

AGRISCIENCE EXERCISE

PHYSICAL SCIENCE/ENVIRONMENTAL RESOURCE SYSTEMS

- Key Concept: The Physical Environment / Atmospheric Resources
- Sub-Concept: Air Quality Characteristics
- Agricultural Context: Many agricultural production and processing practices affect the quality of our atmosphere. Air quality can affect plant growth.
- Exercise: **Tailpipe Emissions**
- Applied Principle: Air quality
- Goals:
1. Become aware of potential air pollution sources.
 2. Discuss ways to increase air quality.
 3. Discuss the relationship of air quality to plant growth.
- Preparation Time: Time to gather materials and arrange for a variety of vehicles to test. (If you cannot arrange for a visit to a farm to collect samples, see if you can get a tractor to visit school.)
- Materials:
- Vaseline, or any petroleum jelly
 - Squares of cloth (old sheets work well) about 8"x 8"
 - Lightweight wire
 - Microscopes (optional)
 - A variety of vehicles to test, including farm equipment, with information on their maintenance schedule.
- References: Humboldt County Office of Education, Eureka, California. (1989) Green Box (2nd Edition).

Teacher Preparation Notes:

- ▶Be very careful not to allow the students to breathe the fumes coming out of the vehicles. This could be quite dangerous.
- ▶Use the wire to construct a loop with a handle to hold the cloth in place so students' fingers don't get burnt by a hot tailpipe. You might want to use hot pads or oven mitts.



Procedures for Conducting the Activity:

1. Prepare squares of cloth by smearing petroleum jelly in an area approximately 4" round in the center of the cloth.
2. While the engine is off, use the wire to construct loops to that snugly fit around the tail pipes to be tested. Since the pipes will get warm, you do not want to use coated wire, it will melt onto the tailpipe and release potentially hazardous fumes.
3. Attach pieces of cloth which have been covered with petroleum jelly to the tail pipe opening of several different vehicles/farm equipment (tractor, combine, etc.). Have someone start the motor and idle the engine for 5 minutes. Carefully investigate the sample to discover what has happened. Pay attention to the make, model, year of each car, engine type and size, date of last tune-up, etc. Collect emissions from cold as well as warm engine exhausts, and compare the findings.

Variation: put the cloth pieces into frames 8 to 10 inches square. Attach the frame to a stand placed at a measured distance behind the tail pipe opening.

AGRISCIENCE EXERCISE

Tailpipe Emissions

STUDENT DATA SHEET

1. Collect the squares of cloth that were used to collect the emissions. Label which vehicle the emissions were collect from. Arrange the squares in order of color, and thickness of particles, darkest thickest on one side to lightest thinnest on the other.

a. Which vehicle has the greatest amount of emissions?

Using the information that your teacher can provide on each of the vehicles, why do you think this vehicle produced the greatest amount of emissions?

b. Comparing the maintenance records of the vehicles with the most and least emissions, what factors might contribute to the amount of emissions these vehicles produced.

c. If two vehicles followed the same maintenance schedules, would they have the same amount of emissions? Why or why not?

2. Is there any difference between emission levels from a cold engine and a warm engine? If so, what might cause that difference?

3. Use the microscope to look at the emissions collected from several vehicles. What differences, if any, are apparent to you?

4. When concerned about air quality, what steps do you think people should take to reduce vehicle emissions?

5. Can all emissions be eliminated from the air? Why?

6. Would you like to breathe air that has a large amount of vehicle emissions in it?

How do you feel that plants are affected by vehicle emissions?