

Directions for laboratory exercise

1. To complete this activity you may print the document, write in your answers in complete sentences, scan or email it back to me. If you do not have access to a printer you may create your own document, type your answers in complete sentences in your document and email me your completed document, **or** write your answers in complete sentences on a sheet of notebook paper, photograph your answers and email it to me. It is completely up to you. *If you create your own document please write the questions and answers so I can follow what you are doing.*
2. **For full credit you must complete 3 of the 4 parts, your answers must be in complete sentences. (if you complete section 4, for full credit you need to send a picture of your object)**

Rubric

Item	Great (3)	Average (2)	Poor(1)	Unacceptable (0)
Questions	Answered correctly in complete sentences	Complete sentences with incorrect answer but you were using critical thinking skills.	Incomplete sentences with correct or incorrect answer	Did not write to the question or did not attempt to answer
Part 4	Answered correctly in complete sentences and included picture	Complete sentences with incorrect answer but you were using critical thinking skills. Or Answered correctly in complete sentences but you failed to provide a picture	Incomplete sentences with correct or incorrect answer	Did not write to the question or did not attempt to answer

If you complete all 4 activities, you will get extra credit.

Name: _____

Bernoulli's Principle Lab Activity

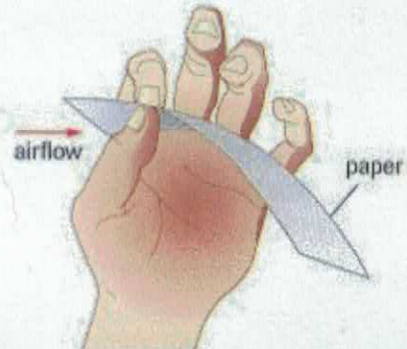
SPH4C

This lab activity consists of a number of short demonstrations of Bernoulli's Principle. They do not have to be done in order.

Part 1: Lift and Drafts

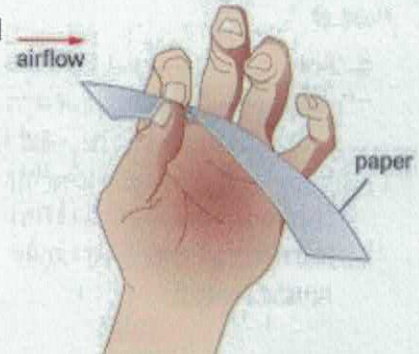
Materials: paper, beaker, two straws, water

Hold a piece of paper between your thumb and forefinger as shown in the diagram at right. Blow *under* the sheet of paper. (You may wish to use a straw to do so.) What happens?

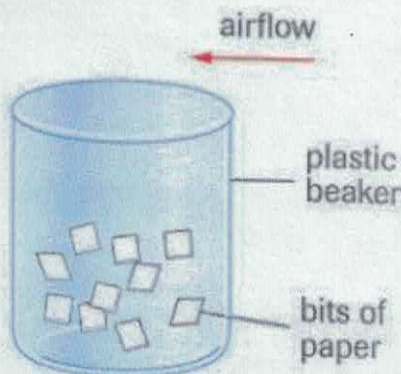


Explain this phenomenon using Bernoulli's Principle. (Your explanation should contain the words "speed" and "pressure.")

Hold the paper between your thumb and forefinger again and this time blow over the sheet of paper. What happens?



Explain this phenomenon using Bernoulli's Principle.

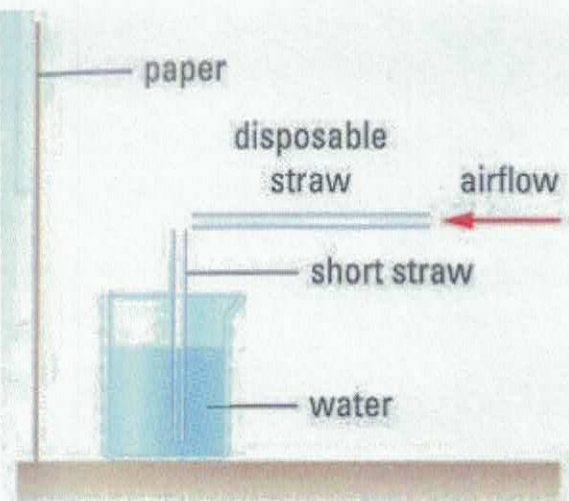


Tear up the piece of paper and place the pieces in a beaker. Blow over the top of the beaker. What happens?

Explain this phenomenon using Bernoulli's Principle.

