Part 3 The External Parts of the Fish and How They Help The Fish Grow and Move

ACCESSING PRIOR KNOWLEDGE:

Students share and the teacher records what students know and have experienced about fish. Encourage the discussion by asking questions such as:

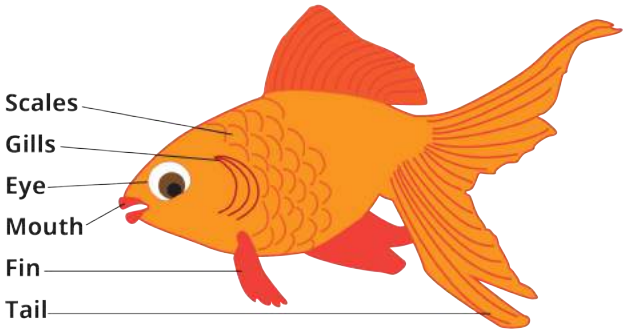
- What kind of environment do fish live in?
- Who has fish at home?
- How does a fish get its food?

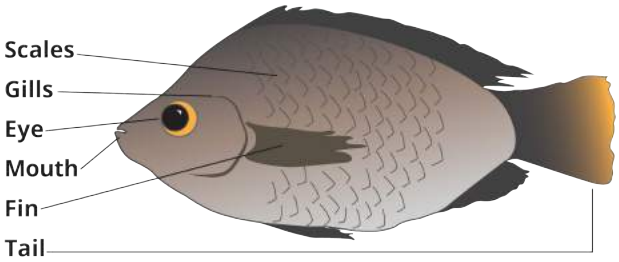
ACTIVITY #6: UNDERSTANDING FISH PARTS

NGSS: K-ESS3-1, K-LS1-1

MATERIALS:

- Diagram of the anatomy of a fish
- Fish parts and their use- glossary
- Fish to observe



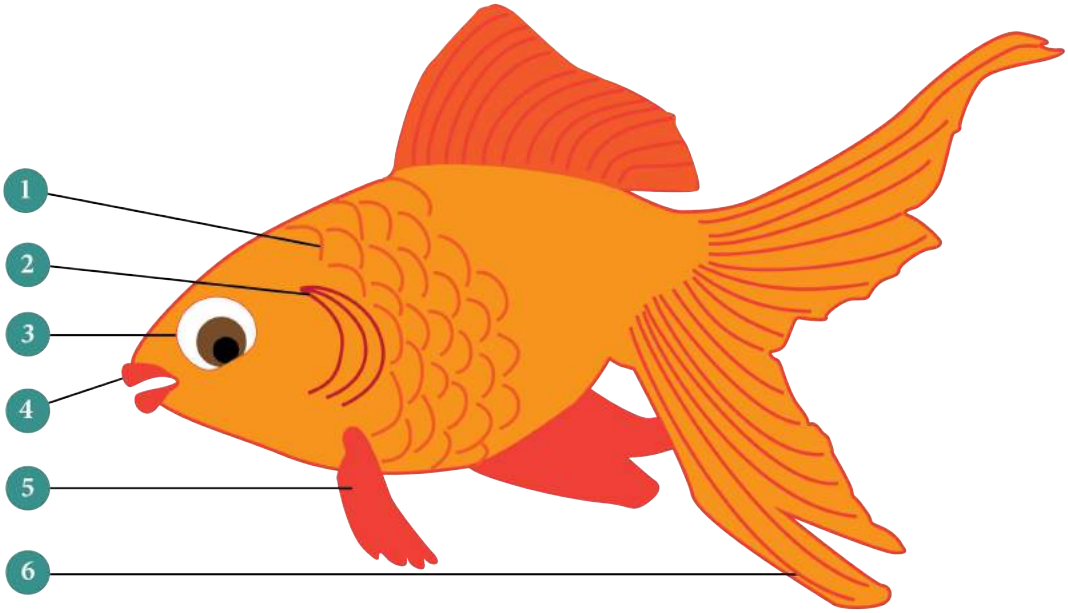


STEP 1: Students count and describe the fish in the fish tank. Students can describe the position of a fish in relationship to other objects using position words such as: above, below, behind, in front of, to the right/left of, etc.

STEP 2: Students observe the fish in the tank and draw what they see. Students describe the parts they see and what they are used for.

STEP 3: Students record their observations in their science notebook.

EVALUATION: Depending on the grade level of the students, students will use a combination of drawing, dictating, and/or writing sentences or paragraphs to recall information, use facts and definitions, and provide a concluding statement.



