



## **Educational Activities** **Kindergarten –5<sup>th</sup> Grade**

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***Objective:***

*To help students develop an understanding and interest in air, and its properties. These lessons cover the Michigan Educational Assessment Program (MEAP) objectives in science, mathematics, language and writing.*

The West Michigan Clean Air Coalition in efforts to expand the public education campaign would like to thank the Clean Air Coalition of Southeast Michigan for the permission to use their packet and adapt it to the needs of West Michigan. The Coalition would also like to thank the individuals who contributed to the development of the public education campaign.

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## What is Ozone? Why is it important?

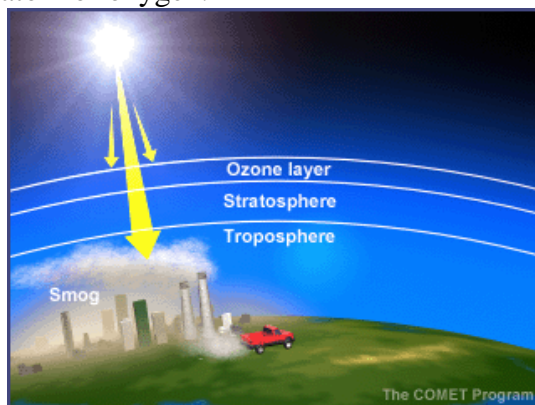
### Objectives

To help students develop an interest in and understanding of air, its properties and the way it is used and impacted by individuals. With these activities, students can study the makeup of the atmosphere, learning about the main gases in the atmosphere and the molecular structure of some of the chemicals that pollute it. These activities focus on the role of naturally occurring ozone ( $O_3$ ) in the stratosphere as a necessity for the protection of public health and, in the troposphere, as the primary component of urban air pollution. Though targeted mainly at science in the classroom, cross-curricular extensions expand the educational impact.

### Background Information

Our planet is surrounded by a sea of gases we call the atmosphere. We breathe these gases into our bodies over 22,000 times a day. Our atmosphere is made up of 79 percent nitrogen, 20 percent oxygen and a one percent mixture of carbon dioxide, water vapor and other gases. One of these other gases is ozone.

Ozone in the stratosphere (upper air) is good, protecting us from the sun's harmful ultraviolet rays. Ozone ( $O_3$ ) is a natural forming gas, formed when molecular oxygen ( $O_2$ ) combines with a single atom of oxygen.



Graphic provided by Project Learn Cycles of Earth [www.ucar.edu/learn/index.htm](http://www.ucar.edu/learn/index.htm)

Ozone in the troposphere, where we breathe, is harmful to our health. This is the ozone targeted by the Ozone Action! program. This ground-level ozone is formed when hydrocarbons from emissions (such as from industry, cars, and buses) react with sunlight. The pollution cooks like a soup on hot (temps above the mid-80s), windless days with little cloud cover. At ground level, ozone can cause lung damage, eye irritation, respiratory tract problems and can damage vegetation.

By learning how ozone is formed and how we all contribute to its production, students can begin to think about how to stop the pollution problem. Learning how to keep our air clean is a valuable lesson for today and the future.

## **Michigan science objectives covered by this series of activities:**

### **Constructing new scientific knowledge**

1. Students will generate reasonable questions about the world based on observation.
2. Students will develop solutions to unfamiliar problems through reasoning, observation, and/or experiment.
3. Students will develop strategies and skills for information gathering and problem solving.

### **Reflecting on scientific knowledge**

1. Students will develop an awareness of the need for evidence in making decisions scientifically.
2. Students will develop an awareness and sensitivity to the natural world.

### **Using scientific knowledge, physical science matter and energy**

1. Students will be able to use scientific knowledge to classify common objects and substances according to observable attributes: color, size, shape, smell, hardness, texture, flexibility, length, weight, buoyancy, state of matter, magnetic properties.
2. Students will be able to use scientific knowledge to identify the properties that make air useful.
3. Students will be able to use scientific knowledge to identify pollutants that threaten the air supply.

### **Changes in matter**

1. Students will describe common physical changes in matter (size, shape, melting, freezing, evaporation, and dissolving).
2. Students will have the opportunity to prepare mixtures and separate them into their component parts.

## Teachers Resource Page

Are your students curious about air quality in West Michigan? Have they noticed that sometimes the meteorologists on local weather stations talk about *Ozone Action!* days? Do they know the difference between “good” ozone and “bad” ozone? Do they know what to do on an *Ozone Action!* day?

