

# Environmental Protection Agency's Formal Complaint Against Chemistry Themed Inc.

Violations:

Illegal Dumping of Wastes  
Excessive Air Pollution Release



Chemistry Themed  
EPA Fine and Environmental Concerns 2016-17

Date	In-Class Assignment	Homework
F 2/24	<b>EPA Fine!</b> - Illegal Dumping - Illegal Offshore Drilling What is our impact? Poodwaddle.com What do we do? Acid Rain PPT pkt p. 7-9	Read Sections D.7, D.8, and D.10 textbook p. 248-252 and 254-256 and answer questions on pkt p 10
M 2/27 <b>Late Start Day</b>	Smog City pkt p 11-15	Finish Smog City if needed
T 2/28	Discuss Smog City Climate Change PPT pkt p 16-17	Read Newspaper Article pkt p 18 and go to <a href="http://www.ecologicalfootprint.com">www.ecologicalfootprint.com</a> and fill out the survey. Print off your results.
W 3/1	Discuss Ecological Footprint Discuss Alternative Energy Project - Pick Groups and Alternative Energy Type Alternative energy planning sessions pkt p. 19	



## From the Office of the Environmental Protection Agency

This serves as a formal notice that your company has violated the following Environmental Protection Agency (EPA) codes.

**Location of violation:** *Cu Unlimited Mine*, located in Salt Lake City, UT

**Violation:** Illegal Dumping

**Dates in Question:** December 14<sup>th</sup>, 2015 - current

- “6.1. It shall be unlawful for any person/company to dump, scatter, or place, or cause to be dumped, scattered or placed any solid waste, material, hazardous or not, which includes any substance produced through industry and/or mining.”
- “9.1. Any person/company who violates any of the provisions of this code is subject to an assessment of civil damages for such unlawful activities. Any person/company who is found by the court to have committed the alleged violations shall be subject to a civil penalty in an amount up to \$5,000 for each day of each violation.”

**Location of violation:** Petroleum Refineries under the operation of Chemistry Themed Inc. throughout the United States

**Violation:** Air Pollution release

**Dates in Question:** February 2<sup>nd</sup>, 2016 - current

- “5.2. Failure to control emissions from an oil/water separator.”
- “5.3. Failure to make a first attempt repair within 5 days.”
- “5.4. Release of hazardous air pollutants, which includes SO<sub>2</sub>, NO<sub>x</sub>, and excessive amounts of CO<sub>2</sub>.”
- “9.2. Any person/company who violates any of the provisions of this code is subject to an assessment of civil damages for such unlawful activities. Any person/company who is found by the court to have committed the alleged violations shall be subject to a civil penalty in an amount up to \$7,500 for each day of each violation.”

The company in question must respond to this/these allegation(s) within 5 business days. This response must include how the company in question will remediate the above allegation(s).

## Word Ball

If the Earth  
were only a few feet in  
diameter, floating a few feet above  
a field somewhere, people would come from  
everywhere to marvel at it. People would  
walk around it, marveling at its big pools of water,  
its little pools and the water flowing between the pools.  
People would marvel at the bumps on it, and the holes in it,  
and they would marvel at the very thin layer of gas surround-  
ing it and the water suspended in the gas. The people  
would marvel at all the creatures walking around the surface of  
the ball, and at the creatures in the water. The people would  
declare it as sacred because it was the only one, and they  
would protect it so that it would not be hurt. The ball would  
be the greatest wonder known, and people would come  
to pray to it, to be healed, to gain knowledge, to know  
beauty and to wonder how it could be. People  
would love it, and defend it with their lives  
because they would somehow know that  
their lives, their own roundness, could  
be nothing without it. If the  
Earth were only a few  
feet in diameter.

