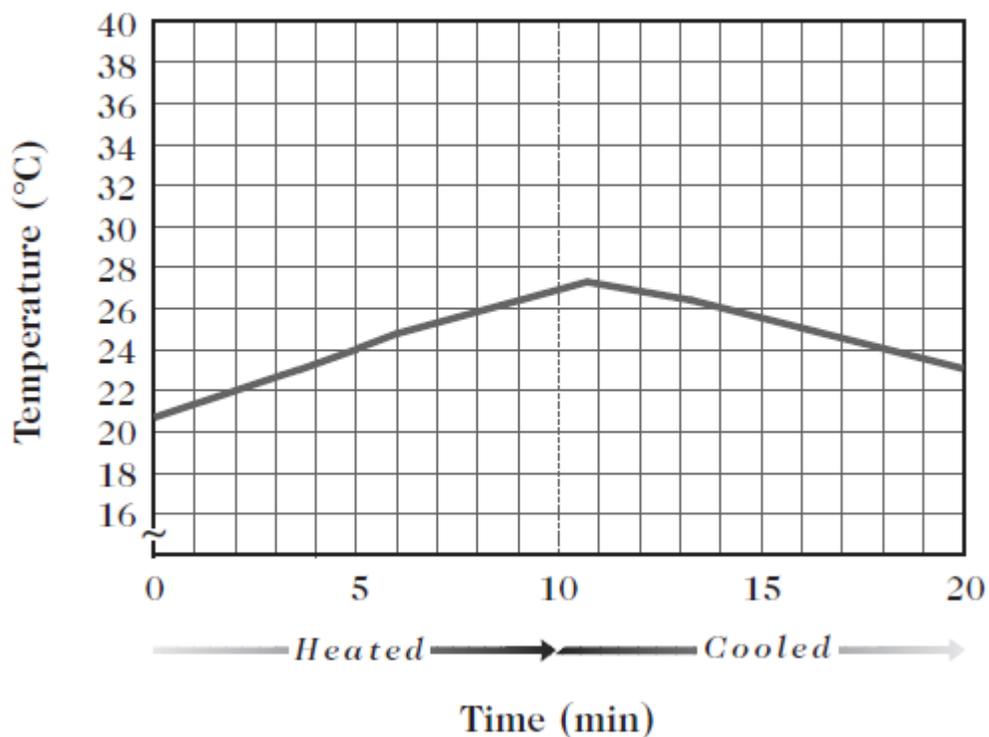


44. Study the above setup for an investigation in which soil and water are being heated. The question being investigated is: “What heats up faster when exposed to equal amounts of light, soil or water?” What changes would you make to the setup to make it a fair test?

- a. Put equal amounts of soil and water in each beaker.
- b. Place the beakers of soil and water equal distances from the lamp.
- c. The setup is correct.
- d. I would do both a and b.

Look at this graph a student created after gathering data from her heating and cooling investigation (see the setup picture above question 44). Use the graph to answer Question 45.

### Heating and Cooling Data



45. How long was the substance heated before it reached 24 °C?
- a. about 5 minutes
  - b. about 2 minutes
  - c. about 8 minutes
  - d. about 10 minutes

End of multiple choice. Stop using scantron sheet

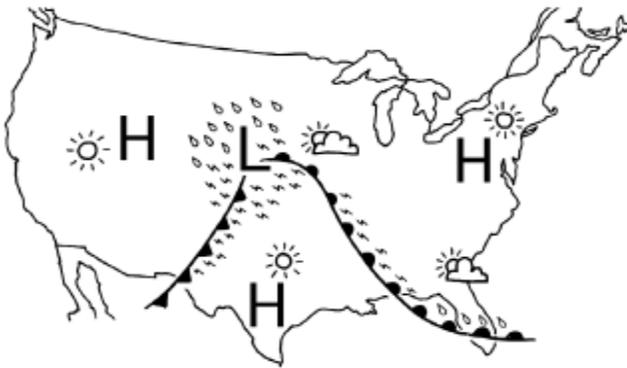
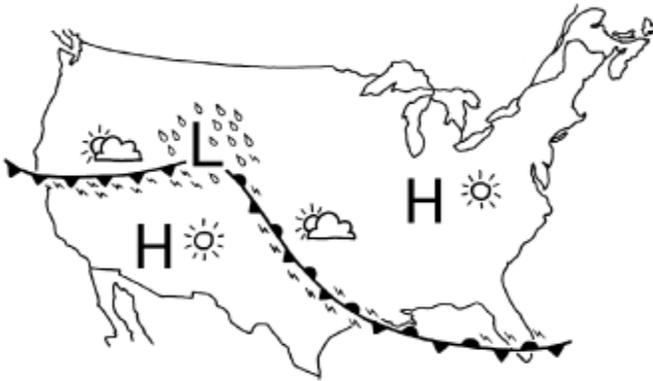
**Short answer. Use the response paper from your teacher.**

