Part II. Under Construction Station Instructions

Lab Station A - Blue Print: There is O_2 Here!

Description: In this lab, you will consider the problem: "What happened to the oxygen in the air we breathed in? ***Air that enters the body upon inhalation contains 21% oxygen. Air that leaves our lung when we exhale contains 14% oxygen and 4.4% carbon dioxide.***

Materials:

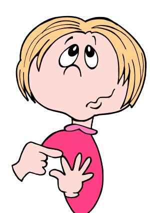
1. 200 ml green craft sand or glitter to represent Nitrogen (N_2) molecules
2. 50 ml red craft sand or glitter to represent Oxygen (O_2) molecules
3. 10 ml white craft sand or glitter to represent Argon (Ar) atoms
4. 10 ml blue craft sand or glitter to represent Carbon Dioxide (CO_2) molecules
5. 2 150 ml glass beakers or clear plastic cups to hold glitter or sand
   a. 150 ml glass beaker (or cups) or vial labeled ***Air Inhaled***
   b. 150 ml glass beaker (or cups) or vial labeled ***Air Exhaled***

A

Procedure:

1. In the bowl labeled ***Air Inhaled***, add the following in layers:
   a. 78.00 ml green craft sand or glitter
   b. 21.00 ml red craft sand or glitter
   c. 1.00 ml white craft sand or glitter
   d. 0.03 ml blue craft sand or glitter
2. In the bowl labeled Air Exhaled, add the following in layers:
   a. 78.00 ml green craft sand or glitter
   b. 14.00 ml red craft sand or glitter
   c. 1.00 ml white craft sand or glitter
   d. 4.40 ml blue craft sand or glitter

AIR
Oxygen/Carbon Dioxide
Nitrogen/Argon



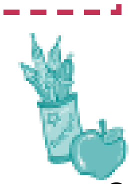
Answer the following *on the Builder's Log*

1. How was the model of inhaled air like the model of exhaled air?
2. How was the model of the inhaled air different from the model of exhaled air?
3. Why do you think only two gases changed in the models of inhaled and exhaled air?
4. What do you think caused the difference?

Point to Ponder: Our red blood cells contain hemoglobin, which can bind with oxygen from the air.

Clean-up:

1. Empty all containers.
2. Straighten the station and clean up any sand or glitter that may have spilled.



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Lab Station B - Blue Print: Dust removal!

Description: In this lab, you will consider the problem: "How much dust does our respiratory system have to handle?" Students will observe dust from various locations on a particulate collector to see the amount of dust particles in the air around us. This is important to know because particles in the air can cause irritation or infection in our respiratory system.

Dust Removal

B

Safety:

1. Carry the stereoscope with two hands always.
2. Be careful when outside the classroom.

Materials:

1. 3 Index cards
2. Single hole paper punch
3. Clear cellophane tape
4. Stereoscope or magnifying glass

Procedures:

1. Using the paper punch, punch 1 hole in each index card.
2. Place clean, clear tape over each hole, so there is a sticky side of the tape exposed on one side of the index card.
3. Give one card to each group member and ask each to walk to different areas of the school for 3 minutes.
4. After three minutes, each should return to the class, place a clean piece of clear tape on the card so the sticky side of the tape is sealed (this will "sandwich" the collected particles between two pieces of tape).
5. Label each card A, B, or C and record (on the card) where the sample was taken.
6. Use the stereoscope or magnifying glass to observe the sample in Card A. Make a drawing of what you see in circle A.

Record your findings *on the Builder's Log!*

A B C

Clean-up:

1. Neatly, stack the index cards containing air particle samples at the station or dispose of them as instructed by your teacher.
2. Wipe up any mess.
3. Turn the light of the stereoscope off.

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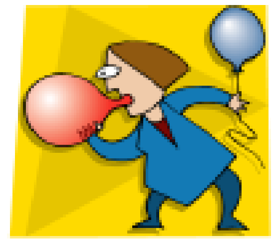
Lab Station C - Blue Print: Everything is Expanding and Contracting!

