

Answer on Question #67541 - Chemistry – Other

Task:

A tire contains a mixture of gases with the following partial pressures: $P_{O_2}=51.3$ kPa, $P_{CO_2}= 0.10$ kPa, $P_{N_2} = 191.3$ kPa, and $P_{others}= 2.3$ kPa. Calculate the total pressure as described by Dalton's law of partial pressures

- a) 101.3 kpa;
- b) 183.7 kpa;
- c) 242.7 kpa;
- d) 245.0 kpa.

Solution:

Dalton's law states that in a mixture of non-reacting gases, the total pressure exerted is equal to the sum of the partial pressures of the individual gases.

Mathematical expression:

$$P_{total} = \sum_i^n \chi_i \cdot P_i \quad \text{or} \quad P_{total} = P_1 + P_2 + \dots + P_i.$$

Where P_i represent the partial pressures of each component. χ_i is the mole fraction of the i th component in the total mixture of n components .

Then,

$$P_{total} = P_{O_2} + P_{CO_2} + P_{N_2} + P_{Others} ;$$

$$P_{total} = 51.3 \text{ kPa} + 0.1 \text{ kPa} + 191.3 \text{ kPa} + 2.3 \text{ kPa} = 245 \text{ kPa}.$$

Answer: D) $P_{Total} = 245$ kPa.