Announcements – 10/2/00

- ***Ch. 10 solutions now on reserve***
- ***Website updates***
- ***Quizzes***
  - Returned at end of class
- *This week's lab:* ***Acid/Base Titration***
- ***Demos today!***

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Gases

- One of the four states of matter
- Simplest to understand both *physically* and *chemically*
- **Gas Properties**
  - Low density
  - *Fluid*
  - Can be defined by their:
    1. Pressure (P)
    2. Volume (V)
    3. Temperature (T)

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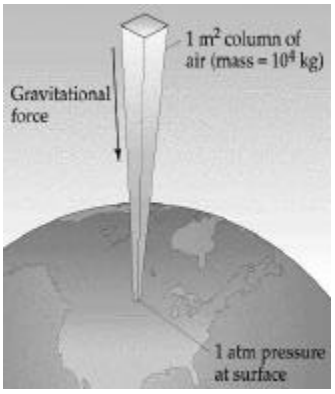
Pressure

- How do we measure/quantify pressure?

Define: P = force/area
= N/m^2
= *Pascals* (Pa)



Atmospheric Pressure:

- force exerted by the atmosphere on the surface of the Earth

P = *1 atm = 101,325 Pa*

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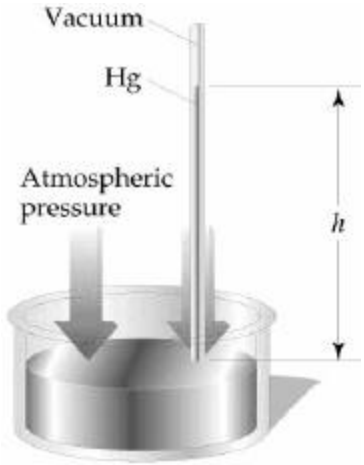
Measuring Pressure

- Torricelli (1600's):
  - atmospheric pressure raises a column of *mercury* 760 mm
  - *Barometer*

1 atm = 760 mm Hg
= 760 *torr*
= 101,325 Pa
= 101.325 kPa



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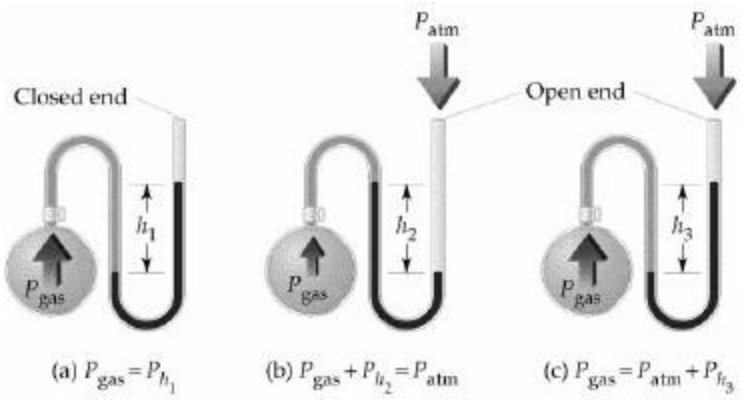
Manometer



$P_{atm} > P_{gas}$ $P_{atm} < P_{gas}$

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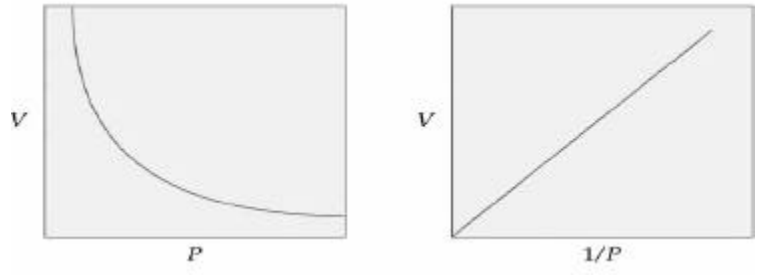
Boyle's Law: Pressure-Volume

- Changing *pressure* on a fixed amount of gas resulted in a corresponding change in **volume:**



Boyle found that: **P x V = constant**

movie

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Boyle's Law Example

- If a gas occupies **1.00 L** at a pressure of **0.50 atm**, what *volume* would it occupy if the pressure were decreased to *0.10 atm*?

Since P x V = constant: $P_1V_1 = P_2V_2$

$V_2 = P_1V_1/P_2 = (0.50\ atm)(1.00\ L)/(0.10\ atm)$

$V_2 = 5.0\ L$

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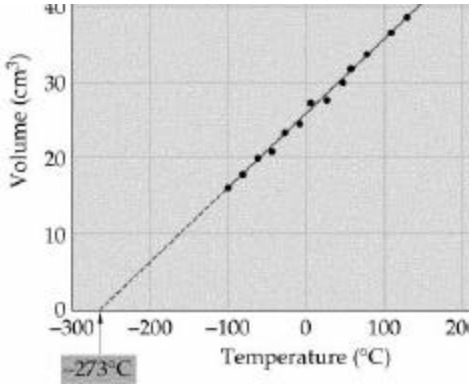
Charles' Law: Temperature

- Changing *temperature* of a fixed amount of gas resulted in a corresponding change in **volume:**

At a fixed pressure, it was found that:

Volume ∝ Temp

-**implication**: at some temp, volume would decrease to ***ZERO***



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Charles' Law Example

- If a gas occupies **1.00 L** at **25.0 ºC** and, after heating, expands to a volume of *2.00 L*, to what *temperature* was the gas heated?

$$\frac{V_1}{V_2} = \frac{T_1}{T_2} \Rightarrow \mathbf{T_2 = \frac{T_1 V_2}{V_1}}$$

$$T_2 = \frac{(25.0 + 273.15)(2.00\ L)}{(1.00\ L)} = \mathbf{596.3\ K}$$

$T_2 = 596.3\ K - 273.15 = 323.15\ ^oC$

$= \mathbf{323.\ ^oC}$

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