Lead Balloons

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Following is one of several demonstrations that I've used in my science classrooms to illustrate principles and generate enthusiasm for science. This one can be done with easy-to-obtain materials and the kids love it!

Lead Balloons:

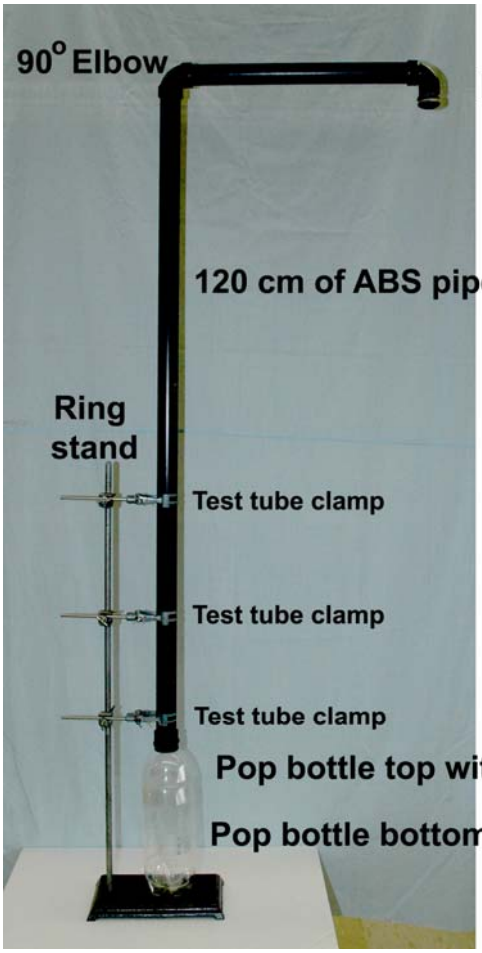
In this demonstration carbon dioxide gas will be used to make a soap bubble sink to the floor rather than float away. By using a super bubble soap solution, those bubbles will actually bounce off a smooth, clean, soap-polished floor. Two people with very clean, very smooth, soap- polished surfaces, such as textbooks, can bounce the bubbles back and forth several times before the bubbles burst in a puff of white fog.

Principle 1: Carbon dioxide gas is heavier than air and as a result will sink when released into the air.

Principle 2: Carbon dioxide gas can be produced by allowing dry ice to sublimate (change from a solid directly to a gas).

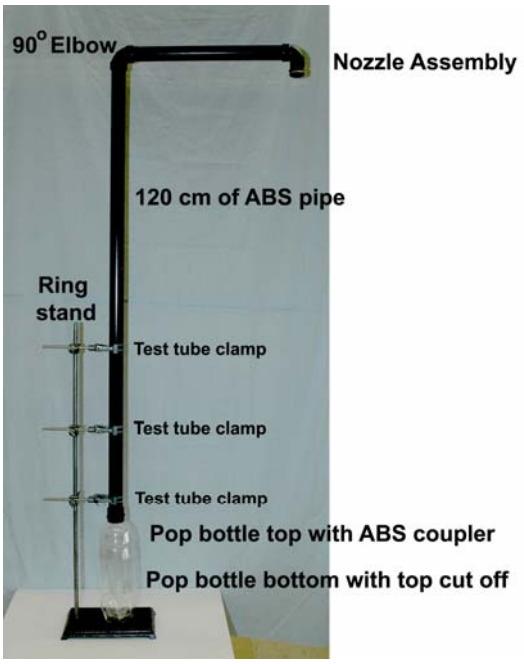
Principle 3: When dry ice is placed in warm water, it sublimates very quickly and carries water vapour with the carbon dioxide gas. This produces an eerie white fog similar to what is used in theatrical performances. The carbon dioxide/water vapour mixture will sink and accumulate along the floor.

