1. Please explain the following terms: (20%)
   (a) Raoult's law　　　　(b) liquid-junction potential　　　(c) zero-point energy
   (d) selection rules in quantum mechanics

2. Consider the system of an ideal gas (one mole),
   (a) calculate the internal energy, C_V, and C_P (15%)
   (b) calculate q, w, and $\triangle H$ for the reversible adiabatic compression from 400 torr and 1L to a final volume of 0.25 L. (R = 8.314 J/mol-K) (15%)

3. For a particle in a one-dimensional (x-axis) box,
   (a) write down the time-independent Schrodinger equation and their corresponding solution of wavefunction. (10%)
   (b) calculate the $\langle P_x \rangle$ and $\langle x \rangle$. (P: moment, x: position) (10%)
   (c) The model could be applied to the Π electrons in $H_2C=CH-CH=CH_2$ (For simplicity, we assume that it is a linear molecule). The Π electrons in $H_2C=CH-CH=CH_2$ move along a straight line. What is the highest occupied energy level? (5%)

4. Please explain the following terms: (25%)
   (a) critical micelle concentration　　　(b) adsorption　　　(c) half-life　　　(d) chain reaction
   (e) steady-state approximation