46. The graph above question 45 does not tell you which substance (soil or water) was being heated. It was heated for 10 minutes with the lamp on, and cooled for 10 minutes with the lamp off. On the basis of these data and the evidence you remember from your investigation, what type of substance (soil or water) do you think is shown on the graph? Choose an answer and **defend it.** (2 points)

- a. A liquid (such as water).
- b. A solid (such as soil or sand).
- c. It can be either a solid or a liquid.
- d. There are not enough data to draw any conclusions.

Go to next page for #47

Look at the maps below. Use them to answer #47:



47. You are a meteorologist for a local news station. The first map shows the weather conditions for Monday. The next two maps show the forecasted weather for Tuesday and Wednesday. Find the appropriate location of your city or state. Then write a weather forecast for your area that predicts what the weather will be like Tuesday and Wednesday. Use some or all of the words in the word bank (2 points):

**Word Bank:** *high-pressure low-pressure cold front warm front precipitation temperature forecast jet stream severe weather lightning*

After doing all of her Catastrophic Events experiments in Earth Science class this semester, Andrea makes this **claim**: “Ocean water and air behave alike when heat is added or removed.”

48. Do you agree with Andrea’s claim? What **evidence** have you observed from your Catastrophic Events labs that supports or rejects her claim? (2 points)

49. **REASONING:** With your evidence in mind, write a scientific principle (rule) that summarizes what always happens to fluids (air and water) when heat is added or removed. (2 points)

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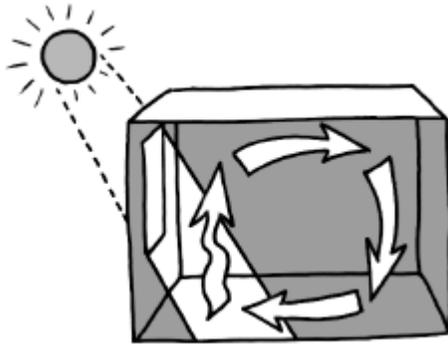
## **Demonstration** (TE 103-105)

**Directions:** Your teacher will hold a paper helix above a light source. Before she turns on the lamp make a prediction. What do you think will happen to the helix? After the lamp goes on, observe the helix, then answer these questions on your answer sheet:

50. Why do you think this happened? Describe what is happening to the **air** and **why**. (2 points)

51. What might happen to the helix if it were held near an opened freezer door? **Why?** (2 points)

Study the diagram of a room with sunshine streaming through the window.



52. If you held the paper helix near the closed window what would happen to the helix? Why do you think this would happen? Be very detailed in your answer. (2 points)

53. If you held the paper helix near the opposite wall, away from the window, what would happen to the helix? Why do you think this would happen? (2 points)

54. Back on questions 50 and 51, your teacher placed a paper helix over a lamp. Think about how the air above the lamp moved the paper helix. How does this movement of the helix relate to how tornadoes and hurricanes are formed? (2 points)

55. Why must scientists and engineers often use models when they study things? Why can't they always make observations and do experiments on the real thing? Give one example (2 points).

56.

*Oliver is an engineer who designed a new smart phone. He loaded it with lots of new technology and made it look good. After he finished building the first one he sent the plans to a factory for the manufacture (making) of ten thousand new smart phones for sale. But Oliver made a mistake. He ignored a core (important) engineering and science practice.*

*Oliver's 8<sup>th</sup> grade sister Jamie made the same mistake. Jamie set up an investigation (lab) to test whether soil or water heats up faster. She made sure all her variables were properly controlled and ran the experiment one time during her earth science class. Her results*

*supported her hypothesis that soil would heat faster. Jamie told her teacher, friends and even family members all about her evidence. She wrote this scientific principle: "Soil always heats up faster than water when equal amounts of light shine upon them." But Jamie failed to follow the same core (important) scientific and engineering practice that Oliver neglected. What core idea or practice did they ignore? (2 points)*

57. Heat energy is transferred around and through the earth systems three different ways. On your answer sheet name the three kinds of heat transfer. If you cannot remember the names, you may write a short definition to describe them instead (3 points):

- 1.
- 2.
- 3.

**End of Semester One Final (8<sup>th</sup> grade Earth Science)**