$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		Centrul Naţional de Evaluare şi Examinare		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		B. ELEMENTE DE TERMODINAMICĂ (45 de		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$				
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		Soluţie, rezolvare		Punctaj
3. b 3p 4. b 3p 5. a 3p TOTAL pentru Subiectul I 15p B. Subiectul al II-lea 15p II.a. Pentru: 3p $p_2 = 2p_1$ 2p rezultat final: $p_2 = 2 \cdot 10^5 \text{ N/m}^2$ 1p b. Pentru: 4p $v_{He} = \frac{m_{He}}{M_{He}}$ 2p $N = v_{He} \cdot N_A$ 1p rezultat final: $N = 1,8 \cdot 10^{24}$ atomi 1p c. Pentru: 4p $v = \frac{v_{O_2} \cdot R \cdot T_1}{p_1}$ 1p $r_1 = 300 \text{ K}$ 1p $p \cdot 2V = (v_{O_2} + v_{He}) \cdot R \cdot 2T_1$ 1p rezultat final: $p = 4 \cdot 10^5 \text{ N/m}^2$ 1p d. Pentru: 4p $v = v_{O_2} \cdot v_{He}$ 1p $m = v_{O_2} \cdot u_{O_3} + m_{He}$ 1p $v = \frac{m}{\mu_{amestec}}$ 1p rezultat final: $\mu_{amestec} = 11 \text{ g/mol}$ 1p				
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		-		
5. a 3p TOTAL pentru Subiectul I B. Subiectul al II-lea II.a. Pentru: $p_2 = 2p_1$ 2p rezultat final: $p_2 = 2 \cdot 10^5 \text{ N/m}^2$ 1p b. Pentru: 4p $V_{He} = \frac{M_{He}}{\mu_{He}}$ 2p $N = v_{He} \cdot N_A$ 1p rezultat final: $N \cong 1,8 \cdot 10^{24}$ atomi 1p c. Pentru: 4p $V = \frac{V_{O_2} \cdot R \cdot T_1}{p_1}$ 1p $T_1 = 300 \text{ K}$ 1p $p \cdot 2V = \left(V_{O_2} + V_{He}\right) \cdot R \cdot 2T_1$ 1p rezultat final: $p = 4 \cdot 10^5 \text{ N/m}^2$ 1p d. Pentru: 4p $V = V_{O_2} + V_{He}$ 1p $m = V_{O_2} \cdot \mu_{O_2} + M_{He}$ 1p $m = V_{O_2} \cdot \mu_{O_2} + M_{He}$ 1p $v = \frac{m}{\mu_{amestec}}$ 1p rezultat final: $\mu_{amestec} = 11 \text{ g/mol}$ 1p				
TOTAL pentru Subiectul I B. Subiectul al II-lea II.a. Pentru: 2p $p_2 = 2p_1$ 2p rezultat final: $p_2 = 2 \cdot 10^5 \text{ N/m}^2$ 1p b. Pentru: 4p $V_{He} = \frac{m_{He}}{\mu_{He}}$ 2p $N = V_{He} \cdot N_A$ 1p rezultat final: $N \cong 1,8 \cdot 10^{24}$ atomi 1p c. Pentru: 4p $V = \frac{V_{O_2} \cdot R \cdot T_1}{p_1}$ 1p $T_1 = 300 \text{ K}$ 1p $p \cdot 2V = (V_{O_2} + V_{He}) \cdot R \cdot 2T_1$ 1p rezultat final: $p = 4 \cdot 10^5 \text{ N/m}^2$ 1p d. Pentru: 4p $V = V_{O_2} + V_{He}$ 1p $m = V_{O_2} \cdot \mu_{O_2} + \mu_{He}$ 1p $m = V_{O_2} \cdot \mu_{O_2} + \mu_{O_2} + \mu_{O_2}$ 1p				
B. Subiectul al II-lea III.a. Pentru: $p_2 = 2p_1$ rezultat final: $p_2 = 2 \cdot 10^5 \text{ N/m}^2$ 3p b. Pentru: $v_{He} = \frac{m_{He}}{\mu_{He}}$ 4p $v_{He} = \frac{m_{He}}{\mu_{He}}$ 2p $N = v_{He} \cdot N_A$ 1p rezultat final: $N \equiv 1,8 \cdot 10^{24}$ atomi 1p c. Pentru: $v = \frac{v_{O_2} \cdot R \cdot T_1}{p_1}$ 1p $T_1 = 300 \text{ K}$ 1p $p \cdot 2V = (v_{O_2} + v_{He}) \cdot R \cdot 2T_1$ 1p rezultat final: $p = 4 \cdot 10^5 \text{ N/m}^2$ 1p d. Pentru: $v = v_{O_2} + v_{He}$ 1p $m = v_{O_2} \cdot \mu_{O_2} + m_{He}$ 1p $m = v_{O_2} \cdot \mu_{O_2} + m_{He}$ 1p $m = v_{O_2} \cdot \mu_{O_2} + m_{He}$ 1p $v = \frac{m}{\mu_{amestec}}$ 1p rezultat final: $\mu_{amestec} = 11 \text{ g/mol}$ 1p				•
