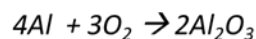
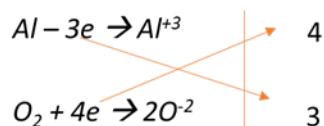
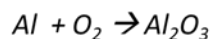


HW 17

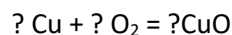
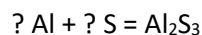
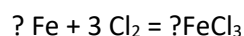
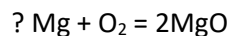
The mole, molar gas volume, Clapeyron-Mendeleev equation

- To calculate masses of products and reactants using balanced chemical equations we use a unit called **mole**. One mole of a substance is the amount whose mass equals the molecular or atomic weight (in atomic mass units, amu) of the substance **expressed in grams**. This means that molecular weight of any substance in amu (from periodic table) is equal to molar weight in grams.
- A mole of anything has 6.022×10^{23} particles. This is called Avogadro's number, after Amedeo Avogadro, who first suggested that equal volumes of gas have equal numbers of molecules.
- 1 mole of any gas takes a volume of 22.4 liters at "normal conditions". This is a molar gas volume under the normal conditions. Normal conditions are temperature of 0°C (273 K) and pressure of 1 atm (101 325 Pa)
- For conditions that differ from normal we use Clapeyron-Mendeleev equation:
 $pV = nRT$
 n – gas mole number
 p – gas pressure (atm)
 V – gas volume (liters)
 T – temperature (K)
 R – gas constant (0.0821 l x atm/mole x K)

Redox chemical reactions can be balanced by looking at the transfer of electrons:



1. Insert the missing equation coefficients:



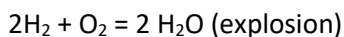
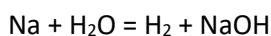
$\text{P} + \text{N}_2\text{O} = \text{N}_2 + \text{P}_2\text{O}_5$ (use the electron balance and show your work)

$\text{NH}_3 + \text{O}_2 = \text{NO} + \text{H}_2\text{O}$ (use electron balance and show your work)

2. What number of moles of Cr (52 amu) is in 20.8 g of this metal?

3. What is the mass of 6.02×10^{23} molecules of methane CH_4 ?

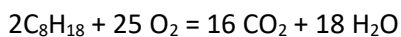
5*. An explosion took place because of the following two reactions:



Find equation coefficients for the first equation and calculate how much (by volume) hydrogen exploded if 2.3 g of Na reacted.

6*. How much oxygen (in kg) does a car consumes between two fillings of its gas tank?

The equation for combustion is:



This means that the combustion of 2 molecules of gas requires 25 molecules of oxygen. An average tank of a car takes 40 L of gas. The density of gas is 0.7 kg/L.