

**UNIVERSITY CEU SAN PABLO  
SCHOOL OF PHARMACY  
DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY**

**COMPLEMENTARY PROBLEMS OF PHYSICAL CHEMISTRY**

**2018-19**

**LESSON 2**

6. One mole of carbon monoxide undergoes a reversible process from 10 atm and 10 l to a final pressure of 1 atm. Considering ideal behaviour, calculate Q, W,  $\Delta U$ ,  $\Delta H$ ,  $\Delta A$  and  $\Delta G$  if the process is :
- a) isochoric
  - b) isothermal
- Data:**  $C_p = 7n/2 R$  and  $C_v = 5n/2 R$

**Solution:**

- a)  $Q = -22812.74 \text{ J}$ ;  $W = 0$ ;  $\Delta U = -22812.74 \text{ J}$ ;  $\Delta H = -31937.76 \text{ J}$ ;  $\Delta S = -47.86 \text{ J}\cdot\text{K}^{-1}$ ;  
 $\Delta G = \text{It can not be calculated}$ ;  $\Delta A = \text{It can not be calculated}$
- b)  $Q = 23345.89 \text{ J}$ ;  $W = -23345.89 \text{ J}$ ;  $\Delta U = 0$ ;  $\Delta H = 0$ ;  $\Delta S = 19.14 \text{ J}\cdot\text{K}^{-1}$ ;  
 $\Delta G = \Delta A = -23345.89 \text{ J}$ .

7. 5 l of an ideal monoatomic gas at 300 K and 1 atm are compressed to 100 atm. Calculate Q, W,  $\Delta U$ ,  $\Delta H$ ,  $\Delta S$ ,  $\Delta A$ ,  $\Delta G$ , for the reversible isothermal process.
- Data:**  $R = 0.082 \text{ atm}\cdot\text{l}\cdot\text{mol}^{-1}\cdot\text{K}^{-1} = 1.987 \text{ cal}\cdot\text{mol}^{-1}\cdot\text{K}^{-1} = 8.314 \text{ J}\cdot\text{mol}^{-1}\cdot\text{K}^{-1}$

**Solution:**

$Q = -2333.99 \text{ J}$ ;  $W = 2333.99 \text{ J}$ ;  $\Delta U = \Delta H = 0$ ;  $\Delta S = -7.78 \text{ J}\cdot\text{K}^{-1}$ ;  $\Delta G = \Delta A = 2334.78 \text{ J}$ .