所別：大氣物理研究所碩士班 不分組 科目：熱力學

1) Give physical explanations (or definitions) for the following terms: (5% each)
   a) isolated system
   b) enthalpy
   c) specific heat
   d) reversible process
   e) isentropic process
   f) efficiency of a heat engine

2) Please answer the following questions briefly: (5% each)
   a) What is an ideal gas? Give an equation describing the ideal gas law.
   b) State the four (the zeroth, the first, the second, and the third) laws of thermodynamics.
   c) Give three different ways of heat transferring process.
   d) Please show that enthalpy is conserved in an isobaric adiabatic process.
   e) Describe, on a $P$-$V$ diagram, the isothermal compression process and the adiabatic compression process, respectively.
   f) Under what kinds of conditions does the Gibbs free energy remain constant?

3) For an ideal gas undergoing an adiabatic process, show that $TV^{\gamma-1}$ is a constant where $T$ and $V$ are the temperature and the volume of the gas, respectively, and $\gamma$ is the ratio of heat capacities at constant pressure and constant volume. (15%)

4) Considering a fixed amount of water in a container, please derive the Clausius-Clapeyron equation which shows variations of the saturated water vapor pressure with the temperature. (15%)

5) When phase transformation occurs, what factors should be taken into account in modifying the equation of state of an ideal gas? Draw, on a $P$-$V$ diagram, two isotherms that represent temperatures well above and below the critical temperature, respectively. (10%)