Name: ___________________

Project 1: Squid Dissection Lab

Potential Credits: /25

Project Goals:

☐ to become more familiar with mollusk anatomy, in particular, that of a squid

Instructions:

☐ Please read through the Unit 10 Lesson, Mollusks, paying particular attention to information and diagrams related to cephalopods.

☐ please complete the Squid Dissection Lab below ensuring that you:
  o video or photograph your labelled dissection as you proceed through the lab
  o complete the written portion of the lab

Materials:

• whole squid (you can typically purchase whole frozen squid from major grocery store chains, fish markets and/or Asian Markets)
• cutting board placed in a glass, metal or foil pan (to prevent liquid from spilling)
• small, very sharp kitchen knife or razor blade or X-Acto knife
• small, very sharp scissors (nail scissors are ideal)
• straight pins (such as used for sewing), needles or toothpicks for labeling
• masking tape, small sticky labels or small post-it notes for labeling
• pen for labeling
• lab instructions (below)
• camera/smartphone
• dish soap for clean up
• paper towel for clean up
CAUTION:

You will be working with a damp, slippery squid and sharp utensils! You must cut away from yourself at all times (refer to Figure 1 below)! Be very aware of where your holding hand is in relation to your cutting hand to ensure that if you slip with the knife it will not travel towards your other hand. It is always preferable to use scissors as much as possible and a knife as little as possible when performing dissections as scissors afford you more control.

A. Incorrect hand position as the person is cutting towards the holding hand and a slip could easily result in a bad cut. B. Correct hand position as the person is cutting away from holding hand and body and a slip is unlikely to result in a cut.

Figure 1. Knife and Hand Position When Cutting. A. Incorrect hand position as the person is cutting towards the holding hand and a slip could easily result in a bad cut. B. Correct hand position as the person is cutting away from holding hand and body and a slip is unlikely to result in a cut.

Squid Dissection Lab:

BACKGROUND

The squid is one of the most highly developed invertebrates. It is in the phylum Mollusca, which is derived from the Latin word meaning “soft body”. It belongs to the class Cephalopoda, meaning “head-footed”, because its head is pushed down toward the foot. This class also includes the octopus, cuttlefish and ancient nautilus.

All mollusks have a soft body with a special covering called the mantle, which encloses all of the body organs such as heart, stomach and gills. Squid have a large mantle, eight arms with two longer feeding tentacles all with suckers, a beak and mouth, a siphon, a large head (with a brain), two large eyes, and three hearts. The tentacles are long and retractable and have suckers only at the tips. Their large eyes are very similar in structure to people's eyes. The shell has been reduced to a chitinous pen that is embedded in the upper surface of the mantle.

Squid breathe using gills. They move by squirting water from the mantle through the siphon, using a type of movement called jet propulsion. They can move both backward and forward just by changing the direction of the water flow through siphon.
Some of the animal’s structures explored in this lesson illustrate the ways in which the squid has adapted to life in the ocean. Its streamlined body and jet propulsion make the squid a fast, active predator. This animal also has a very good defense mechanism.

Squid can change the color of their skin to mimic their environment and hide from predators. When in danger, squid release a cloud of dark ink from their ink sac in order to confuse their attacker and allow the squid to escape.

These fast-moving carnivores catch prey with their two feeding tentacles, then hold the prey with the eight arms and bite it into small pieces using a parrot-like beak. The esophagus runs through the brain, so the food must be in small pieces before swallowing. Squid feed on small crustaceans, fish, marine worms, and even their own kind!

Squid reproduce sexually by releasing eggs into the water. After mating, a female squid will produce 10-50 elongated egg strings, which contain hundreds of eggs in each string. In many species, the parents will soon die after leaving the spawning ground. The egg strings are attached to the ocean floor, are left to develop on their own, and hatch approximately ten days later.

Squid are an important part of the ocean food web. Squid are a major food source for many fishes, birds and marine mammals. Squid are gaining popularity as a food source for humans around the world (calamari). However, over-fishing is a growing concern because there are no regulations on squid harvesting.

Squid can be as small as a thumbnail, or as large as a house. The giant squid, Architeuthis, can measure 60 ft. in length and weigh three tons! Southern California squid populations spawn mainly in the winter (December to March). Squid are seined commercially at their spawning grounds. About 6,000 metric tons are taken yearly for human food and bait.
SQUID ANATOMY

Figure 2. External Anatomy of Squid. Further diagrams may be found by searching the internet.
SQUID ANATOMY

Figure 3. Internal Anatomy of Squid. Further diagrams may be found by searching the internet.
**PROCEDURE**

**Part A: Observing the External Anatomy of the Squid** (8 marks)

Please observe, label and photograph any structure that is **bolded and underlined**.

