Ideal Gas - 1

Scuba Diver (1): Solve

$$P_1\, V_1 = n\, R\, T_1 \quad \text{and} \quad P_2\, V_2 = n\, R\, T_2\,,$$

where the temperatures are in Kelvin, for V_2/V_1 to find V_2. To calculate the pressures P_1 and P_2 use $\rho_s = 1.025 \times 10^3\ kg/m^3$ for the density of sea water and $1\ atm = 101 \times 10^3\ N/m^2$.

Pressure in a Container with Neon Gas (2): Use

$$P_0\, V_{\text{mol}} = R\, T_0 \quad \text{and} \quad P\, V = n\, R\, T$$

with $P_0 = 1$ atm, $V_{\text{mol}} = 22.4\,\text{liter}$, $T_0 = 273.15\,\text{K}$ and $n = M/m_u$, where $m_u = 20.18\,\text{g}$ is the mol mass of Neon, to calculate

$$P = P_0\, n\, \frac{V_{\text{mol}}}{V}\, \frac{T}{T_0}\,.$$

Ideal Gas (3): The final pressure is $P_f = P_i\,(V_i/V_f)\,(T_f/T_i)$, where the initial values P_i, V_i, T_i and final values V_f, T_f are given.

Ideal Gas - 2

Escaping Hydrogen (4). The average kinetic energy is

$$K_{\rm av} = M_{\rm H_2} \frac{v^2}{2} = \frac{3}{2} k T ,$$

where $M_{\rm H_2} = 2 \times 1.673 \times 10^{-27}$ kg is the mass of one $\rm H_2$ molecule and $k = 1.381 \times 10^{-23}$ J/K the Boltzmann constant. Use this equation to find $v = v_{\rm rms}$ and calculate the ratio $v_{\rm rms}/v_{\rm escape}$.

Kinetic energy of a Gas (5) (n number of moles):

$$K = n N_{\rm Avogadro} \frac{3}{2} k_{\rm\ Boltzmann} T .$$