

### Answer on Question #83937 Physics / Molecular Physics | Thermodynamics

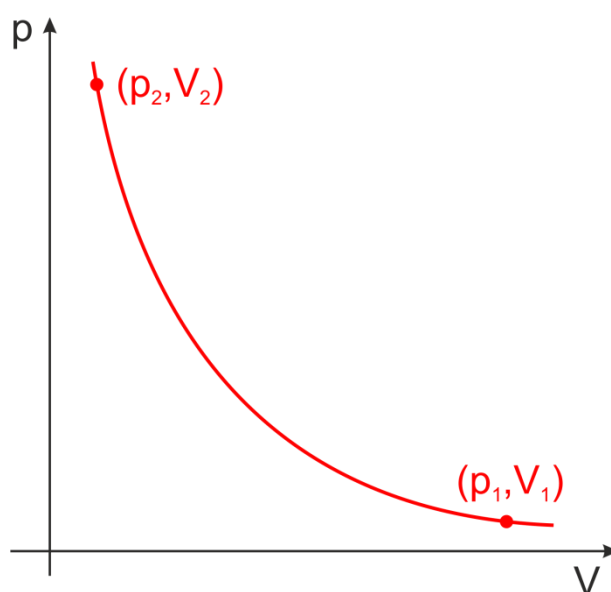
The engine of a Ferrari F355 F1 sports car takes in air at  $t_1 = 20^\circ\text{C}$  and  $p_1 = 1.00\text{ atm}$  and compresses it adiabatically to 0.09 times the original volume. The air may be treated as an ideal diatomic gas ( $\gamma = \frac{7}{5}$ ).

a) Draw a pV-diagram for this process.

b) Find the final temperature and pressure.

#### Solution:

a) The pV-diagram for adiabatic process is as follows



b) Using equations of the adiabatic process,

$$p_1 V_1^\gamma = p_2 V_2^\gamma, \quad T_1 V_1^{\gamma-1} = T_2 V_2^{\gamma-1}$$

we obtain

$$p_2 = p_1 \left(\frac{V_1}{V_2}\right)^\gamma = 1.00\text{ atm} \left(\frac{1}{0.09}\right)^{\frac{7}{5}} = 29.1\text{ atm}$$

$$T_2 = T_1 \left(\frac{V_1}{V_2}\right)^{\gamma-1} = 293\text{ K} \left(\frac{1}{0.09}\right)^{\frac{7}{5}-1} = 768\text{ K}$$

**Answer:** 29.1 atm, 768 K

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