To help answer these and many more questions, the West Michigan Clean Air Coalition has prepared this website guide for you to find lots of information about ozone. Here is a word on “good” and “bad” ozone...



The chemical structure of ozone is  $O_3$  as compared to oxygen which is  $O_2$ . The additional oxygen atom makes ozone very reactive which is good in the upper atmosphere (the ozone layer) but harmful in the lower atmosphere (a component of smog). Ozone is produced through complex photochemical reactions involving natural atmospheric gases, volatile organic compounds (VOCs), nitrogen oxides and sunlight. Hot days can accelerate these reactions. Elevated levels of ground-level ozone make breathing more difficult – especially for people with respiratory problems. It can also damage vegetation and materials.

The *Ozone Action!* Program informs people when elevated ground-level ozone values are anticipated and it offers tips for reducing ozone formation. Since vehicle exhaust and gasoline vapor contribute to the chemical mix, many of the “clean air” tips involve reducing emissions from cars and equipment such as gasoline powered lawn mowers.

Here are some of the great resources available on ground-level ozone:

### ***West Michigan Clean Air Coalition***

<http://www.wmcac.org/>

A group of concerned businesses, educational institutions, non-profit organizations, and government agencies are spreading the word about the West Michigan ozone problem. This site has specific information on when West Michigan *Ozone Action!* days occur, a list of tips for *Ozone Action!* days, and free materials.

### ***Clean Air Coalition of Southeast Michigan***

<http://www.semcog.org/Services/OzoneAction/index.htm>

Check out the fantastic teacher resources at this site. You are going to want the Spatially Plotted Ozone Tracking System (S.P.O.T.S) program for your computer and there are excellent downloadable lessons complete with grade appropriate lessons. Material was specifically developed (by educators) to tie in with Michigan math and science goals and objectives and MEAP science proficiency standards. Don't miss this one!



Would you like maps that show ozone levels and where the Ozone Action! days are happening?

✧ Take a look at the **U.S. Environmental Protection Agency Region 5** website at: <http://www.epa.gov/docs/reg5oair/ozoneday/ozoneday.htm> for regional information and links to ozone action day programs.

✧ The **Michigan Department of Environmental Quality** <http://www.deq.state.mi.us/aqi/ozone.shtml> provides hour-by-hour ozone readings at selected sites on Ozone Action! days and information about air quality in Michigan.



✧ Also, the **National Weather Service** in Grand Rapids has an interesting site. [http://www.crh.noaa.gov/grr/main/weather/current/index\\_current.html](http://www.crh.noaa.gov/grr/main/weather/current/index_current.html)

✧ One of the best national sites is **AIRNow** at <http://www.epa.gov/airnow/> that has information on the Air Quality Index, ozone maps and animation, air quality forecasts, a kid's page, and facts about health issues. This site offers students the opportunity to compare air quality with meteorological events on a national scale.



Some other fun sites with games, activities, and fact sheets include:



**Southeast Texas Regional Planning Commission**  
<http://www.ozoneactionday.org/ozone.asp>

**Houston-Galveston Area Council**  
<http://www.cleanairaction.org/education/education.html>



**Air & Waste Management Association**  
The A&WMA West Michigan Chapter offers teacher workshops and can provide Air Quality Resource Guides upon request.



<http://www.wmawma.org/> and  
<http://www.awma.org/resources/education/ozone.pdf>

Many other Internet websites provide information and activities that can help you teach your students about *Ozone Action!* If you find some good links, e-mail the West Michigan CAC at: [cleanair@wmcac.org](mailto:cleanair@wmcac.org) and we can add them to our list. Let us know if you would like to request an *Ozone Action!* speaker to come to your classroom or if we can help you with other resources.

# What is Air?

## *Discussion Starter*





## What is air?

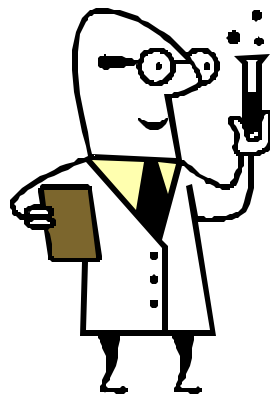
### Introduction:

In this activity, students will be asked a series of questions to see what they know about air – some possible answers are provided. Teachers can then choose from the accompanying series of activities to help students check their assumptions about air.