1. Please gather all of your materials (listed above) first.

2. Place the cutting board inside a pan to minimize mess.

3. Place the thawed squid on the cutting board dorsal side up (darker side). Notice the counter shading. One side is darker than the other.

   ***Note*** You may wish to label your dissection by hand as you go along or you may simply take photographs and then use a computer program to add in the labels after the fact. However, please make sure that you take all the necessary photographs and label all the necessary (bolded and underlined) structures.

4. Observe, label and photograph the **chromatophores** (freckles) on the squid. Chromatophores contain pigment and as they shrink or enlarge they cause the squid to change colour and thus, provide it with camouflage. Try rubbing the chromatophores to see if you can cause a colour change.

5. Observe, label and photograph the **fins**. These help to stabilize the squid and allow it to change direction when swimming. The fins do not provide propulsion as squid are actually jet propelled (see below).

6. Observe, label and photograph the **mantle**. The mantle is the main part of the squid’s body—all organs are inside.

7. Observe, label and photograph the **siphon** (a.k.a. funnel). Water is pulled into the mantle and then the mantle is squeezed forcing water out through the siphon. This type of movement is called jet propulsion. Squids are the fastest invertebrates swimming at approximately 30 mph.

8. Observe, label and photograph the **eyes** of the squid. Squid have big eyes compared to their head. In comparison, humans’ eyes would be the size of dinner plates if the proportions were the same. They are positioned on the side. Being on the side gives them more peripheral vision, which is great for hunting.

9. Observe, label and photograph the number of **tentacles** squid have. The tentacles are longer than the arms and have suction cups only at the tips. These are used to pass food to the shorter arms and then to the mouth.
10. Observe, label and photograph the number of arms a squid have. Arms have suction cups all the way down. Label the suction cups as well. The suction cups help the squid to hold onto food.

11. Hold your squid like a flower with the mantle as the stem and the arms/tentacles as the petals. Let the arms/tentacle lay back so you can see the mouth. You will be able to see the buccal bulb. The buccal bulb attaches to esophagus, which is attached to the stomach.

12. Try to find the beak. The beak is hard and is a dark brownish color.

13. Now, lay your squid ventral side up (lighter side). Locate the collar. The collar is the opening of the mantle (like the collar is the opening to your shirt).

Part B: Observing the Internal Anatomy of the Squid (7 marks)

1. Place the squid with the ventral side (lighter side) facing up. Using scissors and/or a knife, cut the mantle UPWARDS (placing knife into mantle with blade to ceiling) to avoid puncturing internal organs. Cut all the way to the tip of the tail. Lay the flaps of mantle to the sides.

2. Observe, label and photograph the gills (the gills are feathery structures that absorb oxygen from the water). Remove the gills from the body and gently place them in a bowl or tray of water. Notice how in water the gills look feathery. This feature increases the amount of surface area potential for gas exchange.

3. Observe, label and photograph the ink sac. The ink sac lies on top of the liver. Carefully, pull it up with the tip of your scissors or finger and snip the ink sac away. Lay aside for now. The squid releases ink from this gland in times of danger, which is then pushed out through the siphon into the surrounding water.

4. Observe, label and photograph the heart. Squid have 3 hearts – 2 branchial and one systemic. The hearts are located at the bottom of the gills. The heart is for blood circulation.

5. Observe, label and photograph the buccal bulb. Try pulling on it gently to show the trail of the esophagus and general area of the stomach.

6. Observe, label and photograph the gonads. This is the reproductive organ. In males, it is a whitish mound (sperm sac). In females, it is a clear or yellow/orange mass of eggs.

7. Place your fingers in the squid mantle on either side of the head and peel back the head and guts from the mantle. Locate and remove the pen.

8. Finally, take the pen and dip it into the ink sac. Then write your name in the space provided below.
9. Gently remove, observe, label and photograph the **eye**. Remove the cornea (film-like outer coating), and the lens (hard silvery pearl-like structure…careful this little guy tends to like to get away).

10. Clean-Up! Place squid parts in garbage can. Alternatively, you may use your squid tentacles, arms and mantle to make calamari following any of numerous recipes found on the internet.

11. Thoroughly wash all and dry all equipment including your work space.

   **My name, written with squid pen and ink (1 mark):**

**DISCUSSION QUESTIONS**

*Please answer in point form.*

1. Identify the kingdom, phylum and class that squid belong to. *(1 mark)*

2. What is the meaning of the phylum name? *(1 mark)*

3. What is the meaning of the class name? *(1 mark)*
4. Was your squid male or female? How did you determine this? (1 marks)

5. The squid is a highly successful predator. Please describe at least 3 evolutionary adaptations that the squid has that would provide it with a selective advantage as a predator. Please explain how each adaptation provides a selective advantage. (6 marks)