Multiple Choice [25]

1. When water vapor condenses, how much heat energy will be released into the atmosphere?
   (1) 2260 joules/gram  (2) 334 joules/gram  (3) 4.18 joules/gram  (4) 2.11 joules/gram

2. During which process does water gain the most heat energy?
   (1) condensation  (2) freezing  (3) evaporation  (4) melting

Base your answers to questions 3 and 4 on the diagram below, which shows air movement over a mountain range. The arrows indicate the direction of airflow. Points 1 through 3 represent locations on Earth’s surface.

3. Compared to the climate at location 1, the climate at location 3 is
   (1) cooler and drier  (2) cooler and wetter  (3) warmer and drier  (4) warmer and wetter

4. Cloud formation at location 2 is the direct result of air that is rising,
   (1) expanding, and cooling  (2) expanding, and warming  (3) compressing, and cooling  (4) compressing, and warming

5. Which change would cause a decrease in the amount of insolation absorbed at Earth’s surface?
   (1) a decrease in cloud cover  (3) an increase in the duration of daylight
   (2) a increase in cloud cover  (4) an increase in nitrogen gas

6. Which coastal location experiences a cooler summer climate due to ocean currents?
   (1) southeast coast of North America  (3) southwest coast of South America
   (2) northeast coast of Australia  (4) northwest coast of Europe

7. Which cold ocean current affects the climate of the northeastern coast of North America?
   (1) Gulf Stream  (2) Canaries  (3) Labrador  (4) North Atlantic
8. The arrows on the map below show the prevailing winds at a mid-latitude coastal city.

This city most likely has a climate that is
(1) arid, with a small difference between the highest and lowest yearly temperatures
(2) arid, with a large difference between the highest and lowest yearly temperatures
(3) humid, with a small difference between the highest and lowest yearly temperatures
(4) humid, with a large difference between the highest and lowest yearly temperatures

9. In which environment is the amount of transpiration usually the greatest?
Base your answers to questions 10 through 12 on the diagram below and on your knowledge of Earth science. The diagram represents four apparent paths of the Sun, labeled A, B, C, and D, observed in Jamestown, New York. The June 21 and December 21 sunrise and sunset positions are indicated. Letter S identifies the Sun’s position on path C at a specific time of day. Compass directions are indicated along the horizon.

10. The greatest duration of insolation in Jamestown occurs when the Sun appears to travel along path
(1) A  (2) B  (3) C  (4) D

11. At what time of day is the Sun at position S?
(1) 6 a.m.  (2) 9 a.m.  (3) 3 p.m.  (4) 6 p.m.

12. When the Sun appears to travel along path D at Jamestown, which latitude on Earth receives the most direct rays from the Sun?
(1) 42° N  (2) 23.5° N  (3) 0°  (4) 23.5° S

13. A decrease in areas covered in snow and ice leads to an increase in the absorption of insolation because exposed land surfaces are
(1) rougher and darker  (3) smoother and darker
(2) rougher and lighter  (4) smoother and lighter

14. The diagram below shows four surfaces of equal area that absorb insolation.

Which letter represents the surface that most likely absorbs the greatest amount of insolation?
(1) A  (2) B  (3) C  (4) D
15. Which type of land surface would probably reflect the most incoming solar radiation?
   (1) light colored and smooth       (3) dark colored and smooth
   (2) light colored and rough       (4) dark colored and rough

Base your answers to questions 16 through 19 on the diagram below, which shows a model of the water cycle. Letters A through F represent some processes of the water cycle. Letter X indicates the top of the underground zone that is saturated with water.

![The Water Cycle Diagram]

(Not drawn to scale)

16. Which process is represented by letter F?
   (1) capillarity   (2) infiltration   (3) condensation   (4) vaporization

17. What does letter X represent?
   (1) the water table   (2) a floodplain   (3) sea level   (4) impermeable rock

18. If the surface soil is saturated and precipitation increases, there will be
   (1) a decrease in the amount of groundwater   (3) an increase in the rate of capillarity
   (2) a decrease in the surface elevation of the lake   (4) an increase in the amount of runoff

19. The processes of transpiration and evaporation are represented by letters
   (1) A and B   (2) B and E   (3) C and A   (4) D and E

20. Which process in the water cycle is directly responsible for cloud formation?
   (1) condensation   (2) infiltration   (3) precipitation   (4) evaporation
21. During an El Niño event, surface water temperatures increase along the west coast of South America. Which weather changes are likely to occur in this region?
(1) decreased air temperature and decreased precipitation
(2) decreased air temperature and increased precipitation
(3) increased air temperature and increased precipitation
(4) increased air temperature and decreased precipitation

22. Two greenhouse gases that may be responsible for the increased ice melting in Greenland are
(1) nitrogen and oxygen
(2) oxygen and silicon
(3) hydrogen and helium
(4) carbon dioxide and methane

Base your answers to question 23 on the diagram below, which represents the greenhouse effect in which heat energy is trapped in Earth’s atmosphere.

