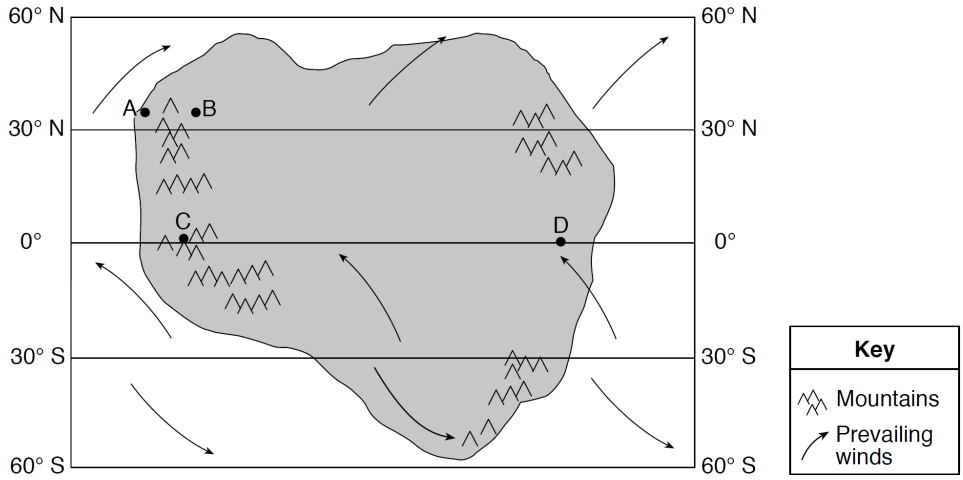
Atmospheric Variables
Free Response HW

Name

Base your answers to questions **1** through **3** on the map in your answer booklet and on your knowledge of Earth science. The map shows an imaginary continent on a planet that has climate conditions similar to Earth. The continent is surrounded by oceans. Points *A* through *D* represent locations on the continent.



1. Identify the primary factor that causes location *C* to have a colder climate than location *D*.

2. Compared to the average air temperature and the average moisture conditions at *A*, describe how the relative average air temperature and the relative average moisture conditions at *B* are different.

3. On the map, draw one curved arrow between 0° and 30° N to indicate the direction of prevailing planetary winds between these latitudes.

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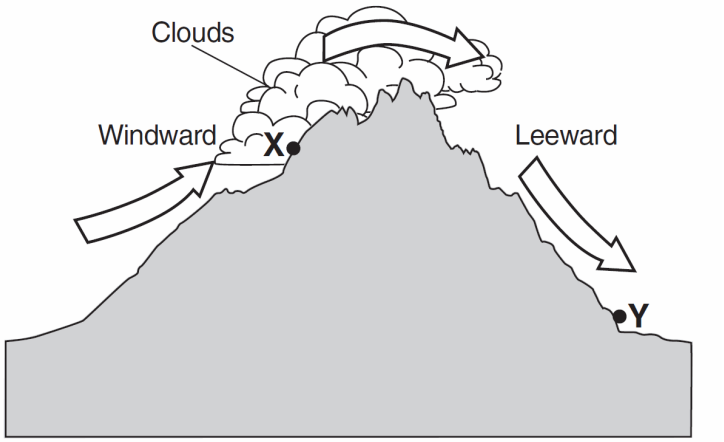
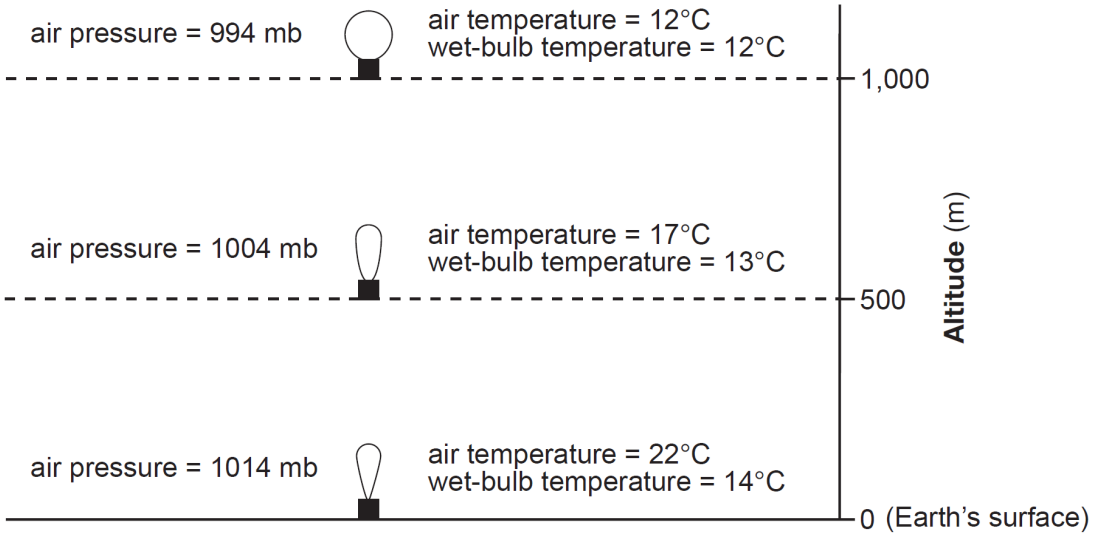
4. The cross section below represents the windward and leeward sides of a mountain range. Arrows show the movement of air over a mountain. Points *X* and *Y* represent locations on Earth's surface.