1 _____

2 _____

3 _____

4 _____

5 _____

6 _____

1 _____

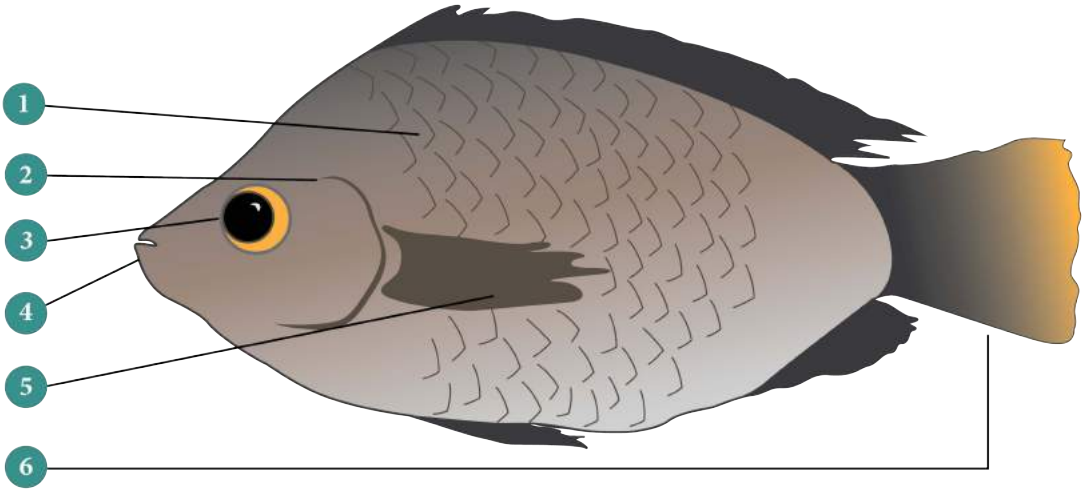
2 _____

3 _____

4 _____

5 _____

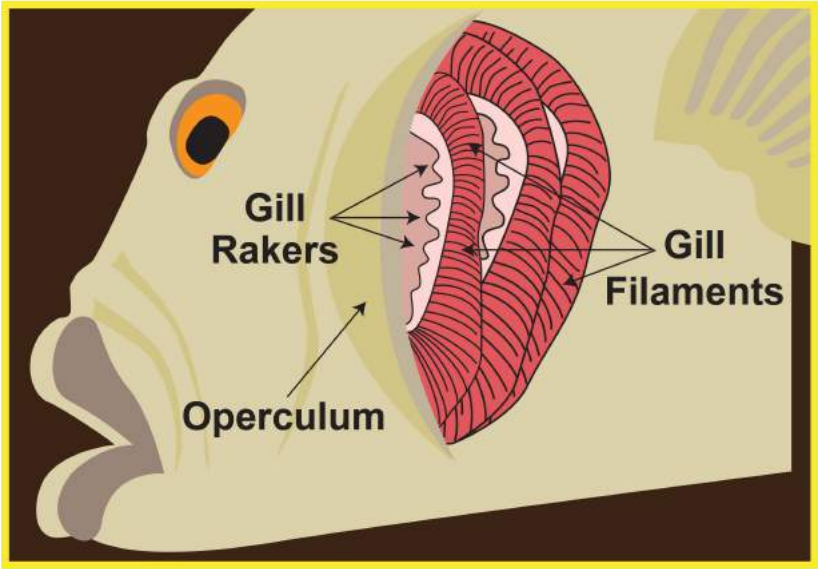
6 _____



ACTIVITY #2: HOW DO FISH GET OXYGEN?

NGSS: MS-LS1-4

OBJECTIVE:
Explain the basic method in which fish get oxygen, how they breathe underwater and understand the structures of the fish body that aide breathing and the exchange of oxygen and carbon dioxide.



MATERIALS:
Description of how fish get oxygen, teachers choice of materials for a sample model of how fish get oxygen.

BUILDING BACKGROUND:
During observations in previous lessons, students should have a clear understanding that while fish move around an aquarium, they continually open their mouths. This is an easy “show me how fish open and shut their mouths” demo to conduct at the beginning of the lesson.

Explain in this lesson, students will plan and create a small model demonstrating how fish get oxygen. The teacher can direct the simplicity or complexity of student models, types of materials to use, steps of completion, in class or homework assignment, etc. Have students work in groups (determined by class size).

