ANNOUNCED QUIZ #8 – ME 3030 — Section 001 – Spring 2024

NAME: SOLUTION

This is an closed book, no calculator quiz. An unsigned honors pledge will result in a zero.

1. The Joule-Thompson coefficient, μ_J, is a measure of how the temperature of a gas changes upon expansion. It is related to the specific heat via the following equation:

$$c_p = \frac{1}{\mu_J}\left[T\left(\frac{\partial v}{\partial T}\right)_p - v\right] \tag{1}$$

Write an equation for μ_J for an ideal gas. Express your equation in simplest possible form

GIVEN: Equation for μ_J

FIND: Equation for μ_J for an ideal gas.

ASSUMPTIONS:

ANALYSIS:

$$c_p = \frac{1}{\mu_J}\left[T\left(\frac{\partial v}{\partial T}\right)_p - v\right]$$

$$\mu_J = \frac{1}{c_p}\left[T\left(\frac{\partial v}{\partial T}\right)_p - v\right]$$

Ideal gas: $Pv = RT$

$$v = \frac{RT}{P}$$

$$\left(\frac{\partial v}{\partial T}\right)_P = \frac{R}{P}$$

$$\mu_J = \frac{1}{c_p}\left[T\frac{R}{P} - \frac{RT}{P}\right]$$

$T\frac{R}{P} - \frac{RT}{P} = 0$

$$\boxed{\mu_J = 0} \leftarrow \text{ANS.}$$

I HAVE NEITHER PROVIDED OR RECEIVED HELP DURING THIS QUIZ.

SIGNATURE