II.a. Pentru: $p_2 = 2p_1$				тэр
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$				3n
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	ii.a.		2n	Эр
b. Pentru: $\nu_{He} = \frac{m_{He}}{\mu_{He}}$ $2p$ $N = v_{He} \cdot N_A$ 1p rezultat final: $N \cong 1, 8 \cdot 10^{24}$ atomi 1p c. Pentru: 4p $V = \frac{v_{O_2} \cdot R \cdot T_1}{p_1}$ 1p $T_1 = 300 \text{ K}$ 1p $p \cdot 2V = (v_{O_2} + v_{He}) \cdot R \cdot 2T_1$ 1p rezultat final: $p = 4 \cdot 10^5 \text{ N/m}^2$ 1p d. Pentru: 4p $v = v_{O_2} \cdot v_{He}$ 1p $m = v_{O_2} \cdot \mu_{O_2} + m_{He}$ 1p $v = \frac{m}{\mu_{amestec}}$ 1p rezultat final: $\mu_{amestec} = 11 \text{ g/mol}$ 1p			-	
$v_{He} = \frac{m_{He}}{\mu_{He}} \qquad \qquad 2p$ $N = v_{He} \cdot N_A \qquad \qquad 1p$ $rezultat final: N \cong 1,8 \cdot 10^{24} \text{ atomi} \qquad \qquad 1p$ $C. \qquad \text{Pentru:} \qquad \qquad 4p$ $v = \frac{v_{O_2} \cdot R \cdot T_1}{p_1} \qquad \qquad 1p$ $T_1 = 300 \text{ K} \qquad \qquad 1p$ $p \cdot 2V = (v_{O_2} + v_{He}) \cdot R \cdot 2T_1 \qquad \qquad 1p$ $rezultat final: p = 4 \cdot 10^5 \text{ N/m}^2 \qquad \qquad 1p$ $m = v_{O_2} \cdot \mu_{O_2} + m_{He} \qquad \qquad 1p$ $v = \frac{m}{\mu_{amestec}} \qquad \qquad 1p$ $v = \frac{m}{\mu_{amestec}} \qquad \qquad 1p$ $rezultat final: \mu_{amestec} = 11 \text{ g/mol} \qquad \qquad 1p$	_		1p	_
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	b.	Pentru:		4p
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		$v_{\text{tr}} = \frac{m_{\text{He}}}{m_{\text{He}}}$	2n	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		μ_{He}	- P	
C. Pentru: 4p $V = \frac{v_{O_2} \cdot R \cdot T_1}{\rho_1}$ 1p $T_1 = 300 \text{ K}$ 1p $\rho \cdot 2V = \left(v_{O_2} + v_{He}\right) \cdot R \cdot 2T_1$ 1p rezultat final: $\rho = 4 \cdot 10^5 \text{ N/m}^2$ 1p d. Pentru: 4p $v = v_{O_2} + v_{He}$ 1p $m = v_{O_2} \cdot \mu_{O_2} + m_{He}$ 1p $v = \frac{m}{\mu_{amestec}}$ 1p rezultat final: $\mu_{amestec} = 11 \text{ g/mol}$ 1p		$N = v_{He} \cdot N_A$	1p	
$V = \frac{v_{O_2} \cdot R \cdot T_1}{p_1} \qquad 1p$ $T_1 = 300 \text{ K} \qquad 1p$ $p \cdot 2V = (v_{O_2} + v_{He}) \cdot R \cdot 2T_1 \qquad 1p$ $rezultat final: p = 4 \cdot 10^5 \text{ N/m}^2 \qquad 1p d. \qquad Pentru: \qquad 4p v = v_{O_2} + v_{He} \qquad 1p m = v_{O_2} \cdot \mu_{O_2} + m_{He} \qquad 1p v = \frac{m}{\mu_{amestec}} \qquad 1p rezultat final: \mu_{amestec} = 11 \text{ g/mol} \qquad 1p$		rezultat final: $N \cong 1,8 \cdot 10^{24}$ atomi	1p	
