

Answer on Question #49310 - Chemistry – Inorganic Chemistry

Question

A student collected 1g of Hydrogen, oxygen, chlorine, & Ammonia in separate bottles. Arrange these samples in the decreasing order of number of molecules in them? Justify?

Answer:

Calculate the number of molecules in 1 g of each gas. The formula is:

$$N = \frac{m \cdot N_A}{M}$$

m – the mass of the gas, m = 1 g;

N_A – Avogadro constant, $N_A = 6.022 \cdot 10^{23}$;

M – molar mass of the gas.

Number of molecules in 1 g of hydrogen is:

$$N(H_2) = \frac{1 \cdot 6.022 \cdot 10^{23}}{2} = 3.011 \cdot 10^{23} \text{ molecules}$$

Number of molecules in 1 g of oxygen is:

$$N(O_2) = \frac{1 \cdot 6.022 \cdot 10^{23}}{32} = 1.88 \cdot 10^{22} \text{ molecules}$$

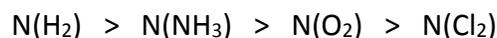
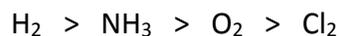
Number of molecules in 1 g of chlorine is:

$$N(Cl_2) = \frac{1 \cdot 6.022 \cdot 10^{23}}{71} = 8.488 \cdot 10^{21} \text{ molecules}$$

Number of molecules in 1 g of ammonia is:

$$N(NH_3) = \frac{1 \cdot 6.022 \cdot 10^{23}}{17} = 3.54 \cdot 10^{22} \text{ molecules}$$

Therefore, number of molecules in 1 g of the gas decreases in a row:



So, the smaller and the lighter the molecule of the gas is, the more molecules of it there are in 1 g of this gas.