ASSIGNMENT 04

CHE221A

6.3-2: A gas has the following equations of state

where B is a positive constant. The system obeys the Nernst postulate (S → 0 as T→ 0). The gas, at an initial temperature Ti, and initial pressure Pi, is passed through a “porous plug" in a Joule-Thomson process. The final pressure is Pf Calculate the final temperature Tf.

6.3-3: Show that for an ideal van der Waals fluid

where h is the molar enthalpy. Assuming such a fluid to be passed through a porous plug and thereby expanded from vi to vf (with vi > vf ), find the final temperature Tf in terms of the initial temperature Ti, and the given data.

Evaluate the temperature change if the gas is CO2 the mean temperature is 0° C the mean pressure is 10 ^ 7 Pa, and the change in pressure is 10 ^ 6 Pa. The molar heat capacity Cp of CO2 at the relevant temperature and pressure is 29.5 J/mole-K. Carry calculation only to first order in b/v and a/RTv.

9.4-2: Derive the expressions for vc, Pc and Tc given in Example 1