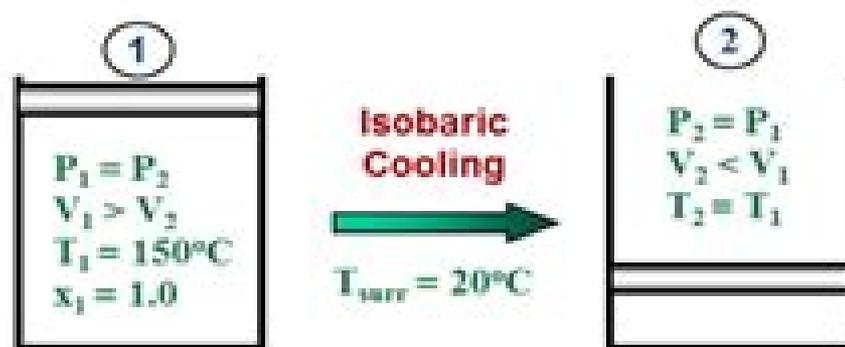## 7B-3 : Entropy Change of an Isobaric Process

6 pts

A piston-and-cylinder device with a free-floating piston contains 2.6 kg of saturated water vapor at 150°C. The water loses heat to the surroundings until the cylinder contains saturated liquid water.

The surroundings are at 20°C. Calculate... a.) ΔS_{water}, b.) $\Delta S_{surroundings}$, c.) $\Delta S_{universe}$

Read : Calculating ΔS for the water in the cylinder is straightforward. The key to calculating ΔS_{surr} is the fact that the surroundings behave as a thermal reservoir. The temperature of the surroundings does not change and there are no irreversibilities in the surroundings that are associated with the process. The key to calculating ΔS_{univ} is the fact that the universe is made up of the combination of the system and the surroundings. Consequently, $\Delta S_{univ} = \Delta S_{sys} + \Delta S_{surr}$

Given:

m	2.60	kg
T_1	150	°C
x_1	1	kg vap/kg
T_{surr}	20	°C
$P_1 = P_2$		
x_2	0	kg vap/kg

Find:

ΔS_{sys}	???	kJ/K
ΔS_{surr}	???	kJ/K
ΔS_{univ}	???	kJ/K

Diagram:

① $P_1 = P_2$ $V_1 > V_2$ $T_1 = 150°C$ $x_1 = 1.0$

Isobaric Cooling

$T_{surr} = 20°C$

② $P_2 = P_1$ $V_2 < V_1$ $T_2 = T_1$

Assumptions:

1 - Changes in kinetic and potential energies are negligible.
2 - Boundary work is the only form of work that crosses the system boundary.
3 - The surroundings behave as a thermal reservoir.

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R Barnett

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Problems in Chemical Thermodynamics with Solutions Maka Aleksishvili,Shota Sidamonidze,2002 The methods of chemical thermodynamics are effectively used in many fields of science and technology Mastering these methods and their use in practice requires profound comprehension of the theoretical questions and acquisition of certain calculating skills This book is useful to undergraduate and graduate students in chemistry as well as chemical thermal and refrigerating technology it will also benefit specialists in all other fields who are interested in using these powerful methods in their practical activities

Equilibrium Problems: Nonsmooth Optimization and Variational Inequality Models F. Giannessi,A. Maugeri,Panos M. Pardalos,2006-04-11 The aim of the book is to cover the three fundamental aspects of research in equilibrium problems the statement problem and its formulation using mainly variational methods its theoretical solution by means of classical and new variational tools the calculus of solutions and applications in concrete cases The book shows how many equilibrium problems follow a general law the so called user equilibrium condition Such law allows us to express the problem in terms of variational inequalities Variational inequalities provide a powerful methodology by which existence and calculation of the solution can be obtained   Thermodynamics Problem Solver The Editors of REA,Ralph Pike,2013-01-01 REA s Thermodynamics Problem Solver Each Problem Solver is an insightful and essential study and solution guide chock full of clear concise problem solving gems Answers to all of your questions can be found in one convenient source from one of the most trusted names in reference solution guides More useful more practical and more informative these study aids are the best review books and textbook companions available They re perfect for undergraduate and graduate studies This highly useful reference provides thorough coverage of pressure work and heat energy entropy first and second laws ideal gas processes vapor refrigeration cycles mixtures and solutions For students in engineering physics and chemistry   **SIAM Journal on Control and Optimization** Society for Industrial and Applied Mathematics,2007   Concepts, Problems, and Solutions in General Physics Raymond A. Serway,1975   *Hyperbolic Problems* Michael Fey,Rolf Jeltsch,1999   **Systems Research for Behavioral Science** Walter Buckley,2017-07-12 Systems Research for Behavioral Science will be of interest to those in any discipline concerned with developments in science It is addressed principally to the student of human behavior as that study is approached from the social side Previously the study of human behavior was the general area of science that had been slowest to respond to the exciting challenge of the modern systems outlook Yet it is behavioral science that stands to gain the most from insights into the workings of more complex systems The editor presents not only a fair selection of systems research in behavioral science but also provides an extensive selection of important statements of general principles including several already considered classics Hence this sourcebook may function in part as a principles text exposing the initiate to original pioneering statements as well as later work inspired by them and alerting the sizeable number of underexposed scholars who are over familiar with the few terms such as feedback boundary input and output that

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