Fluids: Density, Pressure, Bernoulli

- **Fluids:** any substance that flows. Liquid and gas are both fluids!
- **Density:** how compact a substance is. For two objects with the same volume, the heavier one has higher density. An object will float if its density is less than the fluid.
- **Pressure:** force per area. Pressure is higher at the bottom of the fluid than close to the surface. High pressure will push water to squirt faster through a hole or tube.
- **Bernoulli Principle:** When a fluid flows faster, the pressure is lower. When a fluid flows slower, the pressure is higher.

Work with a partner (and / or a parent)

You will need to have access to a sink and a power outlet.

I. Density

1. Fill the two tall cups with water to the level at least higher than the height of an egg.
2. In one cup, add and thoroughly stir 4 tea spoons of salt.
3. Predict: what would happen to the egg in clear water? (Circle one)

float sink neither

4. Predict: what would happen to the egg in salt water? (Circle one)

float sink neither

4. Put one egg in each cup and test your predictions. Does the result agree with your predictions?
5. Try to explain your result. Rank the order of density. 3 being largest density; 1 being smallest density.

water _____ salt water _____ egg _____

6. Gradually add more water to the salty water, try to see if you can get the egg to move to the middle of the water. Why does this happen?

II. Pressure

1. Use a sharp tool to poke three small holes on your disposable cup or bottle.
2. Prediction: If your container is filled with water, which hole will the water travel the farthest in horizontal distance? (Circle one)

top middle bottom

3. Fill your container with water, and test your predictions.

Why does this happen?

III-A. Bernoulli's Principle: Two Pieces of Papers

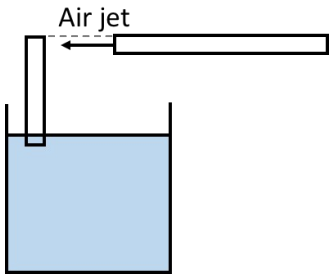
1. Cut a piece of paper in half. Hold the top edge of each paper so they hang vertically down and are parallel to each other. Keep the distance between the papers about 1-2 inches apart.
2. Predict if you blow in the space between the two papers, what will happen to the papers? (Circle one)

further apart closer together no change

3. Now blow air into the space between the two paper. Does your result agree with your prediction?

Why does this happen?

III-B. Bernoulli's Principle: Water Level in Straw



1. Fill the small cup with water to about 0.5 inch below the top of the cup.
2. Cut the straw to two pieces. The shorter piece is about 2 inches long.
3. Insert the shorter piece of straw vertically into water, with the lower opening just below the surface of water.
4. Hold the longer portion of the straw horizontally and plan to blow horizontally just below the short straw's opening.
5. If you blow through the horizontal straw, predict what would the water level be in the vertical straw, compared with the water level in the cup? (Circle one)

higher lower same

6. It works the best if you blow horizontally right below the vertical straw's opening at about 0.5 inch away. (See the picture above) Give a good blow through the horizontal straw. Does your result agree with your prediction?

Why does this happen?

III-C. Bernoulli's Principle: Ping Pong Ball

1. Remove any attachments on the hair dryer so air stream comes out of a circular outlet. Plug in the power outlet and turn it on cool and high setting.
2. Prediction: If you put a ping pong ball on the air outlet of a blowing hair dryer that points up, what would happen to the ping pong ball? (Circle one)

A. stick to the hair dryer
B. floats on top of the hair dryer
C. fly away

3. Test your prediction. Why does this happen?