$T_1 = 300 \text{ K}$ $p \cdot 2V = (v_{O_2} + v_{He}) \cdot R \cdot 2T_1$ $rezultat \text{ final: } p = 4 \cdot 10^5 \text{ N/m}^2$ $\mathbf{d.}$ $Pentru:$ $v = v_{O_2} + v_{He}$ $m = v_{O_2} \cdot \mu_{O_2} + m_{He}$ $1p$ $v = \frac{m}{\mu_{amestec}}$ $rezultat \text{ final: } \mu_{amestec} = 11 \text{ g/mol}$ $1p$	C.	Pentru:		4p
$T_1 = 300 \text{ K}$ $p \cdot 2V = (v_{O_2} + v_{He}) \cdot R \cdot 2T_1$ $rezultat \text{ final: } p = 4 \cdot 10^5 \text{ N/m}^2$ $\mathbf{d.}$ $Pentru:$ $v = v_{O_2} + v_{He}$ $m = v_{O_2} \cdot \mu_{O_2} + m_{He}$ $1p$ $v = \frac{m}{\mu_{amestec}}$ $rezultat \text{ final: } \mu_{amestec} = 11 \text{ g/mol}$ $1p$		$v_{0_2} \cdot R \cdot T_1$		
$T_1 = 300 \text{ K}$ $p \cdot 2V = (v_{O_2} + v_{He}) \cdot R \cdot 2T_1$ $rezultat \text{ final: } p = 4 \cdot 10^5 \text{ N/m}^2$ $\mathbf{d.}$ $Pentru:$ $v = v_{O_2} + v_{He}$ $m = v_{O_2} \cdot \mu_{O_2} + m_{He}$ $1p$ $v = \frac{m}{\mu_{amestec}}$ $rezultat \text{ final: } \mu_{amestec} = 11 \text{ g/mol}$ $1p$		$V = \frac{-2}{p_0}$	1р	
$p \cdot 2V = (v_{O_2} + v_{He}) \cdot R \cdot 2T_1$ $rezultat final: p = 4 \cdot 10^5 \text{ N/m}^2$ $1p$ $d. Pentru: $			4	
rezultat final: $p = 4 \cdot 10^5 \text{ N/m}^2$ 1p d. Pentru: $v = v_{O_2} + v_{He}$ $m = v_{O_2} \cdot \mu_{O_2} + m_{He}$ 1p $v = \frac{m}{\mu_{amestec}}$ 1p rezultat final: $\mu_{amestec} = 11 \text{ g/mol}$				
d. Pentru: $v = v_{O_2} + v_{He}$ 1p $m = v_{O_2} \cdot \mu_{O_2} + m_{He}$ 1p $v = \frac{m}{\mu_{amestec}}$ 1p $rezultat final: \mu_{amestec} = 11 g/mol$ 1p		$p \cdot 2V = (V_{O_2} + V_{He}) \cdot R \cdot 2I_1$	1р	
$v = v_{O_2} + v_{He}$ $m = v_{O_2} \cdot \mu_{O_2} + m_{He}$ $1p$ $v = \frac{m}{\mu_{amestec}}$ $rezultat final: \mu_{amestec} = 11 \text{ g/mol}$ $1p$		rezultat final: $p = 4.10^5 \text{ N/m}^2$	1p	
$m = v_{O_2} \cdot \mu_{O_2} + m_{He}$ $v = \frac{m}{\mu_{amestec}}$ $rezultat final: \mu_{amestec} = 11 \text{ g/mol}$ 1p	d.	Pentru:		4p
$ u = \frac{m}{\mu_{amestec}} $ rezultat final: $\mu_{amestec} = 11 \text{g/mol}$		$v = v_{O_2} + v_{He}$	1p	
$\mu_{amestec}$ rezultat final: $\mu_{amestec} = 11 \text{ g/mol}$		$m = v_{O_2} \cdot \mu_{O_2} + m_{He}$	1p	
$\mu_{amestec}$ rezultat final: $\mu_{amestec} = 11 \text{g/mol}$			1p	

TOTAL pentru Subiectul al II-lea 15p			1p	
D. Cubicetul al III lee	15p			

B. Subjectul al III-lea

111 -	Double		2
III.a.	Pentru:	_	3р
	reprezentare corectă	3р	
b.	Pentru:		4p
	$L = L_{AB} + L_{BC} + L_{CA}$	1p	
	$L_{AB} = v \cdot R \cdot T_A \ln \frac{p_A}{p_B}$ $L_{BC} = v R(T_C - T_A)$	1p	
	$L_{BC} = v R(T_C - T_A)$	1p	
	rezultat final: $L \cong 2,2 \text{ kJ}$	1p	
C.	Pentru:		4p
	$Q_{cedat} = Q_{AB} + Q_{CA}$	1p	
	$Q_{AB} = L_{AB}$	1p	
	$Q_{CA} = v \cdot C_V \cdot (T_A - T_C)$	1p	
	rezultat final: $Q_{cedat} \cong -10,2 \text{ kJ}$	1p	
d.	Pentru:		4p
	$\eta = \frac{L}{Q_{primit}}$	2p	
	$Q_{primit} = L + Q_{cedat} $	1p	
	rezultat final: $\eta \cong 18 \%$	1p	
TOTAL pentru Subiectul al III-lea			15p