Physics 210	Unquiz 07	Name___________

An ideal gas has a molar specific heat given by c_v. Note the units are J/(mole K).

Suppose the gas is taken through an isothermal process at a temperature T.

(a) Calculate ΔU.

(b) If the pressure change is given by $P_f=2P_i$ (the process is still isothermal), what is the relation between the final volume and initial volume?

(c) How much heat is provided to the system?

(d) How much work was done by the system?

(e) Suppose one mole (n=1) of the gas goes through several processes involving changes in T,P and V. However, the initial temperature was T_i and the final temperature was T_f. Calculate ΔU.

(f) Suppose one mole (n=1) of the gas goes through an isovolumeric process. However, the initial temperature was T_i and the final temperature was T_f. Calculate ΔU.

(g) Suppose one mole (n=1) of the gas goes through an isobaric process. However, the initial temperature was T_i and the final temperature was T_f. Calculate ΔU.

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(b) If the pressure change is given by $P_f=2P_i$ (the process is still isothermal), what is the relation between the final volume and initial volume?

$$P_i V_i = P_f V_f \Rightarrow v_f = \frac{P_i}{P_f} V_i = \frac{1}{2} V_i$$

(c) How much heat is provided to the system?

$$\Delta U = Q - W = 0 \Rightarrow Q = W = \int_{v_i}^{v_f} P\, dV$$

$$\Rightarrow NkT \int_{V_i}^{V_f} \frac{dV}{V} = NkT \ln \frac{V_f}{V_i} = NKT \ln \frac{\frac{1}{2} V_i}{V_i} = NkT \ln(1/2) = -NkT \ln(2)$$

(d) How much work was done by the system?
Q=W

(e) Suppose one mole (n=1) of the gas goes through several processes involving changes in T,P and V. However, the initial temperature was T_i and the final temperature was T_f. Calculate ΔU.

$$\Delta U = n c_v \Delta T = C_v (T_f - T_i)$$

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(g) Suppose one mole (n=1) of the gas goes through an isobaric process. However, the initial temperature was T_i and the final temperature was T_f. Calculate ΔU.

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