Lead Balloon Apparatus:



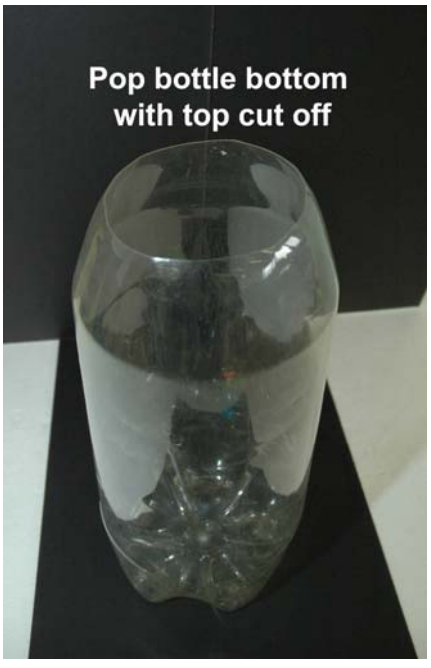
Materials:

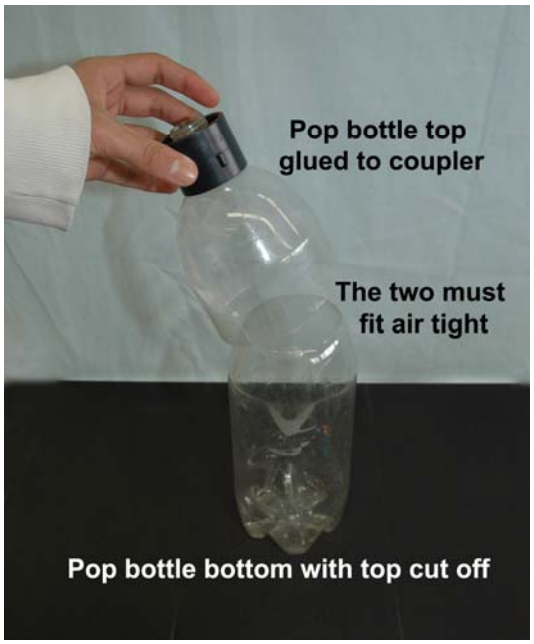
1. The 1 1/4 inch ABS elbows and pipe shown and labeled in the photographs below can be purchased at any Home Depot type store. Do not glue them together if the assembly is to be moveable and storable. Assemble them as you see in the photographs below.



2. The dry ice can be purchased at any welding gas type store such as Praxair or Liquide Air. Make sure you buy it just before you need it; otherwise it will sublimate away. If you want to store it for a short period of time, use a small pop cooler and stuff the extra space with towels to slow the sublimation rate.

3. The pop bottle assembly can be made by cutting the top off two pop bottles in such a way that one pop bottle will fit over the other and make an airtight seal. See photographs below.





4. Make the soap solution by gently stirring (do not shake) the following:

    Part A: 40 mL of glycerin
    Part B: 20 mL of liquid Dawn or Joy dish washing soap
    Part C: 10 mL of white Karo syrup

    Do not use low suds soap. To increase the strength of the bubbles, increase the amount of soap and/or glycerin. Aging improves the characteristics of the soap solution.

Demonstration:

1. Remove the pop bottle from the 1 1/4 inch ABS pipe assembly and half fill it with warm water.

2. Soak the J-cloth-wrapped nozzle with the soap solution. Make sure that there is a film of soap covering the entire opening.

3. While wearing gloves place 5-10 dry ice pellets into the warm water and quickly reconnect the pop bottle to the ABS pipe assembly producing an airtight seal.

4. Quickly turn your attention to the first bubble that begins to form as soon as you have created the seal between the pop bottle and the ABS pipe assembly. At first it will be a clear bubble but as it grows in size, the carbon dioxide/water vapour fog being created in the pop bottle will fill the bubble with a white swirling cloud. When the bubble becomes too heavy, it will fall to the ground quite quickly.

5. As it falls, bounce the bubble on a very smooth, very clean, soap-polished surface (such as a piece of glass or a textbook). The bubble will bounce several times and will burst in a puff of white fog.

Clean-up and Safety:

1. Be very careful with the dry ice. Always wear gloves and avoid contact with skin. An MSDS sheet comes with the dry ice pellets when you purchase it; read it carefully.

2. Wear goggles/safety glasses as the bubbles can bust with considerable force and small soap globs fly off in all directions.

3. Be aware that soap from the bursting bubbles will end up on the floor and create a slipping hazard. Clean any surfaces that come in contact with the bubbles carefully.

Acknowledgements: Bob Becker, *Twenty Demonstrations Guaranteed to Knock Your Socks Off*, 1994.