Quiz 2.4 – Exact Differentials

Name: _____

Natural Variables

Write the exact differentials for the four main thermodynamic potentials (U, H, G, and A) with respect to their natural variables in two forms: (The Wikipedia page on "Thermodynamic Potentials" can be very helpful here, but Helmholtz energy is F instead of A on that page)

- Showing the partial derivatives explicitly

- Replacing the partial derivatives with the appropriate state variables

Properties of Ideal gases

Find the following properties in terms of state variables (i.e. solve the derivatives) for an ideal gas:

- π_T

- α

- κ_T

Joule-Thompson Coefficients

The Joule-Thompson coefficient is positive for most gases under most conditions. State the following:

- What conditions will lead to a negative coefficient for most gases?

- Give an example of a gas with a negative coefficient at STP

Ozymandius

By Percy Bysshe Shelley

I met a traveller from an antique land,
Who said—"Two vast and trunkless legs of stone
Stand in the desert. . . . Near them, on the sand,
Half sunk a shattered visage lies, whose frown,
And wrinkled lip, and sneer of cold command,
Tell that its sculptor well those passions read
Which yet survive, stamped on these lifeless things,
The hand that mocked them, and the heart that fed;
And on the pedestal, these words appear:
My name is Ozymandias, King of Kings;
Look on my Works, ye Mighty, and despair!
Nothing beside remains. Round the decay
Of that colossal Wreck, boundless and bare
The lone and level sands stretch far away."