Answer on Question #38031, Physics, Other

Question:

In a adiabatic change, the pressure and temperature of a monoatomic gas are related as P∞T^c. Here c equals:

a)2/5

b)3/5

c)5/2

d)5/3.

Answer:

The mathematical equation for an ideal gas undergoing a reversible (i.e., no entropy generation) adiabatic process is:

$$PV^{\gamma} = const$$

For a monatomic ideal gas, $\gamma = \frac{5}{3}$. Assuming $PV = RT$:

$$P^{1-\gamma}T^{\gamma} = const$$

or

$$P \propto T^{-\frac{\gamma}{1-\gamma}} = T^{\frac{5}{3}\frac{3}{2}} = T^{\frac{5}{2}}$$

Answer: c) 5/2