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 l·atm·K^{-1}·mol^{-1} = 1.987 cal·K^{-1}·mol^{-1} = 8.314 J·K^{-1}·mol^{-1}

2.- Calculate the system, surroundings and universe variation for the isobaric transformation of one mole of $O_{2\,(g)}$ at 298 K and 1 atm to $O_{2\,(l)}$ 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 $H_{2\,(l)}$ at 13.46 K.
Consider that vaporization occurs at 90.19 K, and the variation of enthalpy is 1630 cal·mol^{-1}
Data: $\overline{C_p}$ ($O_{2\,(g)}$) = 7/2 R; ρ($O_{2(l)}$) = 1.141 g·cm^{-3}
R = 0.082 l·atm·K^{-1}·mol^{-1} = 1.987 cal·K^{-1}·mol^{-1} = 8.314 J·K^{-1}·mol^{-1}