By Joe Miller

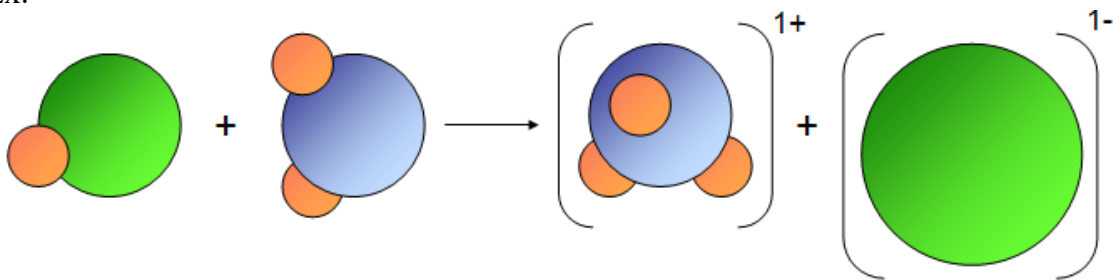


# Acids and Bases

Sections D.7, D.8, D.10

1. List two examples of acids.
2. What do acids have in common, based on their formula?
3. What is the definition of an acid?

Ex:



4. List two examples of bases.
5. What do bases have in common, based on their formula?
6. What is the definition of a base?

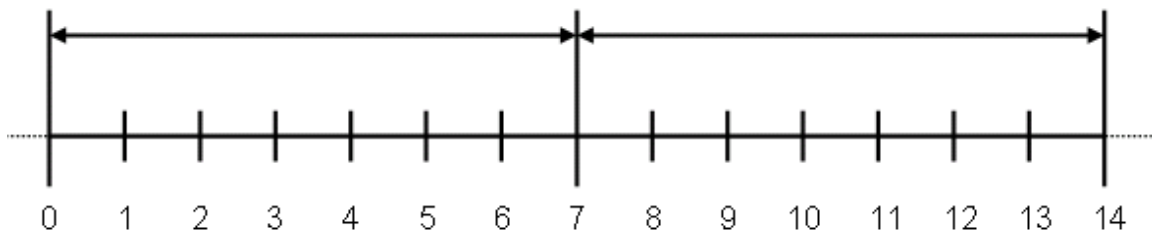
## pH

7. What is the definition of the pH scale?
8. Name a couple of different ways to determine the pH of a solution.

**Use the chart below to answer the following questions.**

9. Label the ranges above for ACID, BASE and NEUTRAL.

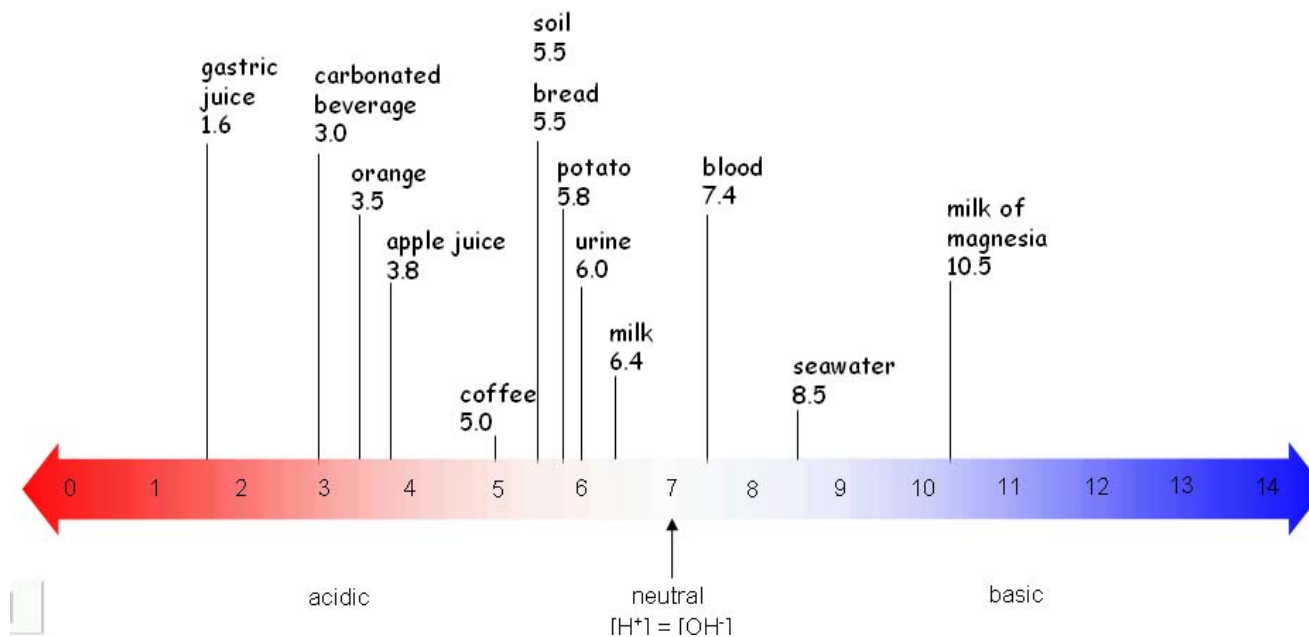
10. What does each step on the pH scale represent?



11. pH 5 vs pH 6 \_\_\_\_\_ times more (acidic/basic) circle one

12. pH 3 vs pH 5 \_\_\_\_\_ X different

13. pH 8 vs pH 13 \_\_\_\_\_ X different



14. What is the pH of pure water?

15. What is the pH of rain water?



16. Why is rain water naturally acidic?
  
17. What is the pH of rain water? Why?
  
18. What is one reason that rain becomes MORE acidic?
  
19. Give the equation that proves this.
  
20. What are other sources of pollution that contribute to Acid Rain?
  
21. According to the National Atmospheric Deposition Association, what was the pH of rainwater in the Chicago area in 2005?

**Read sections D.7, D.8, and D.10 in your text and answer the following questions:**

1. What is the book's definition of acid rain? (D.7)
2. What are some natural events that can contribute to the acidity of precipitation? (D.8)
3. Give at least one example of a chemical equation that shows how acid rain is formed. (D.8)
4. What are some of the detrimental effects of acid rain on natural ecosystems? (D.10)
5. What are some of the detrimental effects of acid rain on non-living things? (D.10)
6. What does it mean when they say "air pollution knows no political boundaries"? (D.10)
7. Look at the chart on the bottom of p 256. What is the biggest contributor to SO<sub>2</sub> emissions?
8. How did the Clean Air Act Amendment of 1990 cause the SO<sub>2</sub> emissions go down? (D.10)
9. How have power companies accomplished the reduction in SO<sub>2</sub> emissions? (D.10)
10. Look at the chart on the bottom of p 256. Where do most of the NO<sub>x</sub> emissions come from?



**PURPOSE:** The purpose of this lab is to understand how various components of our atmosphere and environment interact to produce smog and to determine ways in which smog levels can be reduced.

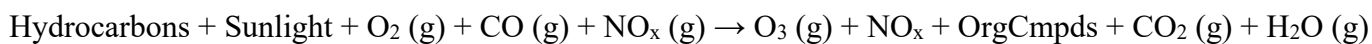
**BACKGROUND INFORMATION:** (This must be completed in order to do the lab. Information may be found in Section D.3, p 245-248).

Define the following terms:

1. Smog
2. AQI
3. Synergistic interaction
4. Temperature inversion
5. Photochemical smog

*(BACKGROUND INFO cont. on next page)*

The chemical reaction for photochemical smog is below:



Sunlight and O<sub>2</sub> are naturally present. Where do the hydrocarbons, CO and NO<sub>x</sub> come from?

Three of the products of this reaction, O<sub>3</sub> (g), NO<sub>x</sub> and OrgCmpds are what make up smog. What harm do each of these cause?

**STOP! WAIT UNTIL CLASS TO PROCEED FURTHER!**

PROCEDURE: log onto: [www.smogcity.com](http://www.smogcity.com)

Read the introductory paragraph. List other harmful effects of ozone.

Click on “Run Smog City” on the left hand side of the screen. It takes a few minutes to load.

There are 9 settings that can be changed in Smog City. Try changing each of the settings and notice how the picture changes for each.

