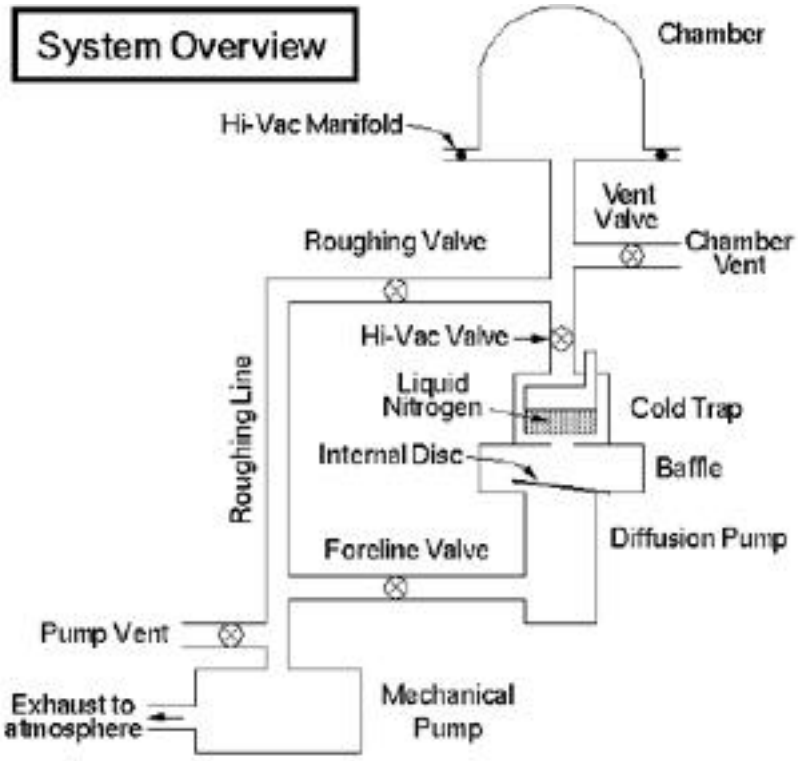
EE143 Week 9: Suggest Pre-Lab Quiz Solution 2006/02/20 Shong Yin

(1) Draw a schematic diagram of the vacuum system, in the detail given in the lab manual. (label all components)



(2) Why do we need the "roughing" or mechanical pump? Briefly describe how they work.

Roughing pump brings the pressure down to a low enough level for the diffusion pump to take over. Mechanically pushes air out through a valve.

(3) At what pressure do we switch to the diffusion pump (i.e. at what pressure has "roughing" been completed)? What could happen if we continue to pump using the mechanical pump at this pressure?

Around 10 millitorr. The mechanical pump will be unable to reduce pressure further. It still must operate to backup the diffusion pump.

(4) What does the oil in the diffusion pump do? What is the danger inherent in the diffusion pump oil? What is the purpose of the cooled baffle?

The oil collides with gas molecules to force them towards foreline and out the exhaust. If the diffusion pump oil gets into the vacuum chamber, it will outgas, contaminate the wafers and impede the pumpdown of the vacuum. The cooled baffle condenses the oil to prevent it from backflowing into the vacuum chamber.

(5) What is a cold trap and how does it "pump"?

A cold trap is a chamber surrounded by liquid nitrogen that condenses vapors towards the diffusion pump. But condensing vapors it reduces the pressure of the vacuum chamber.

(6) What is the purpose of the HF dip just prior to metallization?

The HF dip removes native oxide at the contact holes.

(7) Why is low pressure so important for aluminum deposition?

A high mean free path is required for any physical vapor deposition process.

(8) Why do we heat the charges at 40 Amps for ~20 seconds before we evaporate them?

To drive off any water vapor left on the Al source.

(9) Will the metal layer be conformal? Why or why not?

The layer will not be conformal and is subject to shadowing effects. This is typical of any physical vapor deposition process.