

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

PROBLEMS OF PHYSICAL CHEMISTRY

2018-2019

LESSON 1

- 1.- One mole of a monatomic ideal gas at normal temperature and pressure, undergoes a process in which the volume is doubled. The nature of the process is not specified but ΔH is 500 cal and Q is 400 cal. Calculate the final temperature and pressure, ΔU and W for this process. Assume that the gas reaches the same final conditions by a process which involves two steps, the first, isothermal and the second, isochoric, both reversible. Calculate Q , W , ΔU and ΔH .

Data: $R = 0.082 \text{ l}\cdot\text{atm}\cdot\text{K}^{-1}\cdot\text{mol}^{-1} = 1.987 \text{ cal}\cdot\text{K}^{-1}\cdot\text{mol}^{-1} = 8.314 \text{ J}\cdot\text{K}^{-1}\cdot\text{mol}^{-1}$

- 2.- Calculate the system, surroundings and universe variation for the isobaric transformation of one mole of $\text{O}_2(\text{g})$ at 298 K and 1 atm to $\text{O}_2(\text{l})$ at 90.19 K, if the process is reversible. Coment, without performing any calculations, the results that would have been obtained if the transformation had been irreversible, placing the sample in $\text{H}_2(\text{l})$ at 13.46 K. Consider that vaporization occurs at 90.19 K, and the variation of enthalpy is $1630 \text{ cal}\cdot\text{mol}^{-1}$

Data: $\bar{C}_p(\text{O}_2(\text{g})) = 7/2 R$; $\rho(\text{O}_2(\text{l})) = 1.141 \text{ g}\cdot\text{cm}^{-3}$

$R = 0.082 \text{ l}\cdot\text{atm}\cdot\text{K}^{-1}\cdot\text{mol}^{-1} = 1.987 \text{ cal}\cdot\text{K}^{-1}\cdot\text{mol}^{-1} = 8.314 \text{ J}\cdot\text{K}^{-1}\cdot\text{mol}^{-1}$

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