※ 考生請注意：本試題不可使用計算機

(1) Explain the relationship between the trems exact differential and state function.(15%)

(2) What is the physical basis for the experimental result that U is a function of V at constant T for a real gas? Under what conditions will U decrease as V increases? (15%)

(3) The reactants in the reaction $2NO_{(g)} + O_{2(g)} -> 2NO_{2(g)}$ are initially at 298K. Why is the reaction enthalpy the same if the reaction is (a) constantly kept at 298 K or (b) if the reaction temperature is not controlled and the heat flow to the surroundings is measured after the temperature of the products is returned to 298K? (15%)

(4) Under what conditions does the equality $\triangle S = \triangle H / T$ hold? (15%)

(5) Under what condition is $dA < 0$ a condition that defines the spontaneity of a process? (15%)

(6) Under what condition is $dG < 0$ a condition that defines the spontaneity of a process? (10%)

(7) Which thermodynamic state function gives a measure of the maximum electric work that can be carried out in a fuel cell? (15%)

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