2.

Nr/o	**Soluţie**	**Pun-ctaj**
a)	$\upsilon_{p1}=\sqrt{\frac{2RT}{M_1}}=\sqrt{\frac{2\cdot 8,31\cdot 300}{0,032}}=394,7(\text{m/s})$; $\upsilon_{p2}=\sqrt{\frac{2RT}{M_2}}=\sqrt{\frac{2\cdot 8,31\cdot 300}{0,028}}=422(\text{m/s})$, $\upsilon_{p2}-\upsilon_{p1}=27,3(\text{m/s})$	**1 p.**
b)	$\upsilon_{p2}-\upsilon_{p1}=\Delta\upsilon \Rightarrow \sqrt{\frac{2RT_1}{M_2}}-\sqrt{\frac{2RT_1}{M_1}}=\Delta\upsilon \Rightarrow \sqrt{2RT_1}\left(\frac{1}{\sqrt{M_2}}-\frac{1}{\sqrt{M_1}}\right)=\Delta\upsilon \Rightarrow$ $\Rightarrow T_1=\frac{(\Delta\upsilon)^2}{2R\left(\frac{1}{\sqrt{M_2}}-\frac{1}{\sqrt{M_1}}\right)^2}=363,5(\text{K})$	**1 p.**
c)	$4\pi\left(\frac{m_{01}}{2\pi kT}\right)^{3/2}\upsilon^2 e^{-\frac{m_{01}\upsilon^2}{2kT}}=4\pi\left(\frac{m_{02}}{2\pi kT}\right)^{3/2}\upsilon^2 e^{-\frac{m_{02}\upsilon^2}{2kT}} \Rightarrow \left(\frac{m_{01}}{m_{02}}\right)^{3/2}=e^{\frac{(m_{01}-m_{02})\upsilon^2}{2kT}} \Rightarrow$ $\upsilon^2=\frac{3kT\ln(m_{01}/m_{02})}{m_{01}-m_{02}} \Rightarrow \upsilon=\sqrt{\frac{3RT\ln(M_1/M_2)}{M_1-M_2}}=499,7(\text{m/s})\approx 500(\text{m/s})$	**2 p.**
d)	$N_1'/N_1+N_1''/N_1=1$ $\frac{N_1'}{N_1}=4\pi\left(\frac{m_{01}}{2\pi kT}\right)^{3/2}\int_0^{\upsilon_{p1}}\upsilon^2 e^{-\frac{m_{01}\upsilon^2}{2kT}}d\upsilon=\frac{4}{\sqrt{\pi}}\int_0^1 u^2 e^{-u^2}du$, unde $u=\upsilon/\upsilon_{p1}$ $\frac{N_1'}{N_1}=\frac{4}{\sqrt{\pi}}\int_0^1 u^2\left(1-\frac{u^2}{1!}+\frac{u^4}{2!}-\frac{u^6}{3!}+\frac{u^8}{4!}-\cdots\right)du=\frac{4}{\sqrt{\pi}}\int_0^1\left(u^2-\frac{u^4}{1}+\frac{u^6}{2}-\frac{u^8}{6}+\frac{u^{10}}{24}-\cdots\right)du=$ $=\frac{4}{\sqrt{\pi}}\left(\frac{u^3}{3}-\frac{u^5}{5}+\frac{u^7}{14}-\frac{u^9}{54}+\frac{u^{11}}{264}-\cdots\right)\Bigg\vert_0^1=\frac{4}{\sqrt{\pi}}\left(\frac{1}{3}-\frac{1}{5}+\frac{1}{14}-\frac{1}{54}+\frac{1}{264}-\cdots\right)=0,43$, întrucât deja al 5-lea termen 1/264<0,01; $N_1''/N_1=1-N_1'/N_1=0,57$; pentru azot părţile vor fi aceleaşi	**3 p.**
e)	$<\upsilon>=\int_{\upsilon_{p1}}^{\infty}\frac{\upsilon dN}{N_1''}=\frac{1}{0,57}\int_{\upsilon_{p1}}^{\infty}\frac{\upsilon dN}{N_1}=\frac{1}{0,57}\int_{\upsilon_{p1}}^{\infty}\upsilon dP(\upsilon)=\frac{1}{0,57}4\pi\left(\frac{m_{01}}{2\pi kT}\right)^{3/2}\int_{\upsilon_{p1}}^{\infty}\upsilon^3 e^{-\frac{m_{01}\upsilon^2}{2kT}}d\upsilon=$ $\frac{1}{0,57}\sqrt{\frac{8kT}{\pi m_{01}}}\int_1^{\infty}xe^{-x}dx$, unde $x=\frac{m_{01}\upsilon^2}{2kT}$; $<\upsilon>=\frac{1}{0,57}\sqrt{\frac{8kT}{\pi m_{01}}}\frac{2}{e}=1,29\sqrt{\frac{8kT}{\pi m_{01}}}=1,29\sqrt{\frac{8RT}{\pi M_1}}=574,6(\text{m/s})$	**3 p.**