

國立清華大學 102 學年度碩士班考試入學試題

系所班組別：工程與系統科學系碩士班甲組

考試科目（代碼）：材料熱力學(2502)

共 5 頁，第 1 頁 *請在【答案卡】作答

1. (6%) Indicate the wrong statement for the definition of isolated system in the following:

- (a) no energy interchanged in the system
- (b) no energy exchanged with the surrounding
- (c) no expansion or contraction of the system
- (d) no work done by the system ($w=0$)
- (e) no heat entering from outside ($Q=0$)

2. (6%) Indicate the wrong statement for the definition of closed system in the following:

- (a) energy can be interchanged in the system
- (b) the volume of the system is constant
- (c) no mass enters or leaves the system
- (d) work can be done by the system ($w\neq 0$)
- (e) heat can enter the system ($Q\neq 0$)

3. (6%) Indicate the wrong statement for the properties of ideal gas

- (a) no heat needed in an isothermal reversible expansion process
- (b) internal energy does not depend on pressure
- (c) internal energy does not depend on volume
- (d) internal energy depends only on the temperature
- (e) no intermolecular interaction

4. (6%) which function is a path function

- (a) Gibbs free energy
- (b) Entropy
- (c) Work
- (d) Enthalpy
- (e) Temperature

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共 5 頁，第 2 頁 *請在【答案卡】作答

5. (7%) The initial state of one mole gas is $P_1=1\text{atm}$, $V_1=10$ liters and the final state of the gas is $P_2=10\text{atm}$, $V_2=2$ liters. What the work done by the gas during the process?

- (a) 10 liter-atm
- (b) -10 liter-atm
- (c) -1000 joules
- (d) -1000 cal
- (e) can not be determined

6. (7%) Consider that one mole of ideal gas expands from $V_1=10$ liters to $V_2=20$ liters, through three different reversible paths, (1) isobarically, (2) isothermally, and (3) adiabatically, then the work done would be,

- (a) $W_1>W_2>W_3$
- (b) $W_1>W_3>W_2$
- (c) $W_2>W_3>W_1$
- (d) $W_2>W_1>W_3$
- (e) $W_3>W_1>W_2$

7. (7%) For a steam engine, steam enters at 500°C and is exhausted at 120°C . What is the maximum efficiency of this engine?

- (a) 0.63
- (b) 0.51
- (c) 0.49
- (d) 0.76
- (e) 0.23

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共 5 頁，第 3 頁 *請在【答案卡】作答

8. (7%)When a gas expands adiabatically and reversibly, which of the following statements is NOT correct?
- (a) no change of entropy for the gas
 - (b) the gas does work
 - (c) the gas pressure decrease
 - (d) the temperature decreases
 - (e) none of above are correct
9. (7%)The entropy of a system contained in an adiabatic enclosure
- (a) decreases during an reversible process
 - (b) increases during an reversible process
 - (c) decreases during an irreversible process
 - (d) increases during an irreversible process
 - (e) none of the above
10. (7%)Two moles of an idea gas are contained adiabatically at 30 atm pressure and 298K. The pressure is suddenly released to 10 atm, and the gas undergoes an irreversible adiabatic expansion as a result of which 2,000joules of work are performed.
- what is the final temperature of the gas after the irreversible expansion?
- (a) 192K
 - (b) 350K
 - (c) 218K
 - (d) 396K
 - (e) 77K

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共 5 頁，第 4 頁 *請在【答案卡】作答

11. (7%) From above, what is the created entropy due to the irreversible process (unit: joule/ degree)
- (a) 3.7
 - (b) -7.8
 - (c) 16.3
 - (d) -27.9
 - (e) 5.2
12. (6%) C_p is equal to C_v at
- (a) 0K
 - (b) 0°C
 - (c) 298K
 - (d) 398K
 - (e) 15K
13. (7%) A rigid container is divided into two compartments of equal volume with a partition. One compartment contains 1 mole of A ideal gas, and the other contains 1 mole of B ideal gas, when the partition is removed, the entropy change is (Note: $R=8.314\text{J mol}^{-1} \text{K}^{-1}$)
- (a) 0,
 - (b) 11.53J
 - (c) 23.05J
 - (d) 12.53J
 - (e) 25.06J

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14 (7%) From above, One compartment contains 1 mole of A ideal gas, and the other also contains 1 mole of A ideal gas, when the partition is removed, the entropy change is

- (a) 0,
- (b) 11.53J
- (c) 23.05J
- (d) 12.53J
- (e) 25.06J

15. (7%) The enthalpy of PbO is -219KJ/mole at 298K. ΔC_p of the reaction $Pb + 1/2 O_2 \rightarrow PbO$ is 10J/mole-K for $T = 298 - 500K$. What is ΔH for the reaction at 398K?

- (a) -218kJ
- (b) $-10 \ln(398/298)J$
- (c) 1000J
- (d) 1500J
- (e) not available from the provided data