Describe how the air's temperature and water vapor content at point *X* is different from the air's temperature and water vapor content at point *Y*.

Base your answers to questions **5** through **7** on the diagram below and on your knowledge of Earth science. The diagram represents a weather balloon as it rises from Earth's surface to 1000 meters (m). The air temperature and wet-bulb temperature values in degrees Celsius (°C) and the air pressure values in millibars (mb) are given for three altitudes.



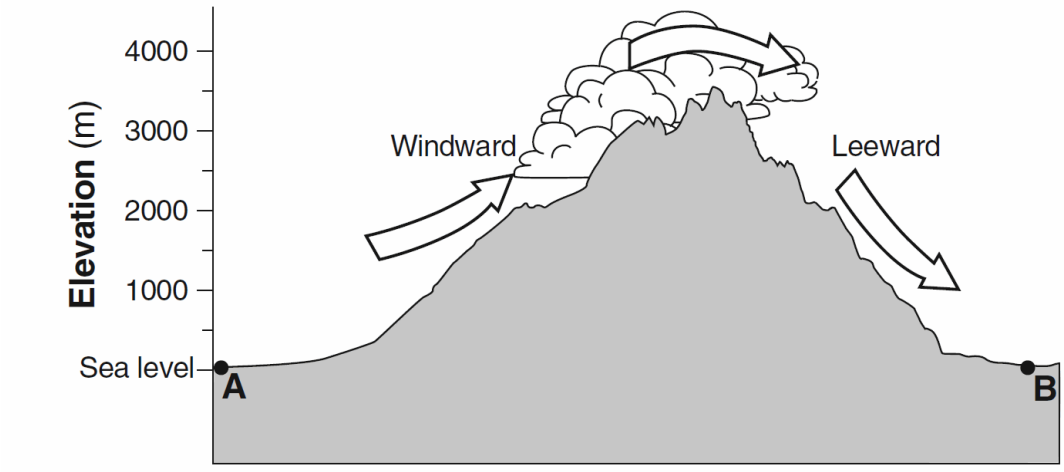
(Not drawn to scale)

5. A cloud is forming at 1000 meters. Identify the phase change that is occurring at 1000 meters to produce the cloud.

6. Determine the dewpoint and the relative humidity of the air at Earth's surface.

7. Identify the names of the instruments carried by the weather balloon that recorded the air pressure and air temperature.

Base your answers to questions **8** through **10** on the diagram below, which shows the windward and leeward sides of a mountain range. Arrows show the movement of air over a mountain. Points *A* and *B* represent locations at sea level on Earth's surface.