- Temperature: (5 possible settings-record as actual temperature)
- Thermal Inversion Layer (mountains): (Top pic record as “none”; middle pic =“med ”; bottom= “low ”)
- Wind Speed: (4 possible settings-record as “4” for the fastest, etc to “1” for no wind)
- Amount of cloud cover: (3 possible settings-record as “none,” “medium” or “complete”)
- Population: (5 possible settings) record as “5” for highest, etc to “1” for lowest)
- Cars and Trucks Emissions: (5 possible settings: record a “1” for the lowest to a “5” for the highest)
- OffRoad emissions: (5 possible settings: record a “1” for the lowest to a “5” for the highest)
- Industry Emissions: (5 possible settings: record a “1” for the lowest to a “5” for the highest)
- Consumer Products Emissions: (5 possible settings: record a “1” for the low to a “5” for the highest)

Randomly choose any setting for each of the 9 settings and record them below (see previous page for how to record each setting).

Temp	Thermal Inversion Layer	Wind Speed	Cloud Cover	Population	Car Emissions	Off Road Emissions	Industry Emissions	Consumer Products Emissions

Click on “What’s the AQI” on the left hand side of the screen. On the graph below, record what rating each line represents (they are color coded) NEXT TO the graph.

Click on START button and draw in your data below. Record the corresponding line in the rainbow graph below. Also, record the Health Effects at the Peak Ozone level in the bottom chart.



Did your ozone level change throughout the day? If so, what do you think caused the change?

**STOP. TEACHER CHECK POINT!!! Show your teacher your data and graph before moving on.**

Now you are ready to see how smog levels change with varying activity and environmental conditions.

## 1 Increase Population

1. Press the Reset button.
2. Increase population to the maximum.
3. Press Start.
4. Leaving all weather conditions as is, vary the EMISSIONS settings in a variety of trials (pressing START after each time) to see what emissions settings must be changed to move ozone levels into the healthy range.
5. Record all settings (including the population and weather conditions that remained constant throughout) that moved ozone into the healthy range.

Temp	Thermal Inversion Layer	Wind Speed	Cloud Cover	Population	Car Emissions	Off Road Emissions	Industry Emissions	Consumer Products Emissions

## 2 Discover the Effects of Weather

1. Press the Reset button.
2. Increase population to the maximum.
3. Turn all emissions knobs to maximum settings.
4. Your challenge now is to see how varying weather conditions (Temp, thermal inversion, wind speed and cloud cover) affect ozone emissions.
5. As a good scientist, you will use the scientific method, using proper controls and variables.

(A) Determine what combination of weather conditions give the LEAST amount of smog. Record your settings in the chart below.

Temp	Thermal Inversion Layer	Wind Speed	Cloud Cover	Population	Car Emissions	Off Road Emissions	Industry Emissions	Consumer Products Emissions

(B) Determine what combination of weather conditions give the MOST amount of smog. Record your settings in the chart below.

Temp	Thermal Inversion Layer	Wind Speed	Cloud Cover	Population	Car Emissions	Off Road Emissions	Industry Emissions	Consumer Products Emissions

(C) In general, what weather conditions promote high ozone levels?

### Create a Citywide Smog Crisis

1. Press the Reset button.
2. Set maximum temperature to 120° F.
3. Set inversion level to low.
4. Set wind level to “1.”
5. Set cloud cover to “none.”
6. Increase population to maximum.
7. Press Start.

What is the ozone rating?

As you did with the weather scenario, vary the emission levels to determine:

1. Which type of emission has the LEAST effect on smog levels?
  
  
  
  
  
  
  
  
  
