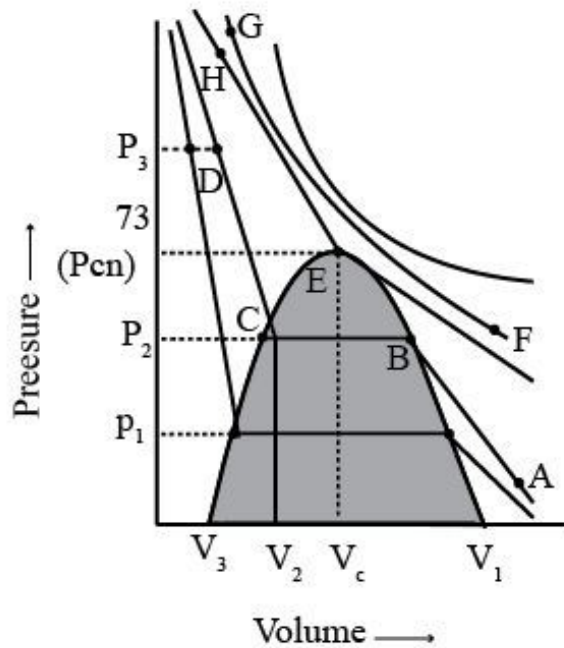
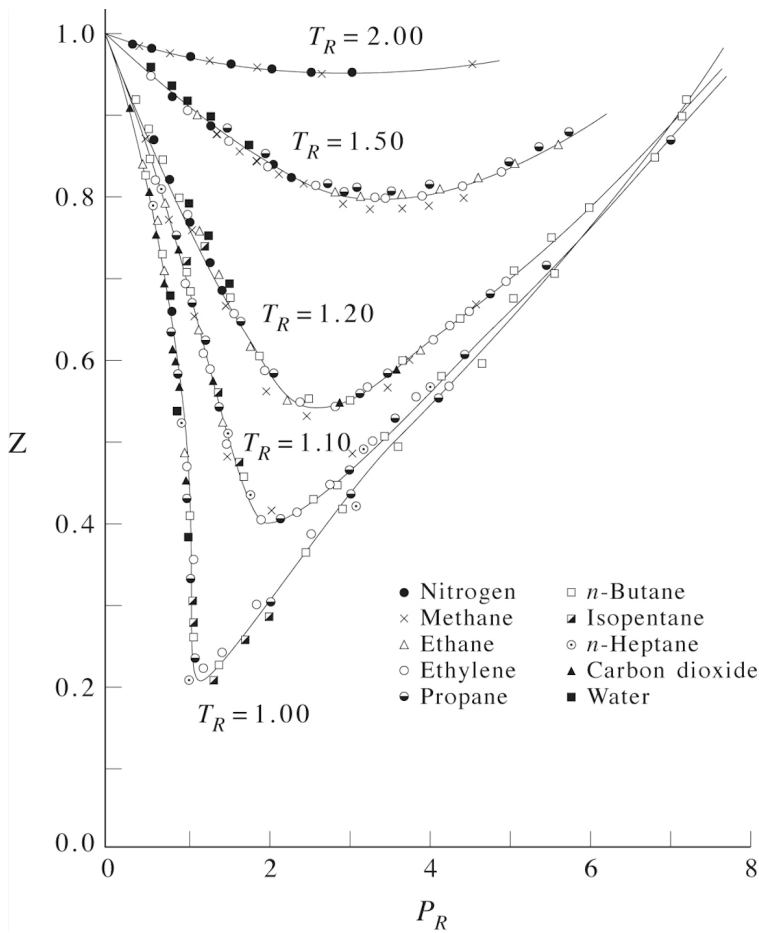


- Trace a path where a gas is compressed isothermally at temperature $T < T_c$. Identify each point where the state changes.
 - Label the inflection point. What is the significance of this point in terms of phase transitions?
 - Draw a path on the diagram to convert the gas to a liquid, ensuring that only one phase exists throughout the process. Describe what you would do to achieve each step.



- Methane ($T_c = 190.6 \text{ K}$, $P_c = 45.99 \text{ bar}$) and propane ($T_c = 369.8 \text{ K}$, $P_c = 42.48 \text{ bar}$) are both at reduced conditions of $T_r = 1.3$ and $P_r = 0.8$. Calculate the actual T and P , and predict which has a greater compressibility factor.

3. Explain how the figure illustrates the Law of Corresponding states by contrasting it to a Z vs P diagram, and use the figure to estimate the molar volume of CO at 200 K and 180 bar ($T_c = 132.85\text{ K}$, $P_c = 34.935\text{ bar}$). The experimental value is $78.3\text{ cm}^3 \cdot \text{mol}^{-1}$. $R = 0.08314\text{ L bar mol}^{-1}\text{ K}^{-1}$



Homework Problem 11

1. Using the van der Waals equation, find the first and second derivatives of the pressure P with respect to the molar volume \bar{V} at constant temperature. Then set both derivatives equal to zero, $\left(\frac{\partial P}{\partial \bar{V}}\right)_T = 0$ and $\left(\frac{\partial^2 P}{\partial \bar{V}^2}\right)_T = 0$ and use this to show $T_c = \frac{8a}{27bR}$.