23. Which type of radiation from Earth is the long-wave radiation absorbed by greenhouse gases?
(1) ultraviolet
(2) visible light
(3) infrared
(4) radio waves

24. In which diagram is the observer experiencing the greatest intensity of insolation?
25. The diagram below, which shows incoming solar radiation passing through the glass of a greenhouse and then striking the floor. What is the primary function of the clear glass of the greenhouse?

(1) The glass reduces the amount of insolation entering the greenhouse.

(2) The glass allows all wavelengths of radiation to enter and all wavelengths of radiation to escape.

(3) The glass allows short wavelengths of radiation to enter, but reduces the amount of long wavelength radiation that escapes.

(4) The glass allows long wavelengths of radiation to enter, but reduces the amount of short wavelength radiation that escapes.
Part II

Base your answers to questions 26 through 28 on the diagram below, which represents Earth’s water cycle. The arrows represent some water cycle processes. Letter A indicates a surface location on Earth.

26. Other than evaporation, which water cycle process transfers large amounts of water vapor into the atmosphere from the forest? [1]

27. Describe one surface condition change at location A that would decrease the rate of runoff. [1]

28. How many joules (J) of heat energy are released by each gram of water vapor that condenses to form cloud droplets? [1]
Base your answers to questions 29 through 32 on the table and map below. The table shows the duration of insolation, in hours, at Barrow, Alaska, on the twentieth day of each month during 2008. The map shows the location of Barrow at 71° N 156.5° W.

<table>
<thead>
<tr>
<th>Date</th>
<th>Duration of Insolation (h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 20</td>
<td>0</td>
</tr>
<tr>
<td>Feb 20</td>
<td>7.8</td>
</tr>
<tr>
<td>Mar 20</td>
<td>12.5</td>
</tr>
<tr>
<td>Apr 20</td>
<td>17.6</td>
</tr>
<tr>
<td>May 20</td>
<td>24</td>
</tr>
<tr>
<td>June 20</td>
<td>24</td>
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<td>July 20</td>
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<td>Aug 20</td>
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<td>Sept 20</td>
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<tr>
<td>Oct 20</td>
<td>7.8</td>
</tr>
<tr>
<td>Nov 20</td>
<td>0</td>
</tr>
<tr>
<td>Dec 20</td>
<td>0</td>
</tr>
</tbody>
</table>

29. On the grid below, construct a line graph by plotting the data for the duration of insolation at Barrow for each date shown on the data table. Connect the plots with a line. [1]
30. Explain why Barrow receives 0 hours of insolation on December 20. [1]

31. State the altitude of *Polaris* as seen from Barrow. [1]

32. On what date was the noontime Sun highest in the sky at Barrow? [1]
33. Explain why Reykjavik has cooler summers and warmer winters than Yakutsk. [1]

34. Describe one way the yearly precipitation in Yakutsk differs from that in Reykjavik. [1]

35. Identify one warm and one cool ocean current that affect the climate of Iceland. [1]
Answer Sheet

EARTH SCIENCE TEST
Weather & Atmosphere #2

Name: ____________________________________________ Date: _____________ Period: _______

Multiple Choice:

1.) _____ 14.) _____

2.) _____ 15.) _____

3.) _____ 16.) _____

4.) _____ 17.) _____

5.) _____ 18.) _____ 26.)

6.) _____ 19.) _____

7.) _____ 20.) _____

8.) _____ 21.) _____ 27.)

9.) _____ 22.) _____

10.) _____ 23.) _____

11.) _____ 24.) _____ 28.)

12.) _____ 25.) _____

13.) _____

Part I (25) = _______

Part II (10) = _______

Total (35) = _______

% = _______
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The test is available at my webpage on the NT school district website:

www.ntschools.org

Complete this test at home.

Print out and fill in the answer sheets (last 2 pages).
You do not have to print the entire test unless you prefer a hard copy.

Bring the completed answer sheets to class Tuesday, April 1, 2014.