  
2. Which type of emission has the MOST effect on smog levels?

#### **CONCLUSION:**

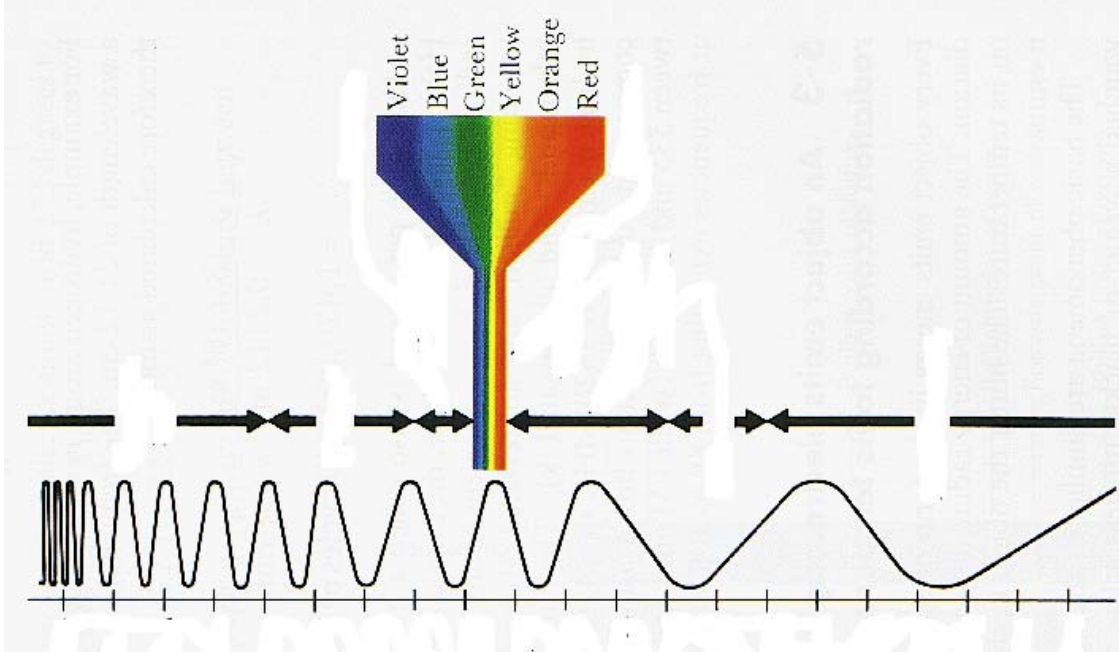
1. Applying what you have learned in this activity to the city of Chicago, what are some of our climate conditions which prevent smog in the city?
  
  
  
  
  
  
  
  
  
  
2. What are some climate conditions that promote smog in the city?
  
  
  
  
  
  
  
  
  
  
3. What are some things that can be done in the city of Chicago to decrease smog?

Ask your teacher if you can get extra credit for reporting on why Chicago is called “The Windy City”?

# Earth's Energy Balance

## Section B.2

1. What are the top four components of the atmosphere?
2. The Electromagnetic Spectrum: Fill in the spectrum below with the name of each type of wave.



### EXPLAINING THE GREENHOUSE EFFECT

3. What are the three forms of electromagnetic radiation emitted from the sun?
4. What happens to the radiation from the sun as it reaches our atmosphere?
5. What happens once the radiation hits the earth's surface?

*SOME of this radiation.....*



6. What happens to the rest of the radiation from the sun?
  
  
  
  
  
7. What are the three main gases that contribute to the greenhouse effect?
  
  
  
  
  
8. What is the GREENHOUSE EFFECT?
  
  
  
  
  
  
  
  
  
  
  
9. How much as the release of CO<sub>2</sub> into the atmosphere changed in the last 150 years?
  
  
  
  
  
  
  
  
  
  
  
10. What are some of the causes of this?
  
  
  
  
  
  
  
  
  
  
  
11. Is the use of renewable energy a way to change this?
  
  
  
  
  
  
  
  
  
  
  
12. What are some of the effects of global warming?

# Your ecological footprint on Earth

April 21, 2003, /By Betsy Vandercook.

Since I wear low heels and usually avoid mud puddles, I rarely leave footprints on the floor. But when it comes to my physical impact on the Earth, what environmentalists call my "ecological footprint," it's another thing altogether.

This global sort of footprint is defined as the estimated land area required for the crops, mines, oil and factories needed to maintain a particular lifestyle. We all, more or less, would like to step lightly on our planet. But I found that in spite of my efforts to commute by mass transit and eat organic apples, my personal footprint is a whopping 24 acres--or the same as an average American's. Problem is, there are only 4.5 biologically productive acres available per person, worldwide.

