Testes A e B

a) Com as informações $p = 50\,kPa$ e $T = 300\,K$

$$PV = nRT \rightarrow \frac{n}{V} = \frac{P}{RT} = \frac{50\,000}{8,314 \cdot 300} = 20,05 \ \frac{mol}{m^3}$$

Podemos relacionar a massa específica $\mu = 0,4010 \ \frac{kg}{m^3}$ com a concentração gasosa em $1\,m^3$, de forma que

$$20,05 - 0,4010$$
$$1 - M_x \ (\text{massa molar})$$

$$M_x = \frac{0,4010}{20,05} = 0,0200 = 20 \ g/mol$$

Logo, concluímos que o gás é o neônio. ✓

b) $$v_{rms} = \sqrt{\frac{3 k_B T}{m_{Ne}}} = \sqrt{\frac{3 \cdot 1,38 \times 10^{-23} \cdot 300}{20 \cdot 1,66 \times 10^{-27}}}$$

$$= \sqrt{37,41 \times 10^4} \cong 612 \ m/s$$

c) $$\lambda = \frac{1}{4\sqrt{2}\pi \frac{N}{V} r^2} = \frac{1}{4\sqrt{2}\pi N_a \frac{n}{V} r^2} = 186 \ nm$$

$$\frac{n}{V} = \frac{\frac{N}{N_a}}{V} = \frac{N}{V} \cdot \frac{1}{N_a} \rightarrow \frac{N}{V} = N_a \frac{n}{V}.$$

Teste C

A	B
$V = 100\ cm^3$ $p = 2\ atm$ $T_i = 373K$	$V = 200\ cm^3$ $p = 4\ atm$ $T_i = 673K$

a) $E_i^A = \frac{3}{2} n R T_i^A \quad \therefore PV = nRT$

$= \frac{3}{2} P_i V_i$

$= \frac{3}{2} \cdot 2 \cdot 1{,}013 \times 10^5 \cdot 100 \cdot 10^{-6} \quad \therefore \ 1m^3 = 10^6 cm^3$

$= 30{,}4\ J.$

$E_i^B = \frac{3}{2} n R T_i^B = 121{,}6\ J.$

b) $E_f^A = \frac{n_A}{n_A + n_B} E_{Total} = 47{,}2\ J. \quad \therefore n = \frac{PV}{RT}$

$E_f^B = \frac{n_B}{n_A + n_B} E_{Total} = 104{,}8\ J.$ $\begin{cases} n_A = 0{,}00653\ mol \\ n_B = 0{,}01448\ mol \end{cases}$

c) $Q^{AB} = E_f^A - E_i^A = +16{,}8J \quad (de\ B \to A)$

$Q^{BA} = E_f^B - E_i^B = -16{,}8J \quad (de\ A \to B)$

D) PARA O SISTEMA A $\quad E_f^A = \frac{3}{2} n_A R T_f \to T_f = \frac{2}{3} \frac{E_f^A}{nR}$

$T_f = \frac{2}{3} \cdot \frac{47{,}2}{0{,}00653 \cdot 8{,}314} = 580k$ ✓

PARA O SISTEMA B $\longrightarrow T_f = \frac{2}{3} \frac{E_f^B}{n_B R} = 580k$ ✓

e) $P_A V_A = n_A R T_A^f$

$$P_A = \frac{n_A R T_A^f}{V_A} = 315\,kPa = 3{,}1\,atm$$

$$P_B = \frac{n_B R T_B^f}{V_B} = 349\,kPa = 3{,}4\,atm$$