

For the EDUCATIONAL REVIEW.]

## NATURE STUDY AND SCIENCE.

BY JOHN BRITAIN, NORMAL SCHOOL, FREDERICTON.

## Lessons on the Forms of Water.

EXPERIMENT 1.—Melt a piece of ice by the heat of a stove or of a spirit lamp.

*Discussion.*—The change of a solid, as ice is, into a liquid by heat is called *fusion*. Find some solids which require a higher temperature than ice to fuse them—some which fuse at a lower temperature—some which cannot be fused at all.

EXPERIMENT 2.—Boil a little water in an open test tube or, better, in one the cork of which has a short, open tube passing through it. Let the children observe the cloud which forms above the mouth of the tube, and see that this cloud begins and ends in nothing visible, and that it disappears entirely when the source of heat is taken away from the water below. (The water may be boiled on the stove in a small kettle with a narrow spout.)

*Discussion.*—Of what was the little cloud made?

What state must the invisible water, which filled the tube between the cloud and the boiling water, have been in?

The *unseen* water, from which the cloud was formed, was in the state of a *gas*.

When liquid water is changed into the gaseous state by heat, the liquid is said to undergo *evaporation*.

When water is in the invisible gaseous state it is called *steam*.

Show whether there is any steam in the air of the school-room or in the air outside of the school-house. (This may be shown by feeling and tasting the liquid which gathers on the outside of a glass vessel containing a freezing mixture of snow or pounded ice and common salt.)

What became of the cloud when it disappeared?

Show whether steam—real steam—can be *seen*.

EXPERIMENT 3.—Boil as before some water in which salt has been dissolved, and catch the steam, before it becomes a cloud, in the lower half of a double egg-cup, the upper half of which contains a mixture of ice or snow and salt. Allow the liquid drops formed from the steam to fall into a saucer set below. Taste and feel this liquid.

*Discussion.*—How did you expect that the liquid in the saucer would taste?

How do you explain the fact that it is tasteless?

What did the heat first change the water into? Then what did the cold change the steam into?

The change of a gas or vapor into a liquid by cold is called *condensation*.

Instead of saying that the water was evaporated, and then condensed, we may use one word to denote both changes, and say that the water underwent *distillation*. The water which dropped into the saucer is called *distilled* water.

How can water in which sugar is dissolved be separated from the sugar?

If your drinking water contained substances not good for your health, how might you purify the water?

Find whether water distilled from a mixture of alcohol and water contains any alcohol. Explain.

EXPERIMENT 5.—Pour a little liquid water into a tube and immerse the tube in a freezing mixture. When you find that the water has become solid, warm the tube, and drop the ice out.

*Discussion.*—The change of a liquid into a solid by cold is called *solidification*. In the case of water, it is called *freezing*.

Mention several forms of liquid water with which you have met. (Ice, snow, hail and frost may be mentioned, and their obvious differences pointed out).

In what state were these forms of water just before they became solid?

What caused the cold by which they were rendered solid?

In what parts of the earth are ice and the other solid forms of water rarely or never seen? Why?

In what *three* states have you found water existing?

In which one of these states is water *invisible*?

In which of these states is water *dry*? (The pupils will probably conclude that water is dry in the solid state, as ice, etc.; dry in the gaseous state, as steam; and that it feels wet only in the liquid state). Argue, from examining the artificial cloud at the mouth of a tube or kettle in which water is boiling, that the clouds in the sky are composed of minute particles of *liquid* water.

In what state was the water of the clouds just before it became visible?

What supplied the heat which changed the liquid water on the earth into the invisible gaseous water (steam) from which the clouds are formed?

What caused the cold (absence of heat) by which the invisible water of the air was condensed into visible clouds?

## Questions for March.

(Answers to all or some of these questions should be sent to the editor of this department by April 15th.)

1. Notice whether the evergreen or the deciduous trees grow any in March. Give proofs based on your own observations.