

Answer on Question#38157, Physics, Other

Question:

A monoatomic ideal gas initially at 17°C is suddenly compressed to one-eighth of its original volume. The temperature after compression is:

- a) 16°C
- b) 17°C
- c) 887°C
- d) none of these.

Answer:

"Sudden compression" means that the gas is squeezed so fast that heat does not have a chance to enter or leave the gas. Therefore it is an adiabatic process:

$$TV^{\gamma-1} = \text{const}$$

For a monatomic ideal gas $\gamma = \frac{5}{3}$

$$T_0 V_0^{\frac{2}{3}} = T_1 \left(\frac{V_0}{8} \right)^{\frac{2}{3}}$$

$$T_1 = 8^{\frac{2}{3}} T_0 = 4T_0 = 4 * (17 + 273)K = 1160 K$$

Answer: d) none of these