

## Dry Ice ideas

Use long graduated cylinder and fill 2/3 with water. Add about 80 drops of universal indicator or until a fairly dark green (pH 7).. Add drops of 6M NaOH until dark blue/purple (very basic). Add dry ice and watch bubbling. Things I talk about:

- Temp of dry ice (-109 °F). “Burning” of skin due to freezing of water in cells. Uses are to ship meat, ice cream other cold things when refrigeration is not available. Dry ice is made by reducing temp and putting pressure on the molecules. This enables weak forces to stick molecules into the solid phase.
- Sublimation. I try to emphasize that CO<sub>2</sub> does actually melt into liquid but not at our normal atmospheric pressure. I use this to try to put in their mind that MP and other phase transitions are a function of outside pressure.
- Color changes in the cylinder as carbonic acid formed from CO<sub>2</sub> + water changes pH. Since carbonic acid is weak acid, at the end of bubbling add some drops of conc. HCl or your favorite strong acid to get the red color for the really acidic solutions.
- CO<sub>2</sub> cloud goes over the top and falls. This is a good illustration that CO<sub>2</sub> is more dense than air. You can talk about old movies and graveyard scenes with “fog” at the feet of people walking through the graveyard. Many of these were done with dry ice.
- I also talk about carbonated beverages and usually open one during the demo. I work some type of explanation of Henry’s Law with the equilibria of carbonic acid, water and CO<sub>2</sub> into my talk. I emphasize with a balloon that bubbles have a hard time forming and need help. Thus nucleation sites on ice and the tongue help bubbles to form. Shaking also allows small bubbles to form larger bubbles and get “over the hump”.

Dry ice can be obtained at Polar Ice on Highway 41-A.