

科目：物理化學

適用：應化系

考生注意：

1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分。
3. 限用藍、黑色筆作答；試題須隨卷繳回。

本 試 題
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1. (a) If \hat{A} and \hat{B} are Hermitian operators, prove that their product $\hat{A}\hat{B}$ is Hermitian if only if \hat{A} and \hat{B} commute (8 pt); (b) If \hat{A} and \hat{B} are Hermitian, prove that $\frac{1}{2}(\hat{A}\hat{B} + \hat{B}\hat{A})$ is Hermitian (8 pt); (c) Is $\hat{x}\hat{p}_x$ Hermitian (7 pt)? (d) Is $\frac{1}{2}(\hat{x}\hat{p}_x + \hat{p}_x\hat{x})$ Hermitian? (7 pt)
2. Write down the Schrödinger equation (10 pt).
3. What is the first law of thermodynamics? (10 pt).
4. Please show the energy of free particle in a one-dimensional box of length l from the time-independent Schrödinger equation? (15 pt)
5. Write down the ideal gas equation of state (10 pt).
6. If $U = U(V, T)$ and $p = p(V, T)$ are functions of V and T and if $H = U + pV$, show that $\left(\frac{\partial H}{\partial T}\right)_p - \left(\frac{\partial U}{\partial T}\right)_V = \left[\left(\frac{\partial U}{\partial V}\right)_T + p\right]\left(\frac{\partial V}{\partial T}\right)_p$ (25 pt)

試

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