**Modeling in AP Biology**

**Title: Why Does Ice Float?**

**Theme V - Relationship of Structure to Function**

**Topic IA - Water**

**Authors: Kimbell Reitz, John Gensic**

**Equipment Used:**

Beaker

beans

ping pong ball

steal ball

ice water

**Summary of Investigation:**

The students will solve the puzzler and attempt to explain in their groups what they think happened. They will then be challenged to cause ice to sink to the bottom of a beaker of water. They will not be able to do so. The students will be asked to whiteboard their observations and explain what they observed.

**Engagement Puzzler -** The students are given a beaker full of beans with a heavy steal ball on top of the beans and a ping pong ball hidden at the bottom. The students should not touch the beakers until instructed to do so. When ready, the students should be challenged to make the steel ball sink to the bottom of the beans but, the students may not touch the beans or the ball either with their finger or with an object such as a pencil. Allow the students to work on the problem for a few moments.

The problem can be solved by shaking the beaker. When the beaker is shaken the beans start moving around and the steal ball sinks to the bottom. At the same time the students will be surprised as the ping pong ball floats to the top. When challenged to cause the ping pong ball to sink without touching it they will find they cannot.

Give the students a beaker of ice water and ask them to cause the ice to sink to the bottom without touching it. They will find they can’t. Just as they couldn’t sink the ping pong ball.

**Whiteboard Questions(s):**

1. Draw why you think the steel ball sank to the bottom while the ping pong ball rose to the top.
2. Draw what you think is happening on the molecular level to cause the ice to float on the water.

**Follow up Questions (Board Meeting):**

Explain what you think just happened.

Why did the ball not sink when the beans were not moving?

What does the movement of the beans simulate? (moving particles)

Why did the ping pong ball come to the top while the steal ball went to the bottom?

Why does ice float?

Are substances other than water less dense as solids than liquids?

What would it mean to life on earth if ice didn’t float?

**Description of Procedure, notes (teacher manual)**

Prepare the beakers ahead of time and don’t allow the students to touch them. Ask the students to observe what they see and take notes in their journal. After giving the students the challenge and waiting for some success ask the students to journal their observations again. Then, give the students the ice challenge. After this ask them to whiteboard their findings and explanations. The class should then have a board meeting to discuss the ideas on the whiteboards.

**Journal:**

How are organisms affected by the fact that ice floats?

What might happen if ice didn’t float?