Ask students to back up their answers with evidence. Questions for students:

1. What do you know about air?
  - We breathe air
  - Air is a gas
  - Air makes up the atmosphere
2. What are some things you have observed about air?
  - Air moves (wind)
  - Air can change temperature
  - Air can smell
  - Air can be seen (water vapor, smoke)
  - You can feel air when it moves (wind)
  - You can see air moves things (storms)
  - Moving air makes weather
  - Hot air rises (hot air balloon)
3. How do living things use air?
  - To breathe (oxygen)
  - Plants use air to make food (CO<sub>2</sub>)
  - Birds use air to fly
  - Seeds are distributed by the wind
4. How does air become polluted?
  - Industry
  - Individuals actions (driving, mowing)
  - Air coming from other areas
  - Transportation (planes, trucks, trains)
5. Is all air clean?
  - Some air is polluted
  - Sometimes we can see air pollution
  - Sometimes we can smell pollution
6. What are the properties of air?
  - Air is transparent
  - Air has weight
  - Air takes up space
  - Air is a gas
  - Air is made up of molecules and atoms

# What is Air? *Air is a Gas!* Lab



## What is air?

### *Air is gas!*

#### Overview

Gas is one of the three states of matter. The two other states of matter are solids and liquids.

#### Time

One Class Period

#### Materials

- 3 glass containers, such as screw top jars
- a block or solid object that will fit into the container
- water

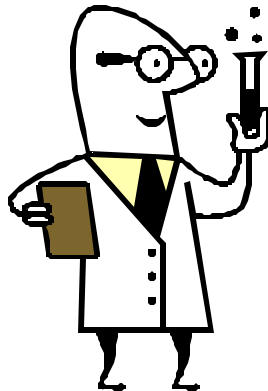
#### Procedure

1. Set the three glass containers on a desk, one containing the solid object, another containing some water and the third containing “nothing”.
2. Have students describe what they see in relation to these three states of matter. Possible answers include:
  - Solid has its own shape inside the jar.
  - Liquid takes the shape of the container but has one free surface.
  - Gas fills the entire container. How can we push the gas out of the jar?
3. There may be some other properties they can name. Ask students what they notice about these states of matter when they are compressed. Older students may be able to talk about the distance between molecules in the three states of matter as well.
4. Take them as far as they can go!

#### Linking activity with *Ozone Action!*

1. We need to breathe air to live. If our air is not clean, it affects our health.
2. Just because we can not see pollution does not mean it is not in the air we breathe.
3. Taking actions on *Ozone Action!* days helps keep our air clean.
4. What are some simple actions students can take that can help clean the air? See TIP Sheet.
5. How might we know if our air is not clean? Have students draw pictures of, or list things they think make our air dirty.

**What is Air?**  
*It moves and it smells!*  
**Lab**



## What is air?

### *It moves and it smells!*

#### Overview

This demonstration and exercise will help students to understand the development of the movement of air, assist them in learning how to gather and analyze data, and encourage skills in both math and science.

#### Time

One Class Period

#### Materials

- Small container
- Household ammonia
- Classroom map (included)
- Four colored pencils or crayons

#### Procedure

- Set a small container of household ammonia on your desk during a discussion on air.
- When all of the students are seated and you are talking about things we observe about air, open the lid on the ammonia container.
- See how long it takes for the first student to notice the smell.
- Students should observe that the odor moves from the source to the farthest place from the source. Does anything affect how the smell is carried through the room (such as a breeze from an open window)?
- Students can plot the time and distance, tracking how air (and the odor) moves through the room (see student handout – classroom map).

#### Linking activity to *Ozone Action!*

1. After pollutants are released, they are moved to other communities by the wind.
2. Our own actions affect other people who might not even live near us. Can students name some neighboring communities?
3. Can students name some activities they (or their parents) do that might affect the air (and other people)?
4. What are some simple actions students can take that can help clean the air?

## Air can smell and move Classroom Map

Back of classroom


Front of classroom

This exercise will show you how air moves in your classroom. Your teacher will open a container that smells in the classroom indicate on the chart how many students can smell it after a period of time. Make sure to fill in the color next to the intensity level. Repeat the exercise and note changes in the intensity.

**Time** \_\_\_\_\_

**Intensity**

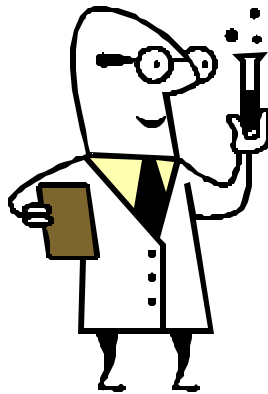
\_\_\_ 1 - No Odor detected at all

\_\_\_ 2 - Begin to smell odor

\_\_\_ 3 - Odor is strong

\_\_\_ 4 - Odor is very strong

**What is Air?**  
*How do living things use it?*  
**Lab**



## **What is air?**

### ***How do living things use it?***

#### **Overview**

Helping students understand how air is used by the body is very helpful in teaching them to appreciate the necessity of clean air. Subjects include math & science.

