Answer on Question #85196 – Chemistry – General Chemistry

A mixture contains 20 cm³ of hydrogen, 35 cm³ of oxygen, 15 cm³ of carbon monoxide and 10 cm³ of nitrogen at STP. Which of the following gives the mole fraction of hydrogen in this mixture?

Solution:
$V(H_2)$ = 20 cm³ = 20 mL = 0.020 L
$n(H_2)$ = $V(H_2)/V_M(H_2)$ = 0.020 L / 22.4 L/mol = 8.90×10^{-4} mol
$V(O_2)$ = 35 cm³ = 35 mL = 0.035 L
$n(O_2)$ = $V(O_2)/V_M(O_2)$ = 0.035 L / 22.4 L/mol = 1.56×10^{-3} mol
$V(CO)$ = 15 cm³ = 15 mL = 0.015 L
$n(CO)$ = $V(CO)/V_M(CO)$ = 0.015 L / 22.4 L/mol = 6.69×10^{-4} mol
$V(N_2)$ = 10 cm³ = 10 mL = 0.010 L
$n(N_2)$ = $V(N_2)/V_M(N_2)$ = 0.010 L / 22.4 L/mol = 4.46×10^{-4} mol
$n(mixture)$ = 4.46×10^{-4} + 6.69×10^{-4} + 1.56×10^{-3} + 8.90×10^{-4} = 3.565×10^{-3} mol
$\chi(H_2)$ = $n(H_2)$ / $n(mixture)$ = 8.90×10^{-4} / 3.565×10^{-3} = 0.25
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