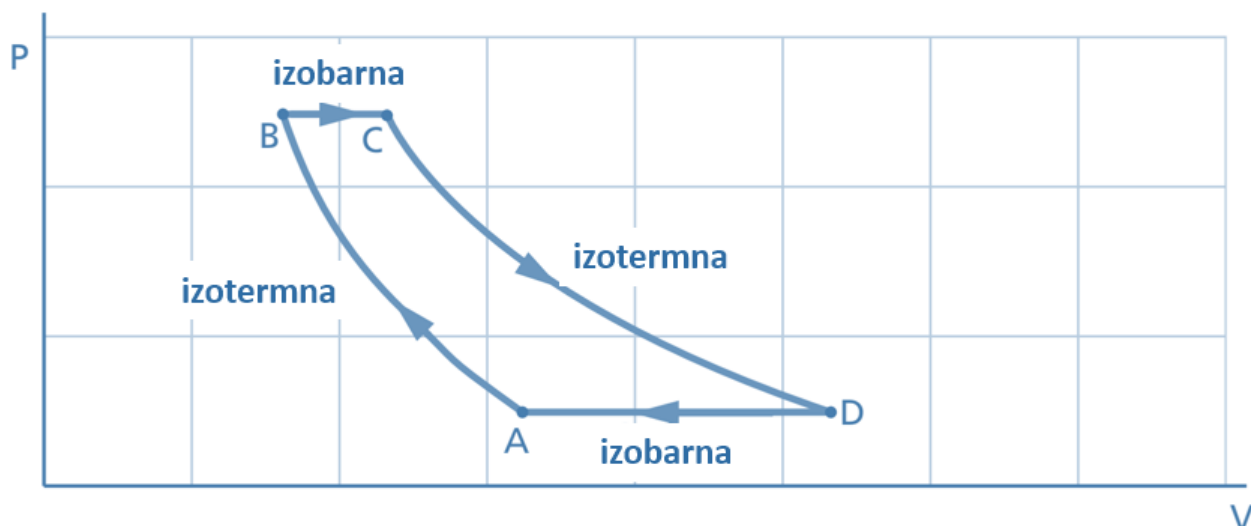


3. Zadatak (12 bodova)

Graf ciklusa je:



Koristeći zakon o idealnom plinu možemo pisati:

$$P_A = nR \frac{T_A}{V_A} = (0,120 \text{ mol})(8,314 \text{ J}/(\text{mol} \cdot \text{K})) \frac{301 \text{ K}}{1,00 \text{ L}} = 3,00 \cdot 10^5 \text{ Pa}$$

$$T_B = T_A = 301 \text{ K (izotermni proces)}$$

$$P_B = P_A \frac{V_A}{V_B} = (3,00 \cdot 10^5 \text{ Pa}) \frac{1,00 \text{ L}}{0,50 \text{ L}} = 6,00 \cdot 10^5 \text{ Pa}$$

$$P_C = P_B \text{ (izobarni proces)}$$

$$V_C = V_B \frac{T_C}{T_B} = (0,50 \text{ L}) \frac{500 \text{ K}}{301 \text{ K}} = 0,83 \text{ L}$$

$$T_D = T_C = 500 \text{ K (izotermni proces)}$$

$$V_D = V_C \frac{P_C}{P_D} = (0,83 \text{ L}) \frac{6,00 \cdot 10^5 \text{ Pa}}{3,00 \cdot 10^5 \text{ Pa}} = 1,66 \text{ L}$$

Dakle:

	$T(K)$	$P(Pa)$	$V(L)$
A	301	3.00×10^5	1.00
B	301	6.00×10^5	0.50
C	500	6.00×10^5	0.83
D	500	3.00×10^5	1.66

(4 boda)

Znamo da vrijede:

$$W_{izoterma} = nRT \ln \frac{V_k}{V_p}$$

$$W_{izobara} = P\Delta V$$

$$\Delta U = nRc_v\Delta T$$

Dakle ima se da:

	$\Delta U(J)$	$W(J)$	$Q(J)$
A→B	0	-208	
B→C	298	198	
C→D	0	346	
D→A	-298	-198	

(4 boda)

Koristeći prvi princip termodinamike možemo izračunati Q

	$\Delta U(J)$	$W(J)$	$Q(J)$
A→B	0	-208	-208
B→C	298	198	496
C→D	0	346	346
D→A	-298	-198	-496

(2 boda)

Učinkovitost ciklusa je dakle:

$$L = 138J$$

$$Q_c = 496\text{J} + 346\text{J} = 842\text{J}$$

$$\eta = \frac{138\text{J}}{842\text{J}} = 16\%$$

(2 boda)