#### **Time**

One Class Period

#### **Materials**

- Student-made pictures of bones, liver, heart, lungs, small intestine, large intestine, brain, kidneys, muscles, stomach or mouth
- Thirty to forty (30 to 40) ping-pong balls in two colors, one color representing clean air, one color representing pollution.

#### **Objectives**

After participating in or observing the lesson students will be able to:

- Explain how the body uses air
- Identify at least three of the body's major organs
- Explain how pollution interferes with air delivery throughout the body



## What is air?

### *How do living things use it?*

#### Procedure

1. After students are finished creating their pictures of the basic respiratory tract, have the class count the number of times they breathe per minute. Does each student breathe at the same rate? What would change their breathing rates? Can they figure out how many times they breathe in one day?

2. Share the following information with the students:

Oxygen is inhaled through the nose and mouth. It enters the lungs and is transported to other organs through the blood. Once used, leftover air, or waste air, moves back to the lungs so that it can be exhaled through the mouth.

3. Start the simulation:
  - Choose students to act as the body parts. They will tape a picture to their shirts. Provide a handful of balls to other students who will serve as inhalation and exhalation.
  - To begin, “clean air” is handed to the mouth who then passes it on to the lungs. The lungs in turn, pass the air to the heart who keeps the ball before passing the rest to another organ who does the same. Eventually, all organs have air and the waste air is returned to be exhaled through the mouth.
  - In the next part of the activity, pollution mixes with air. Students, taking air, must close their eyes when choosing the balls. In the end, we will see that polluted air has interfered with the delivery of clean air to the organs that need it.

#### Linking the activity to Ozone Action!

1. What happens when the air has things in it that are not good for us?
2. How does the quality of air affect our health and our lives?
3. What are some simple actions students can take that can help clean the air?

**What is Air?**  
*Is it clean?*  
**Discussion Starter**



## What is air?

### *Is all air clean?*

#### Preparation

Discuss the fact that some of the gases we find in air can be harmful. One of these gases is Ozone ( $O_3$ ). In the atmosphere, we have three forms of oxygen:

$O$  = elemental oxygen

$O_2$  = molecular oxygen

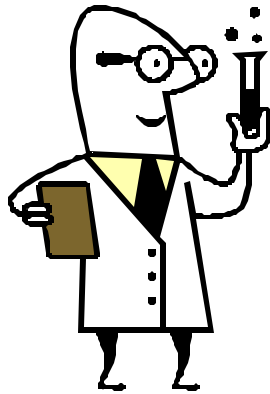
$O_3$  = Ozone

Naturally forming ozone up high in the stratosphere is good. It protects us, and the earth, from the sun's harmful ultraviolet rays. Ozone at the ground level is bad for us. Ground-level ozone affects people's breathing, especially children, elderly, people with a respiratory ailment like asthma and those who exercise strenuously outdoors. At the ground level, ozone is formed when pollution (from cars, factories, and other sources) is "baked" by the sun. This bad ozone is likely to form on days when the temperature is above the mid-80s and there is little wind or cloud cover. When the ozone at ground level is really bad, you can see it and it is sometimes called smog. Thinking about how we contribute to air pollution (and taking actions to prevent it) will help ensure we keep our clean air.

#### Linking activity with Ozone Action!

1. Besides people, what needs clean air (oxygen) to live?
2. Can students cite examples of activities that pollute our air (make it "dirty")?
3. Why is Ozone a problem for us from May – September?
4. Can students identify weather conditions that might cause ground-level ozone?
5. What are some simple actions students can take that can help clean the air?

# Moving Air! Lab



## Moving Air!

### Overview

The movement of air masses can be confusing and difficult for students to conceptualize. This activity aids in the understanding of how air and its contents move.

### Time

One Class Period

### Materials for the Race

- Marble
- Ball of yarn
- Clothes pin
- Rubber ball
- Crayon
- Leaf
- Small pebble
- Pencil
- Facial tissue
- Blown up balloon
- Feather
- Sand

### Other Materials

- Graph Paper
- Masking Tape
- Yardstick

### Objectives

After participating in this hands-on activity, the students will be experienced in:

- Observing data
- Gathering data
- Recording data
- Interpreting data
- Applying data to generalized statements
- Explaining how air currents might move pollution from one area onto another, adding to problems on *Ozone Action!* days.