Description: In this lab, you will consider the problem: "What makes my chest expand and relax during breathing?" Students will create a model, test it, and record the results.

Safety:
1. Always practice special caution with scissors.
2. As you cut the bottle, be careful of any sharp edges.
3. Wear Safety Goggles



Materials: (per group)
1. 1- 20 oz. soda bottle
2. 2 20 cm circumference balloons
3. Scissors
4. Tape and/or rubber band

Procedures:
1. Take the 20 oz. soda bottle and cut it off about 15 cm from the bottom.
2. Insert a balloon in the bottle by sticking it trough the bottom and stretching the top across the mouth of the bottle.
3. On second balloon, cut off top. Stretch this across the bottom of the cut portion of the soda bottle. Tape and/or band into place.
4. Test your breathing machine by pulling downward on the bottom balloon gently. Then release. Notice what happens to the balloon inside the soda bottle.
5. Record your observations.
6. Explain what you *think* is causing these results.

Record Observations *on the Builder's Log*

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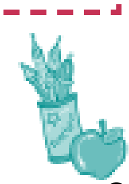
Point to Ponder: As a volume of air increases, air molecules spread out and the pressure they exert decreases. As a volume of air decreases air molecules spread out and the pressure they exert increases.

Clean-up.
1. Trash the balloons, the soda bottle (top and bottom).
2. Add new balloons and a soda bottle from the supply table for the next group.



Part II. Under Construction Station Instructions

Lab Station D - Blue Print: Just Enough Pressure!

Description: In this lab, you will consider the problem: "How does volume change affect my lungs?" Students will make a model, test it, and record observations.

Safety:
1. Do not eat the experimental supplies.
2. Use syringe properly.

Air Pressure

D

Materials:
1. 1- 100 ml syringe (without needle)
2. 1 Miniature Marshmallow or small marshmallow bunny

Procedures:
1. Take the plunger out of the syringe.
2. Put the marshmallow candy up into the syringe all the way to the top.
3. Put the plunger back into the syringe all the way to the bottom of the candy.
4. *Cover the end of the syringe with your finger* as you pull back on the plunger to increase the volume inside the syringe.
5. Pull back on the plunger ***without pulling it totally out*** and observe what happens to the candy as the volume inside the syringe increased.
6. Release the plunger and observe what happens to the candy.
7. Repeat the process.

Record Observations ***on the Builder's Log:*** (Be sure to explain what you think caused your results)

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Point to Ponder: As a volume of air increases, air molecules spread out and the pressure they exert decreases. As a volume of air decreases air molecules spread out and the pressure they exert increases.

Clean-up:
1. Clean out syringe completely.
2. Throw away used candy.

Part II. Under Construction Station Instructions

Lab Station E - Blue Print: Exchange it!

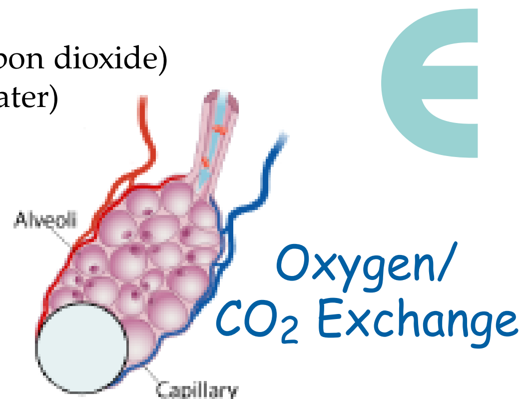
Description: In this lab you will consider the problem, "How can we know when oxygen is exchanged for carbon dioxide?" Students will create two solutions; test it by comparing and record observations.

Safety:

1. Goggles and gloves must be worn for this lab.
2. When measuring the Bromothymol Blue, keep it away from eyes, nose, and hands.

