Answer on Question #75088, Physics / Molecular Physics | Thermodynamics

The molar heat capacities of a gas at constant pressure and constant volume are 28.8 J $mol^{-1}K^{-1}$ and 20.5 J $mol^{-1}K^{-1}$ respectively. Calculate the gas constant.

Answer:

In the adiabatic process, the adiabatic exponent is

$$\gamma = 1 + \frac{R}{c_V}$$

We know the adiabatic index

$$\gamma = \frac{c_p}{c_V}$$

We compare these two equations

$$\frac{c_p}{c_V} = 1 + \frac{R}{c_V}$$

We get

$$R = c_p - c_V$$

$$R = 28.8\, Jmol^{-1}K^{-1} - 20.5\, Jmol^{-1}K^{-1} = 8.3\, Jmol^{-1}K^{-1}$$

Answer: 8.3 J $mol^{-1}K^{-1}$

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