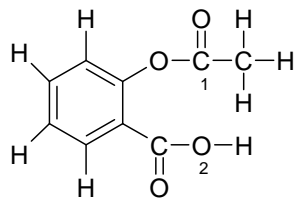


**CHM 151**  
**Recitation #12, 19 November 2008**

1. The skeletal structure of aspirin,  $C_9H_8O_4$ , is shown below.



- a) How many sigma ( $\sigma$ ) and pi ( $\pi$ ) bonds are in the following molecule?
- b) What are the hybridizations of the carbon atom labeled "1" and the oxygen atom labeled "2"?
2. **TRUE or FALSE.**
- a) The volume of a gas is directly proportional to the temperature in Kelvin (at constant P), but is inversely proportional to the pressure (at constant T).
- b) An atmospheric pressure of 74.2 cm is equal to 0.976 atm.
- c) 1 mole of an ideal gas occupies a volume of 22.4 L at STP.
- d) 20.18 g of neon gas (Ne) will have the same volume as 28.02 g of nitrogen gas ( $N_2$ ) at the same temperature and pressure. (Assume neon and nitrogen are ideal gases)
3. An experiment in a laboratory is carried out under high vacuum conditions at a pressure of  $1.3 \times 10^{-9}$  atm. How many **molecules** of an ideal gas are present in a 1.0 L vessel at 298 K at this pressure?

4. Our hero, Ferrous Bueler, skipped Chemistry 151 lecture last week and, therefore, is clueless about the gas laws. In lab, he is given a 2.00 L flask of  $\text{H}_2\text{S}$  (g) at 743 torr and 298 K and told to heat it to 371 K. Help Ferrous calculate the pressure in the flask at 371 K.
5. If equal **masses** of HF and Ar gas are placed in separate, identical containers (each container has the same volume and temperature), which one of the following statements is **true**?
- There are more Ar atoms than HF molecules.
  - The pressure in both containers is the same.
  - The pressure in the Ar container is greater than that in the HF container.
  - The pressure in the HF container is greater than that in the Ar container.
  - Impossible to determine without knowing the volume and temperature.
6. The empirical formula of Freon-11 is  $\text{CFCl}_3$ . If a sample weighing 0.597 g occupies a volume of 0.100 L at  $95^\circ\text{C}$  and a pressure of 1.31 atm, what is the **molecular formula** of Freon-11?
- $\text{CFCl}_3$
  - $\text{C}_2\text{F}_2\text{Cl}_6$
  - $\text{C}_3\text{F}_3\text{Cl}_9$
  - $\text{C}_4\text{F}_4\text{Cl}_{12}$
  - none of these

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Avogadro's # =  $6.022 \times 10^{23}$  particles/mol

$\text{K} = ^\circ\text{C} + 273^\circ$

$PV = nRT$

$R = 0.0821 \frac{\text{L} \cdot \text{atm}}{\text{mol} \cdot \text{K}}$

molar mass =  $\frac{\text{mass of substance (in g)}}{\text{moles of substance}}$

1 atm = 760 mmHg = 760 torr = 101.325 kPa

density =  $\frac{\text{mass}}{\text{volume}}$

STP =  $0^\circ\text{C}$  and 1 atm pressure