Materials:

1. 2 200 ml beakers
2. 100 ml water
3. 100 ml carbonated water (contains dissolved carbon dioxide)
4. 50 ml of Bromo Blue (25 ml for each beaker of water)
5. Goggles/gloves
6. Stir rod
7. Colored Pencils
8. 1 Drinking straw (per student)

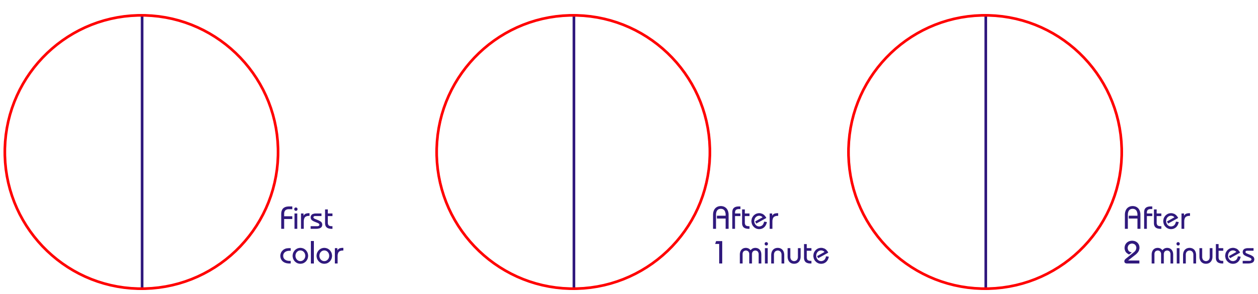


Procedures:

Goggle and Glove Up!!

1. Put water in large beaker, label the beaker A.
2. Put carbonated water in large beaker, label the beaker B.
3. Use caution as you measure out the Bromothymol Blue.
4. Add Bromo Blue to water and stir with the stir rod. Record the color.
5. Add Bromo Blue to carbonated water and stir with the stir rod. Record the color.
6. Record color change after one minute.
7. Record color change after two minutes.
8. Take a deep breath and one person in your group should blow ***through the straw*** into ***Beaker A*** (the Bromothymol Blue solution that doe **NOT** contain carbonated water). What change do you see?

Make recordings *on the Builder's Log.* (1/2 for water and the other for carbonated water – Be sure to label).



What evidence have you found that indicates you breathe out carbon dioxide?

Point to Ponder: Carbon dioxide is a waste product formed when glucose is broken down by cells to release energy.

Clean-up:

1. Follow teacher's directions.

Part II. Under Construction Station Instructions

Lab Station F - Blue Print: Model of Diffusion!

Directions: In this lab, you will consider the problem: "How can gases cross or be contained within a membrane?" Students will set up and observe what happens as substances move across a membrane (the wall of a Zip-Loc® Baggie).

Safety:

1. Always be careful when handling glass in the lab.
2. Wear Safety Goggles.
3. Avoid getting iodine on your hands or clothing – it will stain!

F

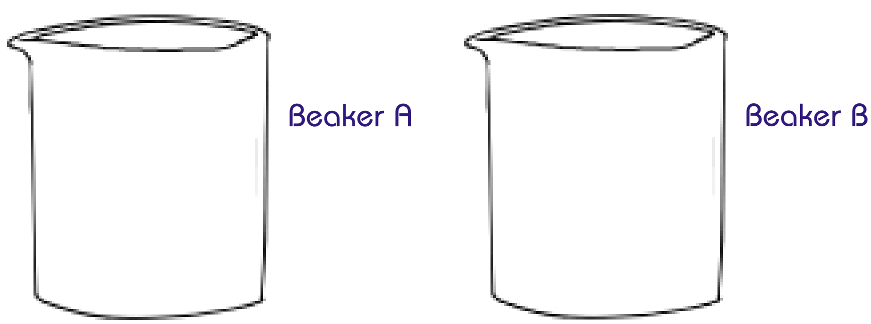
Materials:

1. 2 250 ml beakers
2. 2 thin snack-sized Zip-Loc® Baggies
3. 1 bottle tincture of iodine
4. 10 grams Cornstarch (per group at this station)
5. Triple Beam Balance
6. Glass stirring rods or plastic spoons
7. Paper towels

