Name: _____ Date: _____

Why a Lake Turns Over Twice a Year

Circle group

A deep lake in a cool place is not mixed evenly. For much of the year it forms layers. Twice a year, the layers trade places. This is called turnover. It happens because of a strange fact about water. Water is densest at about four degrees Celsius, not at its freezing point.

In summer, the sun warms the top of the lake. Warm water is lighter than cold water, so it floats on top. Below it is a deep layer of cold, heavy water. Between them is a narrow zone where the temperature drops fast. Wind can stir the top layer, but it cannot push through this barrier. The bottom water gets no fresh air. In a lake with a lot of nutrients, the oxygen at the bottom may slowly run low.

In autumn, the top water cools and gets heavier. At last it is as dense as the water below. Nothing keeps the layers apart. Wind mixes the whole lake. This is the fall turnover. It carries oxygen down and lifts nutrients up toward the light.

In winter, the top water may cool below four degrees and get lighter again. Ice forms on top. The lake forms layers again, with the coldest water at the top. In spring, the sun warms the ice and the top water. The top water sinks until the lake is mixed again. This is the spring turnover. These two mixings give a lake oxygen, so fish and other animals can live deep down.

Questions

1. At about what temperature is fresh water densest?

_____

_____

2. How many times a year does this kind of lake turn over?

_____

_____

3. What stops summer wind from mixing the bottom water?

_____

_____

4. Why might the bottom of a summer lake run low on oxygen?

_____

_____

5. Why does fall turnover start when the top water cools?

_____

_____

6. Why does turnover matter to animals deep in a lake?

_____

_____

Words to know

turnover: the mixing of a lake's layers so top and bottom trade places
dense: heavy for its size, with its parts packed closely together
barrier: something that blocks the way or keeps things apart
nutrients: substances that living things need in order to grow
layers: separate levels lying one on top of another

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

Name: _____ Date: _____

Why a Lake Turns Over Twice a Year

Triangle group

In a deep lake in a cool climate, the water is not mixed evenly. For much of the year it separates into layers, and twice a year those layers trade places in an event called turnover. The key to the story is a peculiar property of water: it is densest at about four degrees Celsius, not at its freezing point.

In summer, the sun warms the top of the lake. Warm water is lighter than cold water, so it stays on the surface, floating above a deep layer of cold, dense water. Between them lies a narrow zone where the temperature drops quickly. Wind can stir the upper layer, but it cannot easily push through that barrier, so the bottom water is cut off from fresh air. In a lake rich in nutrients, the oxygen in the deep water may slowly run low.

As autumn arrives, the surface water cools and becomes heavier. Eventually it is as dense as the water beneath it, and nothing holds the layers apart. Wind then mixes the whole lake from top to bottom. This is the fall turnover. It carries oxygen down to the depths and lifts nutrients toward the light.

In winter, the surface may cool below four degrees, becoming lighter again, and ice forms on top. The lake settles into layers once more, this time with the coldest water at the surface. When spring warms the ice and the surface water, the process reverses. The top water sinks until the lake is mixed again, which is the spring turnover. These two mixings keep a lake supplied with oxygen, which is why fish and other animals can live in its depths.

Questions

1. At about what temperature is fresh water the densest?

_____

_____

2. How many times a year does a lake like this turn over?

_____

_____

3. What barrier keeps summer wind from mixing the bottom water?

_____

_____

4. Why might the deep water of a summer lake run low on oxygen?

_____

_____

5. Why does fall turnover begin when the surface water cools?

_____

_____

6. Why does turnover matter to animals living deep in a lake?

_____

_____

Words to know

turnover: the mixing of a lake's layers so top and bottom trade places
dense: heavy for its size, with its parts packed closely together
barrier: something that blocks the way or keeps things apart
nutrients: substances that living things need in order to grow
layers: separate levels lying one on top of another

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

Name: _____ Date: _____

Why a Lake Turns Over Twice a Year

Square group

In a deep lake located in a cool climate, the water is not mixed evenly throughout the year. For most of the year it separates into distinct layers, and twice annually those layers exchange places in an event called turnover. The key to understanding it is an unusual property of water: it is densest at roughly four degrees Celsius rather than at its freezing point.

During summer, the sun heats the top of the lake. Warm water is lighter than cold water, so it remains at the surface, floating above a deep layer of cold, dense water. Between the two layers lies a narrow zone in which the temperature falls sharply. Wind can stir the upper layer, but it cannot easily force its way through that barrier, so the bottom water becomes cut off from fresh air. In a lake that is rich in nutrients, the oxygen in the deep water may gradually run low.

When autumn arrives, the surface water cools and becomes heavier. Eventually it reaches the same density as the water beneath it, and nothing remains to hold the layers apart. Wind is then able to mix the entire lake from top to bottom. This is the fall turnover, and it carries oxygen down to the depths while lifting nutrients toward the light.

During winter, the surface may cool below four degrees, becoming lighter once again, and ice forms across the top. The lake settles into layers a second time, now with the coldest water at the surface. When spring warms the ice and the surface water, the process runs in reverse. The top water sinks until the lake is thoroughly mixed again, which is the spring turnover. These two mixings keep a lake supplied with oxygen, which is the reason fish and other animals are able to live in its depths.

Questions

1. At roughly what temperature is fresh water at its densest?

_____

_____

2. How many times each year does a lake like this one turn over?

_____

_____

3. What barrier prevents summer wind from mixing the bottom water?

_____

_____

4. Why might the deep water of a summer lake gradually run low on oxygen?

_____

_____

5. Why does the fall turnover begin once the surface water cools?

_____

_____

6. Why is turnover important to animals that live deep in a lake?

_____

_____

Words to know

turnover: the mixing of a lake's layers so top and bottom trade places
dense: heavy for its size, with its parts packed closely together
barrier: something that blocks the way or keeps things apart
nutrients: substances that living things need in order to grow
layers: separate levels lying one on top of another

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

For the teacher: Why a Lake Turns Over Twice a Year

Each student sheet carries a shape, not a level. The same topic and facts, written three ways.

Circle: Why a Lake Turns Over Twice a Year

Easier · 249 words · Flesch-Kincaid grade 3.5

1. About four degrees Celsius.
2. Twice, in the fall and in the spring.
3. A narrow zone where the temperature drops fast.
4. It gets no fresh air from the surface.
5. The cool water gets heavier until it is as dense as the water below, so nothing keeps the layers apart.
6. It carries oxygen down to them.

Triangle: Why a Lake Turns Over Twice a Year

This passage · 278 words · Flesch-Kincaid grade 6.7

1. About four degrees Celsius.
2. Twice, once in the fall and once in the spring.
3. A narrow zone where the temperature drops quickly.
4. It is cut off from the fresh air at the surface.
5. Cooler surface water becomes heavier until it is as dense as the water below, so nothing keeps the layers apart.
6. It carries oxygen down to the depths.

Square: Why a Lake Turns Over Twice a Year

Harder · 305 words · Flesch-Kincaid grade 8.3

1. At roughly four degrees Celsius.
2. Twice, once in the fall and once in the spring.
3. A narrow zone in which the temperature falls sharply.
4. It is cut off from the fresh air at the surface.
5. The cooler water becomes heavier until it matches the density of the water below, so nothing holds the layers apart.
6. It carries oxygen down to the depths.