參考用

1. (a) State the first law of thermodynamics.

    (b) State the Clausius statement of the second law of thermodynamics.

    (c) State the Kelvin-Planck Statement of the second law of thermodynamics.

    (d) Prove that both statements of second law are equivalent.
    (25%)

2. Calculate the entropy density s of the radiation field using the following relations between the energy density, u, radiation pressure, p, and absolute temperature, T:

    $p = \frac{1}{3} u$, $u = \sigma T^4$ 　　　(σ is a constant)
    (20%)

3. From the four thermodynamic function, internal energy, enthalpy, Helmholtz function, and Gibbs function derive the four Maxwell's relations.
    (20%)

4. Determine the pressure, Pc, the volume, $\mathcal{V}c$, and the temperature, Tc, at critical point for a gas which obeys the van der Waals equations.

    $(p + \frac{a}{\mathcal{V}^2}) (\mathcal{V} - b) = RT$

    Where a and b are constants.
    (15%)

5. (a) Derive Poisson's equations from first law of thermodynamics.

    (b) From (a), discuss the relationship between pressure and temperature.
    (20%)