Djilali BOUNAAMA University of Khemis Miliana **1st year LMD SM**
Matter and Computer Sciences Faculty
Physics Department

Series N°2

Exercise 1

The volume of a gas system (considered as an ideal gas) decreases by 0.5 L under a constant external pressure of 10 atm.

1) What is the work received by the system?
2) Express this work in: L.atm; Joules; Calories.

Exercise 2

We heat a container containing 6 g of hydrogen (assumed ideal gas) whose temperature rises from 15°C to 30°C, calculate:

1) The internal energy change of the gas during this heating.
2) The heat received by the gas, if the latter has provided work of 264 Joules.

Data: R = 8.314 J/mol.K; $\gamma = 1.4$

Exercise 3

Calculate the quantity of heat necessary to transform 500g of ice from -10 to 120°C into steam.

Data: $c_P(\text{water})=1\text{cal.g}^{-1}.\text{K}^{-1}$, $c_P(\text{ice})=0{,}45\text{cal.g}^{-1}.\text{K}^{-1}$, $c_P(\text{steam})=1\text{cal.g}^{-1}.\text{K}^{-1}$,
$L_f = 80\ \text{cal.g}^{-1}$, $L_V = 535\text{cal.g}^{-1}$

Exercise 4

One mole of an ideal gas is subjected to the following reversible transformations:
A-B transformation such that $\Delta U_{AB} = 0$ and $W_{AB} = -623$ cal.
B-C transformation such that $Q_{BC} = \Delta U_{BC}$.
C-A transformation such that $W_{CA} = \Delta U_{CA}$.

1) Give the nature of each transformation.
2) Evaluate the variables P, V, T for each of the states A, B, C.
3) Represent the cycle on a Clapeyron diagram P = f(V).
4) Calculate in calories, the work (W), the heat (Q) and the internal energy change (ΔU) for each transformation and for the cycle.

Data: $P_A = 1.5$ atm, $V_A = 24.6$ L, R=0.082 L.atm/mol.K = 8.314 J/mol.K = 2 cal/mol.K, $\gamma = 1.4$

Exercise 5

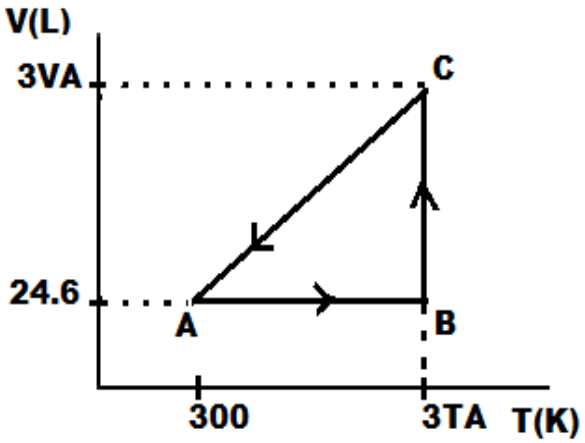
One mole of ideal gas undergoes a reversible cycle of transformations from the initial state A (P_A= 1atm)
-Isochoric heating to state B;
-Isothermal compression up to $V_C = 2\ V_B$ and $T_C = T_B = 2\ T_A$;
-Isobaric cooling to initial state. During this cycle the system provides work of 210,92 cal.

1) Express W_t (total work) as a function of T_A, deduce the value of T_A.
2) Determine the missing parameters of each state.
3) Represent the cycle on a Clapeyron diagram P = f(V).
4) Calculate the work, the quantity of heat, the internal energy change and the enthalpy change for each transformation and for the cycle.

Data: $c_p = 7$ cal/mol.K, $c_v = 5$ cal/mol.K

Exercise 6

One mole of an ideal gas undergoes a reversible cycle ABCA, represented graphically below in terms of T, V coordinates.



1) Determine the missing parameters for each state.

2) Identify the nature of each transformation.

3) Calculate, for each transformation, the heat quantity, the work, the internal energy change and the enthalpy change.

Data : R = 0,082 l.atm/K.mole = 8,314 J/K.mol; $\gamma = 1,4$; 1 atm.L = 101,3 J.