## Moving Air!

### Background Information

Wind is moving air. The wind has energy and can push objects in the direction it is blowing. For example, the wind can move things we can see like a tree, the grass, your hair and sand. The wind can also move very small objects that cannot be seen like ozone which is a colorless, odorless gas.

People hear in weather reports about how fast the wind is blowing. If the wind is moving 10 miles an hour, that means it can push pollution ten miles in a single hour – faster than most people run! The air can push things, like leaves and balloons, and air pollution, from one place to another. Sometimes wind is good; people love to kites, or find pretty colored leaves. Sometimes, wind is bad; we don't like it when a horrible smell comes our way from somewhere else. All of those things, good and bad, move with the air, pushed by the wind.

### Procedure

1. Read the background information to the class and tell them to imagine that they had to move an object without touching it. What would they do? Write answers on the board.
2. Have they ever blown a piece of hair out of their eyes? Have they ever had their hair dried with a blow dryer? What happens? Wind can move things.
3. Show the students some of the objects (listed in the materials section) one at a time and have them name them. Do the students think they can move all of these objects with wind?
4. Present rules for the activity to the class (low voices, only one person out of their seat at a time, no running or throwing and keep hands to yourself are some suggestions).
5. Make sure that the table tops are clean and dry for the “race”. Place a piece of masking tape about two feet long on one end of the students’ tables for the starting line. Three feet away, place another piece of tape about two feet long for the finish line. Gather all of the objects for the “race” and place them in boxes; one for each group.

## Moving Air! (continued)

6. Form groups of five students. Once they are in groups, have the students count off, if necessary. Pass out role labels according to numbers. All of the ones are “Gophers” twos are “Wind,” threes are “Timekeepers,” fours are “Recorders” and fives are “Encouragers.”
7. Announce to the class that they now are going to find out if they can use wind to move all of these objects and explain the instructions. If there are no questions, have the “Getters” come up to the front and pick up the materials they need.
8. Have the “Getters” place one object on the desk and say: “On your mark, get set, go!” The “Wind” will then blow on the object until it crosses the finish line. “Recorders” will count the number of blows it takes to move the object the entire distance and the “Encouragers” will record the number on their graph by coloring in the corresponding number of blocks. “Timekeepers” will monitor the length of time given for the race, (30 seconds to one minute) depending on the length of the desk.
9. The race continues until all of the objects have crossed the finish line or until time is up.

**Note:** Have the students read the names of the objects printed at the bottom of the graph to be sure they know where to record the data for each object, or have the students draw pictures to identify each object.

### Questions and anticipated responses

- What might have made the objects move? Your breath, air, wind, number of blows...
- What is wind? Wind is moving air. The wind has energy and can push object in the direction in which it is blowing.
- Which objects took the most blows to move? Clothes pin, pebble, crayon, pencil...
- Why? Bigger, heavier, not round...
- Which objects took the least amount of blows to move? Hats, windmills, leaves, flags, dust, clouds, paper, balls...
- Do you think it makes a difference what direction the wind comes from in order for something to move in a certain direction? Hint: Think about your investigation. Yes, you have to blow it in the direction you want it to go (finish line). Yes, if you blow from an angle it might not move or it might go in a different direction.

## Moving air!

### *Extension Activities*

**Wind-powered puffs:** Discuss ways in which the wind is helpful to us and how we might use the wind to help us accomplish tasks. For example, we use hair dryers, clothes dryers, fans and we even blow on hot food to cool it before we eat it.

Encourage the students to think of other ways to use wind. Invite children to use their wind power to accomplish a task. Divide the class into four or five equal teams. Have one person from each team kneel behind a starting line. Place a cotton ball in front of each person. On the start signal, have each student blow the cotton ball with just one puff. Measure how far the cotton ball went. Repeat until each student has had a turn. Graph the results. Discuss the results. Discuss some of the problems with wind power, such as harnessing its energy and controlling its effects and the way it can bring unwanted things (like pollution and odors) in the area.

**Wind-powered rocket:** Show the students a picture of a wind turbine and explain how wind can help generate power that can be used to create energy. Demonstrate how to build a wind-powered rocket with the following instructions:

1. Stretch a string tightly from one side of the room to the other.
2. Thread the string through a plastic drinking straw.
3. Blow up a balloon and hold the end with a finger to prevent air from escaping.
4. Using tape, attach the balloon to the underside of the straw.
5. Let the air out of the balloon and watch the “rocket” fly across the room on the string.

