Name_____ Period _____Date_____

# What Makes GloFish® Swim?

## Objective

The student will learn how buoyancy affects GloFish® fluorescent fish.

## Introduction

Buoyancy is the upward push of water on an object that causes something to float or rise to the surface. GloFish and most other fish use three different kinds of buoyancy.

1. **Neutral buoyancy** is the ability to neither float nor sink. Fish can stay in the middle of the water column.
2. **Positive buoyancy** is a fish's ability to float upwards.
3. **Negative buoyancy** is a fish's ability to sink downward.

Most fish have a "swim bladder" or "air bladder" inside their bodies. This flexible air sac is similar to a balloon. When gases inside the air sac expand (*move outward)* due to less water pressure inside the fish's "swim bladder" the fish will move upward. When the gases compress (*become smaller*) due to water pressure, the fish will sink downward. Some fish including sharks do not have "swim bladders". They have different body shapes and other structures that help them with their buoyancy.

## National Standards Addressed

Science as Inquiry A—Evidence, models, and explanation
Life Science C—Structure and function in living systems
Life Science C—Characteristics of organisms

## Materials Per Group

5 small neon water balloons (green, orange, red, blue, and yellow)
1 green balloon filled with **water**
1 orange balloon filled with **½ water and ½ air**
1 red balloon filled with **air** only
1 yellow balloon filled and tied with only a small amount of **water**
1 blue balloon filled and tied with only a small amount of **air**
A clear container or tub of water
Large two liter plastic drink bottles with lid
Blue food coloring
Dish detergent
Small amount of sand or gravel

## Safety Precautions

It is always helpful to have students working in pairs and the teacher walking around facilitating learning. Be prepared for possible water spills and broken balloons.

## Procedures

### Part A: Buoyancy Observation

When your teacher calls your group, go to the GloFish® aquarium and observe the fish in neutral, positive and negative buoyancy positions.

1. Return to your seats and place your green GloFish balloon in the container of water. Observe the buoyancy.
2. Place your red GloFish balloon in the container of water. Observe the buoyancy.
3. Place your orange GloFish balloon in the container of water. Observe the buoyancy.
4. Turn your balloons different ways. Observe any changes to the buoyancy.

### Part A: Data

Draw and color a picture of what you observed when you placed each of the balloons in the water.

## Part A - Discussion Questions:

1. Write a description of how the balloon filled with water acted in the container.

2. Write a description of how the balloon filled with ½ water and ½ air and water acted in the container.

3. Write a description of how the balloon filled with air only acted in the container.

4. Which balloon most closely shows neutral buoyancy?

5. What did you notice about the air in the ½ full balloon when turning it different ways?

## Part B: Making Your Own Fish Tank

1. Fill your plastic bottle ¼ full of water.
2. Drop two drops of blue food coloring into the water.
3. Put a small drop of dish detergent in the water.
4. (Optional) Place a small amount of sand or gravel in the bottle.
5. Push the small yellow balloon with only **water** into your bottle. Observe the buoyancy.
6. Push the small blue balloon with only **air** into your bottle. Observe the buoyancy.
7. After securing your lid, turn your fish tank different ways and observe each fish's buoyancy.

8. Take your fish tank to the GloFish® aquarium and compare buoyancy.

### Part B - Discussion Questions:

1. What was your favorite part of making your own "fish tank"?

2. Which fish in your "fish tank" most closely shows neutral buoyancy?

3. Which fish in your "fish tank" floated?

4. How is floating different from neutral buoyancy?

5. Describe what happens when you turn your soda bottle side ways? Upside down?

### Elaborations and Extensions

This lesson can bring up many questions about density. The floating orange experiment is always fun. Cut an orange in half. Let kids observe it floating. Peel the orange and watch it sink. The orange floats with the peeling on because of air pockets in the skin. The orange will sink when peeled because it is denser than the water now. Research can also be done on questions like "What makes a ship float?" or "How does a shark stay buoyant without a swim bladder?"

# What Makes GloFish® Swim?
## *Answer Sheet*

### Intended Grade Level
6th, 7th, and 8th

### Teacher Information
Before starting this lab collect enough two litter soda bottles for all students. Have balloons filled in advance of the lesson. Some students need help getting balloons pushed through the narrow opening of the bottle. Give them plenty of time to problem solve and manipulate the balloons before helping. Part A balloons can be bigger and fuller than those in part B. Eyes with permanent markers can be applied to fish, drawing more details is not advised as the fish flip over and can end up floating upside down. With only eyes, any way it turns it will still be right side up.

### Discussion Questions and Possible Answers

### Part A:

1. Write a description of how the balloon filled with water acted in the container.

   *The water filled balloon was below the surface of the water. It was more neutrally buoyant.*

2. Write a description of how the balloon filled with ½ water and ½ air with water acted in the container.

   *The water balloon that contains half air and half water floats with half the balloon out of the water.*

3. Write a description of how the balloon filled with air only acted in the container.

   *The air filled balloon floated on top of the water.*

4. Which balloon most closely shows neutral buoyancy?

   *The balloon with all water inside of it was more neutrally buoyant.*

5. What did you notice about the air in the ½ full balloon when turning it different ways?

   *The air bubble was always at the top, making the balloon float different ways.*

**Part B:**

1. What was your favorite part of making your own "fish tank"?

   *Answers will vary.*

2. Which fish in your "fish tank" most closely shows neutral buoyancy?

   *The one filled with water that floats below the surface.*

3. Which fish in your "fish tank" floated?

   *The one with all air.*

4. How is floating different from neutral buoyancy?

   *Floating is to sit on top of the water and neutral buoyancy is when the object stays in the middle of the water column.*

5. Describe what happens when you turn your soda bottle side ways? Upside down?

   *The water and the gravel move but the fish float the same way.*