Phys102 (Sec #41) Quiz # 4 (Ch.19)

Name: Key ID #

1- In an adiabatic process, the temperature of *one* mole of an ideal *monatomic* gas is decreased from 500 K to 400 K. What is the *work* done during the process?

3

$W = -\Delta E_{int} = -nC_v \Delta T$

$= -(1)\left(\frac{3}{2}R\right)(400-500)$

$= \frac{3}{2}R(100) = 1247\ J$

2- Five moles, of an ideal monatomic gas, expand at constant pressure of 1×10^2 Pascal from a volume of 1.0 m^3 to to a volume of 3.0 m^3. What is the change in the internal energy of the system?

3

$\Delta E_{int} = nC_v\Delta T$

$= 5\left(\frac{3}{2}R\right)4.8$

$= 299\ J$

$\Delta T = \frac{P\Delta V}{nR} = \frac{1\times10^2\,(2)}{5\,(8.31)} = 4.8$

3- One mole of an ideal monatomic gas, initially at 300 K, expands adiabatically to twice of its initial volume. How much is the work done process?

4

$W = -\Delta E_{int} = -nC_v\Delta T$

$= -(1)\left(\frac{3}{2}R\right)(-111.4)$

$= +1.4\times10^3\ J$

$T_i V_i^{\gamma-1} = T_f V_f^{\gamma-1}$

$\gamma = \frac{C_p}{C_v} = \frac{5}{3}$

$300\,V_i^{0.67} = T_f(2V_i)^{0.67}$

$T_f = \frac{300}{2^{0.67}} = 188.6\ K$

$\Delta T = T_f - T_i = 188.6 - 300 = -111.4$