

## 1.2. FOUR CONDITIONS IN THE EARTH'S ATMOSPHERE CAUSE WEATHER

There is a saying: "If you don't like the weather, wait an hour." This refers to how quickly weather conditions can change. By its nature, weather changes constantly. The term "weather" describes the condition of the atmosphere for a short period of time in a specific area. Because the atmosphere changes constantly, the weather, too, changes constantly. Four variable conditions in the atmosphere affect an area's weather: temperature, moisture, atmospheric pressure, and wind.

**Temperature.** The earth receives its warmth from sunlight, or solar radiation. The process by which sunlight warms the earth is called insolation. Only about 48 per cent of all sunlight actually reaches the earth's surface. Gases in the atmosphere either absorb or reflect the rest back into space. Land and water absorb the sunlight that reaches the earth's surface and change it into heat energy. This heat energy radiates back into the atmosphere, where it warms the air. At night the earth and the air slowly cool.

**Moisture.** It is the second variable element of weather. The air in the lower atmosphere always contains some amount of moisture. However, air higher than 6.4 km above the earth's surface rarely contains moisture. The amount of moisture in the air is called humidity. Humidity can be measured in two ways: absolute humidity and relative humidity.

As a rule warm air can hold more moisture than cold air. When air contains all the moisture it can, it becomes saturated and has a relative

humidity of 100 per cent. If the saturated air cools, the extra moisture condenses to a liquid state, forming clouds and fog. When the drops of water condensing in cooling air become large enough, they form precipitation — rain, snow, sleet, or hail. Rain forms when condensation takes place at temperatures above  $0^{\circ}\text{C}$ . Snow, sleet, and hail form when condensation takes place below  $0^{\circ}\text{C}$ .

**Atmospheric pressure.** The third variable element of weather is atmospheric pressure, or the weight of the air. The standard pressure exerted by the atmosphere at sea level is 760 millibars. The distance above the earth's surface — altitude — has a major effect on atmospheric pressure. At high altitudes pressure is lower because the earth's gravity holds fewer gas molecules. Temperature ~~also~~ affects air pressure. Warm air weighs less and exerts less pressure than cool air. As the light, warm air rises, a low-pressure center forms below it. Cool air is denser than warm air and tends to sink, forming a high-pressure area. In general, low-pressure areas tend to have unstable weather with clouds, rain, and storms. High-pressure areas tend to have clear, calm weather.

**Wind.** When air moves from high-pressure areas to low-pressure areas we call it wind. The winds that flow continually between global pressure belts are called prevailing winds. Prevailing westerlies, trade winds and doldrums form part of the global circulation of the atmosphere. But it is only a very general scheme of the atmospheric circulation. The real situation is more complicated due to the influence of various factors. For example, unequal heating of land and sea greatly affects weather conditions and causes the seasonal winds, such as monsoons, and also many types of local winds.

One of these wind patterns is found along the coastlines of large water bodies. During the day, the wind often blows strongly from the cooler water toward the land. A breeze blowing from the sea may lower temperatures of the adjacent land up to  $6-7^{\circ}\text{C}$ . As the sun sets, the breeze dies down. During the night the pattern reverses itself. The cooler air over the land then blows toward the water.

1. What four atmospheric conditions cause weather?
2. What are the global pressure belts? How are they formed?
3. What are westerlies, trade winds and doldrums? Where do they occur?
4. How important are weather and climate to the business and industry of your region?

**2.6. Match each of the following terms with the correct definition.**

a) *deciduous*; b) *savanna*; c) *climate*; d) *continental influence*; e) *wind*;  
f) *atmospheric pressure*; g) *precipitation*; h) *condensation*; i) *weather*;  
j) *humidity*; k) *temperature*; l) *evaporation*

- \_\_\_\_\_ 1. Condition of the atmosphere for a short period of time.
- \_\_\_\_\_ 2. Process in which gaseous water vapor changes to a liquid.
- \_\_\_\_\_ 3. Moisture in the air.
- \_\_\_\_\_ 4. Condensation in the snow, sleet, or hail.
- \_\_\_\_\_ 5. Force exerted by the air.
- \_\_\_\_\_ 6. Movement that occurs when air flows from high-pressure to low-pressure areas.
- \_\_\_\_\_ 7. Average of daily weather conditions over a long period of time.
- \_\_\_\_\_ 8. Climatic effect on lands separated from the ocean by mountains or by hundreds of miles of land.
- \_\_\_\_\_ 9. Broadleaf trees that stop growing and shed their leaves when it gets cold or dry.
- \_\_\_\_\_ 10. Grassland found in tropical wet-and-dry climates.
- \_\_\_\_\_ 11. Measure of heat or cold.
- \_\_\_\_\_ 12. Change of water from its liquid form to gaseous water vapor.

### 3. Translation into Russian

1. The atmosphere is made up of gases. The two that are of the most concern to modern scientists are carbon dioxide and ozone.
2. The four conditions that cause weather are temperature, moisture, atmospheric pressure, and wind.
3. Changing atmospheric conditions can create violent weather.
4. Thunderstorms, tornadoes, hurricanes, and typhoons are among the most spectacular displays of weather and can be very dangerous and destructive.
5. Latitude, altitude, and proximity to land and water are controls that determine climate patterns.
6. Vegetation responds directly to climatic conditions and plant-growth patterns. Global vegetation regions are related to global climate regions.
7. Global vegetation regions include forest-lands, grasslands, vegetation in dry and cold regions, and mountain vegetation.
8. Heat energy does not pass through the air as easily as sunlight does. The lower atmosphere temporarily traps the heat, much like a greenhouse traps warmth. In a greenhouse the sunlight passes through the glass roof and walls and warms the air. The heat, however, does not immediately pass back through the glass to the outside air. Instead the heat is temporarily trapped in the warm air, keeping the greenhouse warm, just

as heat energy is temporarily trapped in the lower atmosphere, keeping the earth warm. This process, called the greenhouse effect, constantly warms the earth.