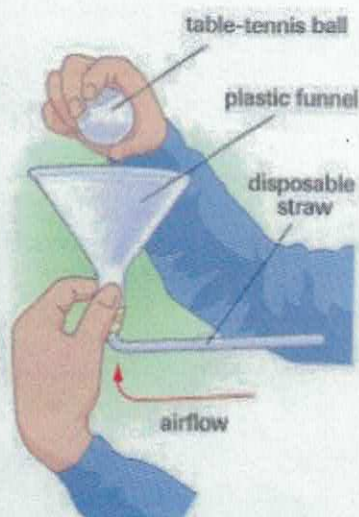
Explain how this demonstration relates to the draft that can be created in a chimney.

Set up your apparatus as shown in the diagram at right. (You may wish to use tape to secure the straw in the beaker to keep it steady.) Blow through the horizontal straw. What happens?



Explain this phenomenon (used in spray atomizers) using Bernoulli's Principle.

Part 2: The Classic Demonstration and a Modification

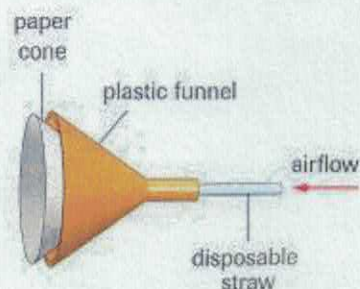


Materials: table-tennis ball, funnel, straw, tape, paper

Set up your apparatus as shown in the diagram at left. (Note that tape is securing the straw to the funnel.) Blow through the straw. What happens? (You may wish to continue holding the table-tennis ball lightly while the air is flowing so you can really feel the effect.)

Explain this phenomenon using Bernoulli's Principle:

Construct a cone shape from paper. Set up your apparatus as shown in the diagram at right. Blow through the straw. What happens?



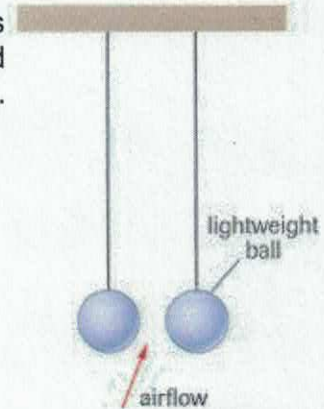
Explain this phenomenon using Bernoulli's Principle:

Does the shape of the object in the funnel make a difference? If so, explain how and why.

Part 3: Invisible Forces

Materials: straws, table-tennis balls, string and tape, empty pop cans

Use the string (attached with tape) to suspend two table-tennis balls from the lab bench (or other support). The table-tennis balls should be several centimetres apart. Blow between the table-tennis balls. (You may wish to use a straw to direct the flow.) What happens?



Explain this phenomenon using Bernoulli's Principle:



Set two empty pop cans on top of disposable straws as shown in the diagram at left. Blow between the pop cans. (You may wish to use a straw to direct the flow.) What happens?

Explain this phenomenon using Bernoulli's Principle:

Note that most people not familiar with physics will assume that the table-tennis balls and pop cans will move away from each other, reasoning that the moving air will exert a pressure on the objects. Most people not familiar with physics will also lose the index card challenge:

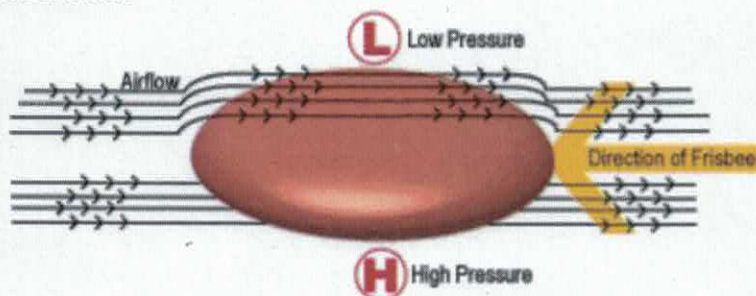
Fold an index card so that about a centimetre on both ends has been folded at a right angle to the rest of the card. Next, place the card on a flat surface with the folded parts facing down. Now challenge someone to blow the card off the table by blowing under the card. They will probably try to blow air under the card, but the harder the person blows under the card the more the card sits there. It even bends down closer to the surface as air passes underneath the card.

How do you get the card off the table?

Part 4: Design a Frisbee

Materials: paper, tape

Given what you have learned about Bernoulli's Principle and lift, use nothing more than paper and tape to design an object that can be tossed like a Frisbee (rotating in flight) and stay in the air for an extended time.



You may wish to try several designs and test them before deciding on a final design.

Maximum time in the air: _____

Maximum distance travelled: _____

Sketch your final design in the space below, showing how the object is shaped to improve lift.

Show your final design to your teacher and ask your teacher to initial this space: _____

The person in the class with the most effective design (that remains in the air for the longest time when tossed horizontally) will earn 10% bonus to be applied to the next quiz.

*Note that you are not to build a paper airplane.
The object should be designed to rotate in flight.*