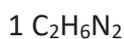


Answer on Question #81416 – Chemistry – Organic Chemistry

Task:

In an experiment, 10 cm³ of an organic compound, J, in the gaseous state was sparked with an excess of oxygen (O₂). 20cm³ of carbon dioxide (CO₂) and 5cm³ of nitrogen (N₂) were obtained among the products. All gas volumes were measured at the same temperature and pressure. What could be the identity of J?



Solution:

The volume of 1 mol of an *ideal* gas at STP is 22.4 L. (V_m = 22.4 L/mol.)

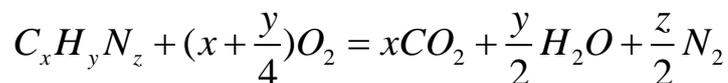
$$n = \frac{V}{V_m};$$

$$n(C_xH_yN_z) = \frac{V(C_xH_yN_z)}{V_m} = \frac{10\text{ cm}^3}{V_m};$$

$$n(N_2) = \frac{V(N_2)}{V_m} = \frac{5\text{ cm}^3}{V_m};$$

$$n(CO_2) = \frac{V(CO_2)}{V_m} = \frac{20\text{ cm}^3}{V_m}.$$

Schematic equation of chemical reaction:



By the reaction equation:

$$n(C_xH_yN_z) = \frac{n(CO_2)}{x} = \frac{2 * n(N_2)}{z};$$

Then,

$$\frac{n(\text{CO}_2)}{n(\text{C}_x\text{H}_y\text{N}_z)} = \frac{x}{1} = \frac{20 \text{ cm}^3}{10 \text{ cm}^3}; \Rightarrow x = 2$$

$$\frac{n(\text{N}_2)}{n(\text{C}_x\text{H}_y\text{N}_z)} = \frac{z}{2} = \frac{5 \text{ cm}^3}{10 \text{ cm}^3}; \Rightarrow z = 1$$

That means there are 2 carbon atoms in J, which also means there is 1 N atom in J.

Then there are two options: $\text{C}_2\text{H}_3\text{N}$ and $\text{C}_2\text{H}_7\text{N}$.

Answer: $\text{C}_2\text{H}_3\text{N}$ and $\text{C}_2\text{H}_7\text{N}$

Answer provided by www.AssignmentExpert.com