Physics 301

Homework due 16 October 2024

1) Stowe problem 12.2.

2) Consider an ideal gas, the ratio of whose molar specific heats is given by $\gamma = \frac{c_p}{c_V}$.

The gas is thermally insulated and allowed to expand quasi-statically from an initial volume V_i to a final volume V_f.

a) Use the relation, $pV^\gamma = \text{constant}$, to find the final temperature T_f of the gas.

b) Explain why the entropy does not change during the process.

c) Use the fact that the entropy remains constant to calculate the final temperature T_f of the gas.

3) Liquid mercury at atmospheric pressure and $0^\circ C$ has a molar volume of $14.72\ \text{cm}^3$ / mole and a specific heat at constant pressure of $c_p = 28$ Joules/mole/degree. Its coefficient of volume expansion is $\beta = 1.81 \times 10^{-4}$ / degree, and its compressibility is $\kappa = 3.88 \times 10^{-12}\ \text{cm}^2$/dyne. Find its specific heat c_V at constant volume.

4) Stowe problem 12-3, parts a, b, and d.

5) Stowe problem 12-10.