Abdelhafid Boussof University Center - Mila

Institute of Sciences and Technology **Academic Year: 2024/2025**
Course: Thermodynamics **First Year ST**

Series Nº 2

Exercise 1:

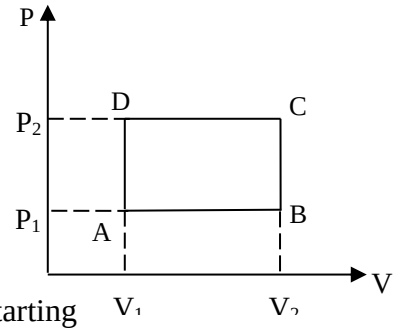
1. Calculate the amount of heat required to heat 100 g of copper (Cu) from 10°C to 100°C.
2. If a mass of 100 g of aluminum (Al) absorbs the same amount of heat at 10°C, which one heats up more, copper or aluminum?
   (Given: Specific heat of copper = 0.39 J/g°C, specific heat of aluminum = 0.9 J/g°C).

Exercise 2:
1 mole of an ideal gas expands from P_1=100 atm to P_2=1 atm at a constant temperature of T=25°C.

- Calculate the work done in two ways: reversibly and irreversibly.
- Represent the work graphically in both cases.

Exercise 3:
A reversible cyclic process is performed on 1 mole of an ideal gas, represented by the rectangle shown in the Clapeyron (PV) diagram:

- Calculate the work exchanged in each transformation between the gas system and the external environment, then calculate the total work exchanged in the cyclic process.
- Find the expression for the heat Q exchanged in the transformation A→B in terms of γ and R, then calculate it.
  Given:
  - T_1=200 K, T_2=300
  - P_1=10^5 Pa, P_2=20×10^5 Pa
  - V_1=5 L, V_2=12 L
  - γ=Cp/Cv=1.4, Cp−Cv=R, R=8.31 J/mol.K



Exercise 4:
3 moles of an ideal gas undergo a series of reversible transformations starting from point A (P_A=1 atm, T_A=300 K):

1. Isothermal transformation AB, where the system releases heat of −3500 cal.
2. Isobaric transformation BC, where T_C = 450 K.
3. Adiabatic transformation CD, where the system returns to the initial pressure.
4. Isobaric transformation DA.

- Calculate T, V, and P at each point, then draw the cycle of these transformations on a PV diagram (Clapeyron diagram).
- Calculate the work W_{cycle} and the heat Q_{cycle} exchanged during the cyclic process.

Given:

- Cp=7 cal/mol.K