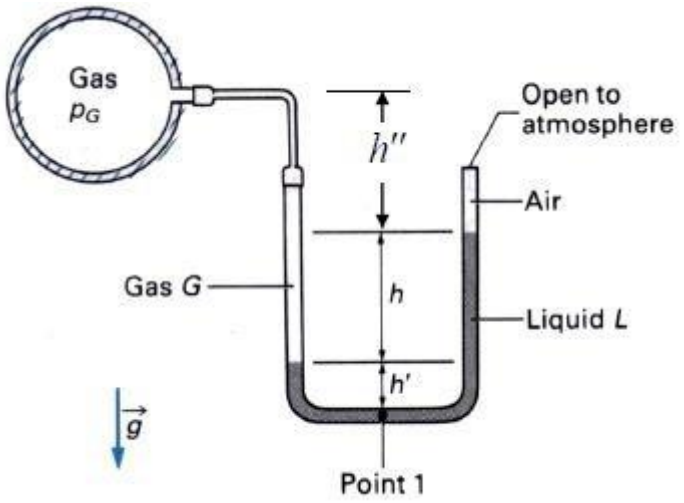
MP Manometer practical

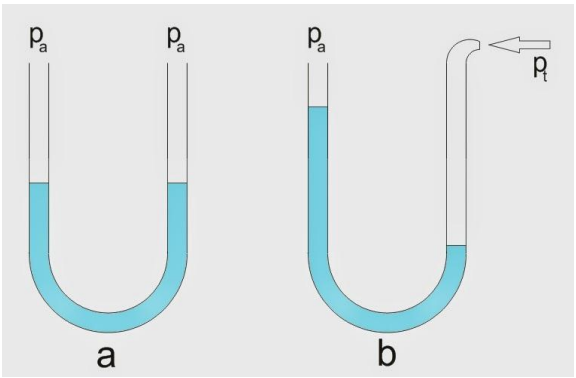
Using manometers to measure the *pressure* of the laboratory gas supply

PRESSSURE = FORCE / AREA

NAME: ..... DATE: .....

A manometer is a U-shaped tube with one end open to the air and the other connected to a gas source (via a flexible hose) to enable its pressure to be measured.



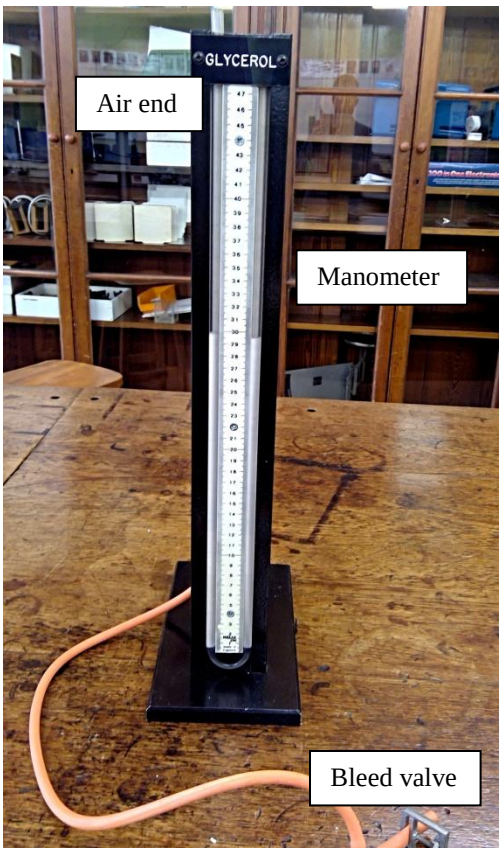


A liquid (in our case water, glycerol or ethanol) is in the bottom of the tube, and prior to measurement the liquid levels *should be the same.* This means only atmospheric pressure acts upon both ends of the tube. (Note if it doesn't, release the bleed valve to release any excess pressure in connecting pipes and return the system to level).

If a gas source is connected then the pressure difference from atmospheric pressure p_{atm} is:

$$p_{gas} - p_{atm} = \rho g h$$

where ρ is the density of the liquid, g is the strength of gravity ($g = 9.81$N/kg on Earth) and h is the height change of the liquid when the gas is connected.



Note 1 atmosphere (atm) is 101,325 N/m^2 and 1 N/m^2 = 1 Pa (Pascal). Atmospheric pressure may vary from about 920-1070 mbar, although both are quite serious extremes. About 1000 mbar is typical.

1000mbar = 100,000 Pa.

INSTRUCTIONS

1. Connect tube to gas supply. Turn off initially.
2. Open bleed valve until liquid level is the same on both sides.
3. Turn on gas supply. Wait till levels remain static.
4. Record height difference *h* between liquid levels using the table on the next page. Then turn off gas supply.

** CAREFULLY CHECK GAS IS TURNED OFF!! **

Fill in the table below to determine the gas supply pressure

Atmospheric pressure /Pa: (Use a calibrated pressure sensor)

p_{atm} = ...

Liquid	Density /kgm^{-3}	High liquid height /cm h_1	Low liquid height /cm h_2	h (metres) $h = \frac{h_1 - h_2}{100}$	ρgh (Pa)	$p_{gas} = \rho gh + p_{atm}$ (Pa)
WATER 1	997					
WATER 2	997					
ETHANOL 1	789					
ETHANOL 2	789					
GLYCEROL 1	1260					
GLYCEROL 2	1260					

Now use this data to calculate the gas pressure (express your answer in the form mean pressure $\pm$ uncertainty).

Comment on your measurements/calculations: