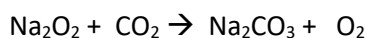


***The mole, molar gas volume, Clapeyron-Mendeleev equation***

- 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  $6.022 \times 10^{23}$  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)

1. A person needs about 1 mole of oxygen per hour to breath. Calculate how much  $\text{Na}_2\text{O}_2$  will be needed for a 24-h trip in a single-person submarine using the following equation:



2. How many moles of oxygen are in an oxygen tank of 40 L if the oxygen is under a pressure of 150 atm at 20°C? How much air ( $\text{m}^3$ ) were used to obtain this oxygen? (Assume that oxygen makes up 21% by volume of air.)
3. There are 10 g of each:  $\text{KMnO}_4$ ,  $\text{KClO}_3$ ,  $\text{KNO}_3$  in the lab. How many liters of oxygen can be obtained from each of these reagents? Use the following equations:

