

Charles' Law Demonstration

Behold! The amazing power of cold!

Chemicals and Equipment Needed

- Liquid Nitrogen
- Large crystallizing dish – **P3**
- Balloon – **V3**
- Grande dewar – **A3**
- Rubber-tipped tongs – **U2**

Hazards

- Liquid nitrogen is VERY COLD (-196C/77K/-321F). Severe cold burns can result from skin exposure.
- It is also oxygen-displacing, so there is a suffocation hazard in case of a spill.

Preparation

- Inflate the balloon to just fit in the large crystalizing dish and tie off.
- Fill the grande dewar with LN2

Presentation

- Slowly pour LN2 over the balloon.
- The balloon shrinks as you pour the liquid nitrogen on top.
- Use the tongs to pull the balloon out by its knot, and either place on the table and allow to return to room temperature or gently blow on it to warm it up. The balloon reinflates.

Discussion

- Present the Ideal Gas Law:
$$PV = nRT$$
 - Ask: How do P , V , n , and T vary (or remain constant) throughout this demonstration?
 - What is P in this situation?
 - Solicit explanations from the audience, then repeat the demonstration, if desired.
- As the demo is presented, the liquid nitrogen is boiling away in the crystalizing dish, and “snow” will start to build up on the dish as well
 - Ask: where did the snow come from?

Clean-Up

- Pour any leftover LN2 into the storage dewar. Toss the balloon