If everyone lived like me, we would need 5.5 Earths to sustain us all.

Two Canadian scientists, Mathis Wackernagel and William Rees, wrote a book outlining the methodology to compute ecological footprints. But trust me, if you read their book, you will quickly realize that doing these

calculations requires serious leisure time.

Instead, I'd suggest a short online quiz developed by the Earth Day Network, appropriately called

[www.myfootprint.org](http://www.myfootprint.org)

It works like this: After plugging in your country, city size and other basics, you answer a few simple lifestyle questions. For example:

How often do you eat meat?

What size is your home and how many people live there?

Do you have electricity? (How someone could have no electricity but access an Internet quiz gives one pause, but we continue.)

How far do you travel weekly using bikes, buses, cars or feet?

When you've answered everything, the final screen reveals your more-than-likely monstrous footprint.

I ran the numbers with my 15-year-old son, Noah, sitting nearby. When the 5.5 planets popped up, I turned to him, hoping for a discussion, and asked, "Well, what do you think of that?"

All he said was "How depressing" and went downstairs, probably to cook up a couple of hot dogs.

Left alone, I clicked on the "take action" option to learn how to reduce my impact. Eat less meat. Bike more. Turn off the air conditioning.

Maybe Noah was right. How could I ever consume enough vegetables or buy enough products in bulk to reduce my impact to a "sustainable" level?

What each of us chooses to do will help of course, but saying that our eco-impact is only about lifestyle choices is like telling someone with a thyroid condition to lose weight through will power alone.

I don't mean to pass the blame, but I'd really like to see a footprint quiz designed for our national government as well. It might look like this:

What have you done to support the Kyoto Protocol to reduce the threat of global warming? (Signed the treaty, done nothing.)

What efforts have you made to reduce America's dependency on foreign

oil? (Subsidized research on renewable fuels, demanded increased efficiency of existing power plants, proposed drilling in the Arctic National Wildlife Refuge.)

And how about a question of the environmental impact of war? Now that is depressing.

To test the theory that maybe, just maybe, my footprint isn't all about me, I went back to the quiz, but clicked on Canada as my home. You know, my footprint shrank to 21 acres.

Next was Denmark (with its wind farms): 20 acres.

Then Germany (where recycling is federally mandated): 18 acres

And finally, Japan (home to inter-city bullet trains): 15 acres. Now I would only need 3.4 Earths to sustain me.

So go ahead--try the quiz yourself. And if you're not already using low-energy light bulbs or public transportation, consider starting now.

However, if you really want to make change, I'd also suggest posing some hard questions to those guys in Washington.

Make them understand that we only have one Earth for all of us to share.

**Assignment:** Read and interact with both texts. Then calculate your ecological footprint on the website in article. Print out results. Bases on article and poem, write a paragraph about your reactions to what you read and learned. Put on same page as printouts (handwritten is okay).

## **Alternative Energy Project – 1<sup>st</sup> day planning session**

*Your teacher may require this at the end of class, or the following day as a homework assignment. Please be sure you know if and when this paper is due. This paper may not necessarily be returned to you, so please copy it or take a picture if you find it helpful. Answer the following questions below:*

1. Who are the people in your group? When is the due date?
2. Someone being sick/absent will not grant an extension. You must divide responsibilities and create redundancy to make sure the project gets uploaded to YouTube on the deadline date. Do you have contact information for all your group members?
3. What alternative energy topic have you been assigned?
4. What will be the “theme” of your project?
5. Where will the video take place? (someone’s house, another location, etc.)
6. Where will your meeting place be for group members?
7. How will you show/depict the problem?
8. How will you show that your topic helps solve the problem? What improvements still have to be made in this technology?
9. Where will you come up with examples of its implementation?
10. What is the rough sequence of steps your video will following (about two to seven broad steps)?
11. Your video must take less than five minutes, about how much time do you think each steps should take?
12. Who will write the video script?
13. Who will take video? (camera person)
14. Who will edit video?
15. Who will upload it to YouTube?