Give each student a plastic drinking straw and a balloon. Have students work in pairs to stretch a string between two points and launch their rockets. After they have had a chance to experiment, discuss the scientific principle of the wind-powered propulsion.

**Wind picture:** Give each student a 9”x12” sheet of black construction paper and a straw. Drop a few drops of diluted white paint in the center of each child’s paper and encourage students to aim the straw at the paint and blow into it to create an interesting, wind-blown design. It is important that the straw does not touch the paint. For variety, try using bright colors of paint on white construction paper.

### **Make stuffed clouds.**

Have students put two pieces of butcher or construction paper, one on top of the other, and cut a large cloud shape through both layers. Then have students paint, color, or decorate (with glitter, tissue, etc.) both of the outer layers. Staple the edges, leaving an opening to stuff with newspaper; then staple the remaining opening. Hang the clouds around the room.



## Moving Air!

### *Cross curricular extension activities*

#### **Math:**

There are a few math activities in this learning cycle. During the exploration, students will record and graph the number of blows it takes to move each of the objects. Elaborating with “Wind-Powered Puffs,” they are measuring distance and recording their findings on a graph.

#### **Language Arts:**

Read a poem about wind and have students write their own rhymes and poems about wind. (Recommended: “Who Has Seen the Wind” by Christina Rossetti.)

Read the book The Wind Thief, by Judi Barrett. Make hats out of newspaper and masking tape by placing two sheets of paper on your head and having someone else take the tape and wrap it around your head where the newspapers are. Fold the sides up or down to create a unique design, students can then decorate their hats. If it is a windy day, take the students, while wearing their hats, outside and let them see what happens.

#### **Social Studies:**

Ask the students: In history, what significant events has wind been involved in? Does the wind ever change direction? How can you tell? For study, have the students construct a wind vane and investigate the direction of the wind for three days. To make a wind vane, you need an eraser, a pencil, a straw, oak tag and a straight pin. Cut the point and tail arrow out of oak tag and tape them to the straw. Put the pin through the straw into the eraser end of the pencil. Stick the pointed end of the pencil into a flat eraser, and glue to a square piece of oak tag. Label the sides of the oak tag base North, East, South, and West and set the wind vanes outside with the north sides facing north. Record the direction of the wind for three days.

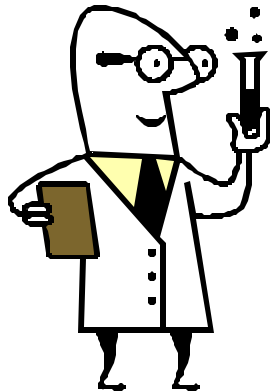
#### **Environment:**

Make an imaginary map of an imaginary city where people live on the south side of town; factories manufacture things on the north side of town and there are many cars, trucks and buses; the east side of town is surrounded by lakes, and the west by forests. Encourage students to imagine they live in a town on a day when the wind came from the east. What would they feel? Water? Warm air or cold air? Why? What would they smell? Fish? Ask students to imagine the wind changes direction and is now blowing from the west. What would they see? Leaves blowing? Dirt blowing? What might they smell? Animals? Trees? Flowers? Ask students to imagine the wind came from the north side of town. What would that be like? Would there be pollution? Would it smell bad? Look funny? Ask student to consider their own pollution and how it blows other places, too. Ask students to think about the sources of pollution and what they can do to reduce the amount of pollution they put into the air that moves, blown by wind.

# No More Ozone!

## *The Rain Game*

### Lab



## **No more ozone!**

### ***The rain game***

#### **Overview**

The effect of weather on air quality is difficult for students to conceptualize. This activity encourages an understanding of how weather can both help form and dissipate air pollution.

#### **Time**

One Class Period

#### **Materials**

- Assorted colored construction paper
- Rope or hula hoop

#### **Objectives**

After participating in this hands-on activity that simulates the processes of ozone formation and precipitation, the students will be able to:

- Explain how weather influences ground-level ozone formation and depletion
- Explain the precipitation
- Explain why precipitation happens

## **No more ozone!**

### ***The rain game***

#### **Background Information**

In the summertime, the West Michigan Clean Air Coalition calls *Ozone Action!* days to encourage people to reduce the amount of pollutants in the air. That is because hot, sunny days help turn pollutants into ozone – a lung irritant when excessive amounts are inhaled. West Michigan never has *Ozone Action!* days when it rains, because rain helps to get rid of ground-level ozone.