SIMPLE CLASSROOM DEMONSTRATION:
Place a small amount of ground coffee onto a coffee filter. The ground coffee represents anything that could be floating in water, including oxygen molecules. The filter represents a gill filament. Have a student or two hold the filter flat above a large bowl and pour warm water through the coffee grounds. Have students look at the water in the bowl. Although there are no solid pieces of coffee, the water is not clear. The brown in the water is what the water took away from the coffee grounds. For purposes of this demonstration, the brown color in the water is caused by the oxygen that moved through the gill, or coffee filter, and into the fish's lungs.

SWIMMING DEEPER:

Suggestions for older students:

1. Make models more complicated or ask that they only use specific materials (e.g. your model must be made out of all recycled materials).
2. Ask students to conduct peer reviews using the same grading rubric or create a different grading rubric for peer reviews.
3. Ask a guest judge to come to class. This could be a principal, science teacher, local aquaponics or fish expert and conduct a small science fair asking students to demonstrate their models for judging.

HOW FISH GET OXYGEN:

Unlike marine mammals such as whales and dolphins with lungs that store oxygen from the surface air, fishes have gills. Gills are a series of membranes located on each side of the fish that function as respiratory organs. As water passes over this system of extremely fine gill membranes, the fishes absorb the oxygen from the water. The gills contain a network of fine blood vessels (capillaries) that take up the oxygen and diffuse it through the membranes. When fishes are taken out of water, they suffocate, because their gills collapse and they are unable to absorb oxygen. In many ways, the interior of the fish resembles that of many other animals. The digestive, circulatory, and nervous systems are very similar to those of other vertebrates. However, what really makes a fish different from other animals is its respiratory system.

A fish's respiratory system is determined primarily by the fact that it spends its entire life in water. Unlike the marine mammals such as whales, a fish has evolved in such a way as to not require frequent trips to the surface to breathe air. Fish have developed gills, on which they rely for the oxygen necessary for a fish's limited metabolism.

Many animals have gills at some stage of their life (even humans have them at an early stage of their development in the womb), but fish retained these gills and they are still a functional part of their anatomy. Fish use their gills to extract oxygen from their watery environment. The process starts with the fish's mouth, which is how the fish takes in water.

When a fish opens and closes its mouth, it is actually pumping water back through the gills and is thus breathing. Most fish have an effective pumping system that involves the mouth and the outer cover of the gills, called the operculum. When the fish's mouth opens, the operculum closes, drawing water into the fish's mouth. When the fish closes its mouth, the operculum opens, allowing fresh water to cross the gills. Other fish have a less effective pumping system, requiring them to swim constantly to keep fresh, oxygenated water flowing over the gills. These types of fish, such as tuna, generally swim with their mouths partly open. Incidentally, while many fish have nostrils, the nostrils are used only for a sense of smell, and play no part in respiration.

Once through the mouth, the water continues past structures called gill rakers. The gill rakers are essentially a filter system for the gills, straining the water to sift out floating food particles or foreign material. After passing through the gill rakers, the water continues through the gill arches and actually passes over the gills, which are suspended between the mouth cavity and the operculum. Each gill is made of two rows of gill filaments, which are extremely thin membranes sticking out into the water flow. Each of the gill filaments is composed of rows upon rows of lamellae, which are thin, disc-like membranes loaded with a capillary network. The water flows across the lamellae, and oxygen and carbon dioxide are exchanged directly across the capillary membrane. The capillaries are situated to take best advantage of the water flow; fish can actually extract up to 85% of available oxygen out of the water. Since water contains only 2-5% of the available oxygen that air at sea level does, such a high efficiency is extremely important.

From the gills, the deoxygenated water passes out the operculum, and the oxygenated blood joins the circulatory system. Despite the efficiency, some fish require more oxygen than others. This helps to explain why some fish thrive in specific habitats. For example, trout prefer northern streams because the cool water of the streams tends to retain dissolved oxygen, and the active trout need the extra oxygen. Carp, on the other hand, are sluggish and do not need as much oxygen, which is why carp can thrive in warm, relatively stagnant ponds, such as ornamental ponds. Goldfish, unlike most fish found in home aquariums, can survive in a non-aerated fish bowl because goldfish spend the majority of their time at the surface, where the oxygen content is highest due to the contact of the water with the atmosphere.

Despite the obvious advantages of having such an efficient surface for air exchange, the gill method of breathing was replaced in land animals with the lung. There are two reasons for this. First, the gills provide an excellent surface not only for air exchange but for water exchange, and a terrestrial animal with gills would lose too much water too rapidly. Second, the gills are efficient structures, but extremely fine ones, ones which require the buoyancy provided by water to retain their integrity. On land, the gills would quickly collapse into a mound of useless flesh, which is why the most efficient breathers on Earth would die in the rich atmosphere.

Source: www.coralfilm.com and www.papa.essortment.com