Assignment 2: CHM221A
Topic: Intensive properties and equation of states-I

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August 24, 2023

To students: These assignments are designed to strengthen your understanding in the lessons taught in class as well as develop your problem solving skills. If you copy from other sources without understanding, those purposes will be defeated and you will receive no benefits. **If you cannot solve them, *try* and bring your problems to the instructor. He will definitely help. Also, there may be some typo - discuss with me if you think there are any.**

1. Find out the dimension of S/R where R is the ideal gas constant

2. Find out the equations of state for

$$u = Av^{-2}e^{s/s_0}$$

   . A and s_0 are constants.

3. Find out plot

   (a) P vs T at constant V

   (b) P vs V at constant T

   (c) V vs T at constant P

4. The fundamental relation for a mono-component system is

$$s = \frac{\left(\frac{v}{v_0}\right)^{\gamma}}{1 + e^{-\frac{u}{u_0}}}$$

   where
$$u = \frac{U}{N}; v = \frac{V}{N}; s = \frac{S}{N}$$
   and γ, u_0 and v_0 are positive constants.

   (a) Show that (1) $v \to 0$ as $T \to 0$ **and** (2) $\gamma > 2$

(b) Find out the independent equations of state

5. The equations of state for a system is given by

$$P = \frac{s^3}{v-1}$$
$$T = v^4 s^{1/3}$$

where

$$u = \frac{U}{N}; v = \frac{V}{N}; s = \frac{S}{N}.$$

Find out the energetic fundamental relation if at a reference state $u = u_0$ for $s = s_0$ and $v = v_0$.