What affects Anuran metamorphosis? **\_\_\_\_\_** / 25 Points  
  
This lab demonstrates how chemicals in the environment may interact with chemicals within tadpole bodies, changing the way frogs look after metamorphosis. Students submerge encapsulated sponge animals in a variety of different liquids (water, vinegar, cooking oil, and bleach) to study the impact of chemicals on frog metamorphosis

**Materials**

Each lab group will need

* Encapsulated sponge animals (four)
* water
* Caution signvinegar
* Bleach (Safety note: Use of bleach requires proper ventilation, and students must wear gloves and goggles.)
* cooking oil
* plastic spoon
* 200 mL beakers or baby-food jars (four)
* plastic wrap
* rubber band
* timer

**Background information**

The three distinct life stages of amphibians include the (1) egg, (2) larva, and (3) adult. In anurans (frogs and toads), the larval stage is called a tadpole. A tadpole transforms into an adult in a process known as metamorphosis. This process is one of the most spectacular and important events in the life cycle of anurans. When the anurans hatch into tadpoles, their development into an adult may be very rapid or slow, depending on the species. This development rate has also been found to depend on environmental factors.

In nature, tadpole metamorphosis may be sped up when breeding areas become overcrowded or begin to dry up. However, human activities probably cause environmental cues that slow, speed up, or cause more negative effects on metamorphosis. For example, water pollutants disrupt the normal chemistry involved in tadpole development. These disruptions cause abnormal limb development, sexual organ development, and so on. For example, hind limb deformities of frogs were found in agricultural areas of Ontario, Canada. Insecticides, herbicides, and fungicides are chemicals associated with agriculture. When human activities like agriculture, forestry, and urbanization are present near anuran populations, there is a chance that malformations may occur.

**Procedure**

1. Caution signObtain four capsules from your teacher. These capsules represent tadpoles waiting to go through metamorphosis
2. Check that your beakers are labeled with: Bleach, Water, Vinegar, and Oil. **Caution:** Do not breathe the fumes of these liquids directly. Be careful handling the hot water.
3. Check that there is plastic wrap over the bleach and vinegar containers to prevent fumes in the lab area.
4. Record your ‘Start Time’ on the data sheet.
5. Each student will drop in one capsule per container. Swirl the beakers at will to make sure the capsules don’t stick to the sides. Do NOT put your fingers in the liquids. Each student is responsible for watching the time and recording the information on their data table
6. Watch for signs of metamorphosis; note these changes on your data table. (i.e., when it starts opening, when it’s done opening, color changes, bubbling). Record your observations at two-minute intervals in the table.

After 30 minutes, use the spoon to remove all capsules/frogs

Caution sign**Clean up**The bleach and vinegar may go down the drain. Make sure the water is running while emptying your beakers.   
Oil may not go down the drain! Dispose of as much oil as you can in the trashcan.

All glassware and plastic ware must be washed with soap and water. Place all cleaned glassware on the drying rack. Place all plastic ware back into your basket at your lab station.

Throw away any remaining capsules/sponges in the trashcan.

**Data sheet.**

Note that observations will vary in thoroughness and over time.

Complete this data table with your observations; be specific. (5 points)  
Start Time:\_\_\_\_\_\_\_\_

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Minutes | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | Final shape | Notes |
| Water |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Bleach |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Vinegar |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Oil |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**Post lab questions for ‘What Affects Anuran Metamorphosis?’**

1. Which capsule was the control capsule? (1 point)
2. Which capsule opened first? (1 point)
3. Did all of your capsules open? If not, which did not open? (3 points)
4. Did you see any capsules change color? Which changed? How did it change? (3 points)
5. Your vinegar capsule should have completed the metamorphosis very quickly once it started opening. Do you think this would affect the adult frog in real life? How? (3 points)
6. Your capsule floating in oil did not open at all. What would this mean in the real world? In other words, how would this affect the tadpole in a real pond? (3 points)

Each person in your group should TYPE a brief essay (five sentences) stating at least two ways that you think the community could produce fewer frogs with malformations. This will be your homework. (6 points)