Procedures:

1. Label the beakers A and B.
2. *Beaker A*
   a. Place 5 grams of cornstarch and 50 ml of water, stir
   b. Place 50 ml of water into one of the baggies and add 10 drops of iodine
   c. Seal the baggie and place into the beaker with cornstarch & water
   d. Allow to stand and make observations every 5 minutes
   e. Record observations *on the Builder's Log*
3. *Beaker B*
   a. Place 5 grams of cornstarch and 50 ml of water in the baggie, mix well and seal the baggie.
   b. Place 50 ml of water and 10 drops of iodine in the beaker, stir
   c. Place the sealed baggie in the iodine water
   d. Allow to stand and make observations every 5 minutes.
   e. Record observations *on the Builder's Log*

Make drawing and record data *on the Builder's Log*.



Point to Ponder: Water (moisture) is required for substances to move across the membranes of living cells.

Clean-up:

1. Dispose of baggies and water as directed by your teacher.
2. Rinse and dry the beakers, stirring rods (or spoons)
3. Wipe the station clean and organize materials.

Part II. Under Construction Station Instructions

Lab Station G - Blue Print: Branching Out

Directions: In this lab, students will consider the problem, "How do the lungs branch out on the inside?" Students will dissect a piece of cauliflower and stain it with dye to see the many branches in its structure.

Safety:
1. Always be very careful when handling the dissecting equipment.
2. Carry the stereoscope with two hands.
3. Wear an apron if you are worried about staining your clothes.

G

Materials:
1. 1 dissecting kit
2. 1 stereoscope
3. magnifying glass
4. 1 floweret of cauliflower
5. red dye (use dropper if needed)
6. running water
7. Petri dish

Procedures:
1. Use the scalpel to slice a thin cutting across the length and width of a floweret.
2. Place floweret in Petri dish and observe under the stereoscope and with the magnifying glass.
3. Write down an observation of what you see.
4. With the floweret in the Petri dish, dot the ends of the floweret with four drops of dye.
5. Let set for 2 minutes.
6. Hold the floweret by the stem and lightly rinse under running water.
7. Dry with paper towel.
8. Repeat steps 2 and 3.

Record observations ***on the Builder's Log*****:**

Without Dye:

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With Dye:

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What is the advantage of having the respiratory tree branch out as it does?

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Clean-up:
1. Discard the floweret into the trash.
2. Rinse off scalpel and Petri dish.
3. Wipe down work area.

Part II. Under Construction Station Instructions

Lab Station H - Blue Print: Break down the surface tension!

Directions: In this lab students will consider the problem, “How do *surface active agents* help keep the surface area of the alveoli moist?” Students will perform a lab investigation that breaks down surface tension. Wet the inside of a plastic bag – what happens? The sides of the bag are drawn together, collapsing the bag. There is a similar tendency in the alveoli of the lungs, but your body has taken care of this potential problem!

Safety:
Keep detergent from getting into your eyes. It is an irritant.
Be careful handling the toothpicks.
Wear safety goggles.

H

Materials:
1. 2 250 ml beakers with water
2. Toothpicks
3. Ivory dishwashing detergent
4. Paper towels.

Procedures:
1. Fill the beakers with water.
2. Float a toothpick on the surface of the water.
3. Add 1 teaspoon of detergent to one of the beakers of water. Do not stir.
4. Wait 2 minutes and record what happens.
5. Wait 2 more minutes and record what happens.

Record observations *on the Builder’s Log:*

After 2 minutes:

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After 4 minutes:

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Point to Ponder: The inside of the alveoli is coated with water. Water molecules attract each other and tend to pull the walls of the alveoli together, causing a collapse. Surfactant reduces the surface tension (attraction of water molecules to each other) and helps keep the alveoli open.

Clean-up:
1. Pour used water down the drain.
2. Dry on towel.
3. Clean away any spills.