

# Lesson Plans: Measuring Quantities of Gas

## Objective

The objective is to enable students to become familiar with the measuring units of small amounts of gas in the atmosphere which may otherwise be confusing

## Materials

Each group of students will need the following:

- Food coloring or ink
- 1-liter measure
- 4 containers (approximately 2-liter capacity)
- Teat pipette

## Important Points to Understand

Scientists measure amounts of greenhouse gases in very small quantities that are often abbreviated as ppm (parts per million), ppb (parts per billion), or ppt (parts per trillion). Sometimes,  $v$ , is added to the end and it means that the amount is measured by volume.

Carbon dioxide is currently about 350 ppm of air in the atmosphere. Similarly, CFC-11 is currently about 0.2 ppb of air in the atmosphere.

## Procedure

1. Place 10 drops [assuming 10 drops = 1 n-d (milliliter)] of food coloring or ink into one of the containers.
2. Add 999 ml (1 ml less than 1 liter of water in that container). This solution is now 1 part, per thousand of food coloring or ink.
3. Place 1 ml (10 drops) of the parts per thousand solution in a second container and add 999 ml of water. This solution is now 1 part per million (i.e., 1 ppm) of food coloring or ink.
4. Place 1 n-d (10 drops) of 1 ppm solution in a third container and add 999 ml of water. This solution is now 1 part per billion (i.e., 1 ppbl of food coloring or ink).
5. Place 1 ml (10 drops) of 1 ppb solution in a fourth container and add 999 ml of water. This solution is now 1 part per trillion (i.e., 1 ppt) of food coloring or ink.

## Exercise

1. Make a solution that is 350 ppm of food coloring or ink by using an appropriate measuring container.
2. Make a solution that is 0.2 ppb of food coloring or ink.
3. Relate this experience to the known pollution of the atmosphere as identified above.