#### **Procedure**

Outside, or in a room with plenty of space, have the students line up and count off one through six. Tell all the students in group one that they are pollution from factories, blowing in the wind. Tell group two they are people driving cars. Students in group three are the pollutants escaping from cars (they will have to stay close, at first, before moving with the wind) and students in group four are people mowing lawns. Students in group five are pollutants from lawn mowers and group six represents light and heat from the sun.

Tell the students to imagine that the world's people are still asleep and as the sun rises (Group six should "rise and shine") the people start to wake up too. Next, some people drive to a work (polluting); the factory starts to work (maybe polluting). Other people start to mow their lawns and the pollutants start to mingle together. Later in the morning, the sun is higher in the sky shining everywhere and lots of people are driving around and pollution from driving is mingling with other pollution. At lunch time, the sun is at the highest point in the sky it can be and people take breaks for lunch. The factories stop working, the people mowing lawns go inside to eat and the people driving get out of their cars and go to lunch, too. All the students who stopped the simulation should sit together, in a group, and watch what happens next, while pollution that is still moving in the air begins its transformation.

Imagining that they are transforming the others, students from group six (sunshine) should gently tap the pollutants on their arms while the others sit and watch. When the "pollutants" feel the sun tap them on the arm, they are to join hands. In the end, the students have formed a giant mass of ozone.

Explain to the students that pollution and sunlight, together, create ozone. They are now ozone, staying at ground level, in the air we breathe. The ozone plume should move slowly toward the group of "polluters," and sit down with them.

When all students are sitting explain the difference between naturally occurring ozone in the stratosphere (protects us from ultraviolet radiation) and ozone in the troposphere (a lung irritant). Explain that there are a lot of things being done to decrease the pollution



that causes ground-level ozone. One thing students can do is participate in the *Ozone Action!* program. This program encourages people to reduce pollution on days when weather conditions make ozone formation more likely.

Ask students to talk about what their families do, or can do, to reduce the emissions that cause ground-level ozone.

Explain that weather, while it helps to make ozone, can also help get rid of it. One weather condition that is really helpful is rain. Give each student a piece of construction paper and have them tape each piece in a random pattern on the ground.

Instruct each student to stand on top of their piece of construction paper with their arms outstretched. Tell them they are going to pretend they are a small drop being blown about by wind. When you say “go”, have the students move from their piece of paper to another of the same color, keeping their arms spread out to their sides.

Each time one student touches another, they should grab hands as if they were becoming a larger cloud drop and continue moving on to a piece of paper which has the same color as the one from which they came. If students from two different colors should happen to collide en route, they should combine and move to the closest piece of colored paper. This will be the group’s new color. Larger drops move about intermixed with smaller drops and keep combining in a similar manner. When a drop has five students in it they have formed a rain drop and they should go to the puddle area and sit down. The puddle area is defined by a roped off area or hula hoop, located out of bounds. If drops combine to make a single drop of six or more, students then should divide it in half, choose new colors, and remain moving throughout the cloud. Continue this game until the cloud in rained out and the puddle is full.

Tell the students that the rain destroyed all of the bad ozone and that the air is clean, as it was washed by the rain.

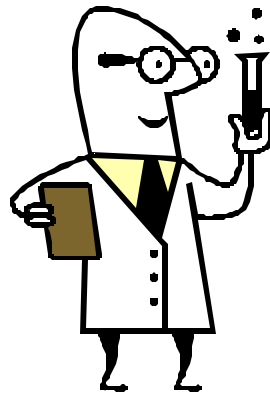
Ask them to discuss what they learned about how weather helps ozone form and how it also helps destroy ozone.

Remind them that there is a lot they can do, on *Ozone Action!* days, as well as, to reduce ozone-forming pollution.

**Handout:**

Kid *Ozone Action!* Tips, 25 Things You Can Do to Keep Air Cleaner Every Day.

# Making an Alphabet Book Activity



## Making an alphabet book

### Overview

Making an *Ozone Action!* alphabet book is a fun learning experience for students. It can be used in many subjects and helps students learn about a topic through research, drawing, writing and completing a finished product.

### Time

Depending on the depth of information in the alphabet book, this can take anywhere from two to five class periods.