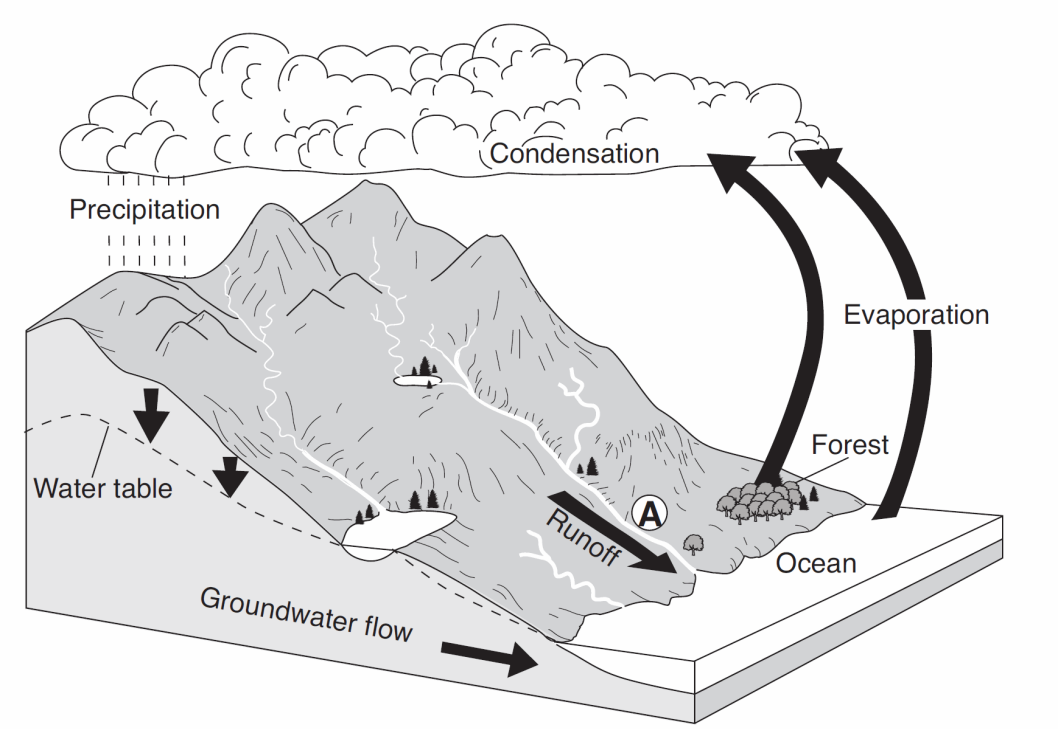


8. Identify *one* weather instrument that could be used to determine the dewpoint of the air at point *A*.

9. Explain why air cools as it rises up this mountain.

10. Compared to the temperature and relative humidity of the air at point *A*, describe how the temperature and relative humidity of the air are different as the air arrives at point *B*.

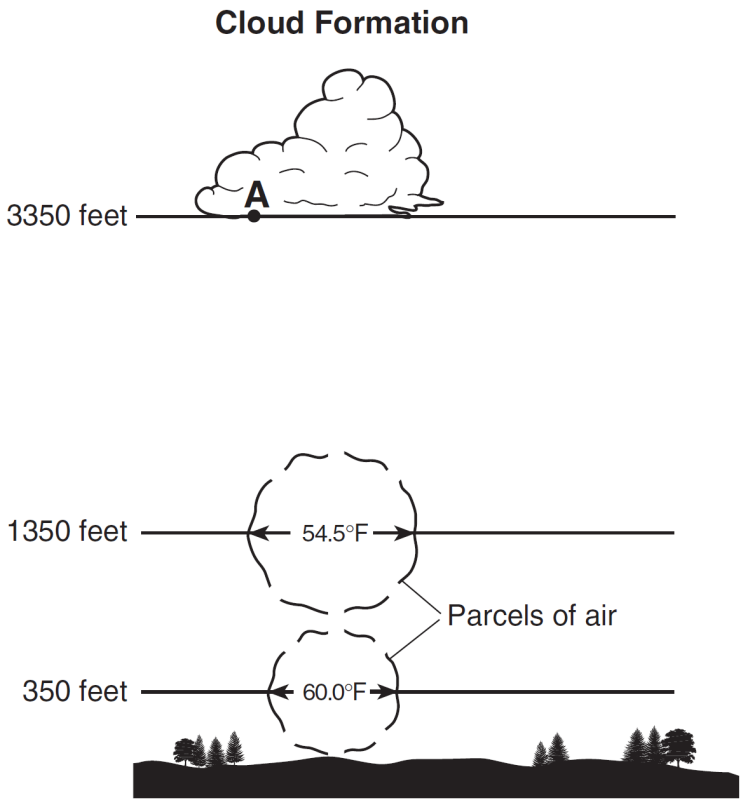
Base your answers to questions **11** and **12** on the diagram below, which represents Earth's water cycle. The arrows represent some water cycle processes. Letter *A* indicates a surface location on Earth.



11. How many joules (J) of heat energy are released by each gram of water vapor that condenses to form cloud droplets?

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

Base your answers to questions **13** through **15** on the diagram below, which shows the temperature change when a parcel of air warms, rises, and expands to form a cloud. Location *A* is at the base of the cloud.



13. State the relative humidity of the air at location *A*.

_____ %

14. Assume the cooling rate of the rising parcel of air is constant. Determine the temperature of the air parcel at the 3350-foot altitude. Express your answer to the *nearest tenth of a degree.*

_____ °F

15. Explain why the warmer air rises.