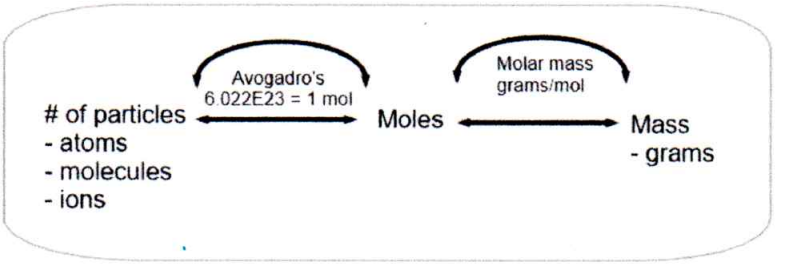
(#6-2)

Mathematical relationships



MUST SHOW FACTOR LABEL WORK!

1. Nitrogen gas (N_2)
   a. How much does 1 mole of N_2 weigh? 28g/mol
   b. A 25.0 g sample of N_2 contains
      i. Moles – fill in/calculate
      ii. Molecules – fill in/calculate

$$25\text{g } N_2 \left| \frac{1 \text{ mol}}{28 \text{ g}} \right. = 0.892 \text{ moles} \qquad \left| \frac{6.022\text{E}23 \text{ molecules}}{1 \text{ mol}} \right. = 5.37\text{E}23 \text{ molecules } N_2$$

2. Fructose $C_6H_{12}O_6$.
   a. What is the molar mass of fructose? 180g/mol
   b. 100.0 g of fructose contains?
      i. Moles: $100.0\text{g} \cdot \frac{1\text{mol}}{180\text{g}} = 0.5556\text{ mol}$
      ii. Molecules: $0.5556\text{ mol} \cdot \frac{6.022\text{E}23}{1\text{mol}} = 3.345\text{ E}23\text{ molecules}$
   c. Which sample contains the most number of particles. Justify

0.892 (25.g N_2) or 100.0g of fructose 0.555

3. A sample of a person's breath contains 2.0 E23 particles of CO_2
   a. What is the molecular weight of CO_2? 44g/mol
   b. The sample contains
      i. Moles: $2.0\text{E}23 \cdot \frac{1\text{mol}}{6.022\text{E}23} = 0.33\text{mol}$
      ii. Mass: $0.33\text{ mol} \cdot \frac{44\text{g}}{1\text{mol}} = 14.6\text{g}$
      iii. Volume (1 mole = 22.4L at 0°C and 1 atm pressure)

$$0.33\text{mol} \cdot \frac{22.4\text{L}}{1\text{mol}} = 7.3\text{L}$$