

Answer on Question #81993 - Chemistry - Physical Chemistry

Question:

$N_2 = 73\%$, $H_2O = 13\%$, $CO_2 = 12\%$, $O_2 = 2\%$.

find: apparent molecular weight, composition by weight, value of R for gas, volume of 1 kg mixture at 101 kPa.

Solution:

$V(\text{sum}) = 100 \text{ L}$, so $V(N_2) = 73 \text{ L}$, $V(H_2O) = 13 \text{ L}$, $V(CO_2) = 12 \text{ L}$, $V(O_2) = 2 \text{ L}$;

So $n(N_2) = 73/22.4 = 3.259 \text{ mol}$;

$n(H_2O) = 13/22.4 = 0.58 \text{ mol}$;

$n(CO_2) = 12/22.4 = 0.536 \text{ mol}$;

$n(O_2) = 2/22.4 = 0.089 \text{ mol}$;

$m(N_2) = 3.259 * 28 = 91.252 \text{ g}$;

$m(H_2O) = 0.58 * 18 = 10.44 \text{ g}$;

$m(CO_2) = 0.536 * 44 = 23.584 \text{ g}$;

$m(O_2) = 0.089 * 32 = 2.848$;

$m(\text{sum}) = 128.128 \text{ g}$;

$w(N_2) = 91.252/128.128 = 71.2\%$;

$w(H_2O) = 10.44/128.128 = 8.1\%$;

$w(CO_2) = 23.584/128.128 = 18.4\%$;

$w(O_2) = 2.848/128.128 = 2.2\%$;

$PV = nRT$;

$R = 8.314 \text{ J}/(\text{mol}\cdot\text{K})$;

$128.128 \text{ g} = 1 \text{ mol}$, so $1 \text{ kg} = 7.805 \text{ mol}$;

$101000 * V = 7.805 * 8.314 * (275+38)$;

$V = 7.805 * 8.314 * 313 / 101000 = 0.203 \text{ m}^3$.

Answer provided by www.AssignmentExpert.com