### Materials

- Access to dictionaries, encyclopedias, and the library
- *Ozone Action!* Tip cards
- *Ozone Action!* meteorological forecasting notes
- *Ozone Action!* glossary
- Magazines
- Scissors
- Glue or tape
- Pencils, crayons, and other drawing media

### Objectives

As a result of this activity, the students will:

- Be very familiar with the *Ozone Action!* program and with air quality vocabulary words
- Improve their thinking skills, research skills, art skills, language skills and cooperative skills

## Making an alphabet book

### Background

*Ozone Action!* helps people to protect themselves and others from ground-level ozone pollution by teaching them about things they can do to reduce pollution on *Ozone Action!* days.

*Ozone Action!* days are the hot, sunny days that meteorologists forecast as being the most likely to produce excessive amounts of ground-level ozone in the air we breathe. They occur during ozone season, between April 1 and September 30, when West Michigan has the most sun and the most heat. The Michigan Department of Environmental Quality's team of meteorologists calls *Ozone Action!* days based on weather conditions. Certain weather conditions, like sun and heat, are part of the conditions that turns pollution into ozone. On *Ozone Action!* days, people can really help to make a contribution by reducing the amount of pollution they put into the air.

Ground-level ozone is unhealthy in the air we breathe. It can hurt our eyes, noses and lungs. It is especially bad for people who have asthma or other breathing problems, people who work or play strenuously outdoors or for the elderly. Following *Ozone Action!* tips are as easy as 1-2-3. Teaching people about ozone and *Ozone Action!* is as easy as A-B-C. Even when it's not ozone season in Michigan, we can still take Action! by helping teach people about ozone, pollution and activities that stop them. That's a year round job.

### Procedure

1. Look at other alphabet books. (Recommended: "Animalia" by Grahame Base.)
2. Assign letter of the alphabet to individuals, partners, or groups.
3. Have students do research to find the core word for each page, if brainstorming does not help them agree on a particular word. Research can include *Ozone Action!* materials in your teacher resource kit, internet search, or visiting the school library.
4. Have the students create sentences for each of the pages that include nouns, verbs, adjectives, and adverbs plus other words if wanted or necessary. The sentences should explain the word's role in *Ozone Action!*
5. The students will work together designing the pages of the book, putting pictures of the words/activities/etc. in context, and including other relevant *Ozone Action!* words that begin with the same letter.
6. When they are finished, students will share their pages, explaining their work to class.





## Teacher Evaluation Form

**Your feedback is necessary to make these resource guides a success.**

Remain anonymous, if you wish, but please do complete the following items and return this form to the West Michigan Clean Air Coalition:

Name \_\_\_\_\_

School \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Phone Number (\_\_\_\_) (\_\_\_\_ - \_\_\_\_\_) Email: \_\_\_\_\_

Please tell us what grade level and/or subjects you teach: \_\_\_\_\_

Total number of students participating in class using  
*Ozone Action!* classroom materials \_\_\_\_\_

Which *Ozone Action!* Resource Guide(s) did you use?

- ? K-5
- ? Grade 6-8
- ? Grade 9-12

Please rate your agreement with the following statements using a scale of 1 to 5.

Ozone Action! background information is complete and helpful.

1 = strongly disagree   2 = disagree   3 = neutral   4 = agree   5 = strongly agree

Ozone Action! classroom science activities are useful and relevant to class room needs.

1 = strongly disagree   2 = disagree   3 = neutral   4 = agree   5 = strongly agree

Ozone Action! classroom science activities are complete and easy-to-follow.

1 = strongly disagree   2 = disagree   3 = neutral   4 = agree   5 = strongly agree

Ozone Action! classroom activities are easy to integrate into daily lessons.

1 = strongly disagree   2 = disagree   3 = neutral   4 = agree   5 = strongly agree



Activities are well-received by students.

1 = strongly disagree    2 = disagree    3 = neutral    4 = agree    5 = strongly agree

I would teach *Ozone Action!* activities in my classroom again.

1 = strongly disagree    2 = disagree    3 = neutral    4 = agree    5 = strongly agree

I will use *Ozone Action!* classroom activities and lessons again next year.

1 = strongly disagree    2 = disagree    3 = neutral    4 = agree    5 = strongly agree

Please share your thoughts on the *Ozone Action!* education packet. What I liked best about the Ozone Action! Teacher Resource Kit. (Please give us an idea of what worked well for you).

What I liked least about the *Ozone Action!* Teacher Resource Kit. (Please give us an idea of what did not work well for you, any information you felt was missing, etc.)

What changes would most help you meet your teaching needs? Please use a separate sheet for additional comments if necessary.

*Fax or send completed form to  
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