

國立屏東科技大學九十七學年度碩士班暨碩士在職專班招生考試
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1. What is isolated system, closed system and opened system? (10%)
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2. Please explain extensive properties, intensive properties, 1st law of thermodynamics and 2nd law of thermodynamics? (10%)
3. Please prove $C_p - C_v = (\partial V / \partial T)_p [P + (\partial U / \partial V)_T]$ and $C_p - C_v = R$ for ideal gas. (10%)
4. A system comprise one mole of an ideal gas at 0°C and 1 atm. The system is subjected to the following process, each of which is conducted reversibly:
a. A 10-fold increase in volume at constant temperature.
b. Then a 100-fold adiabatic increase in pressure.
c. Then a return to the initial state along a straight line path in P - V diagram
Calculate the work done by the system in step (c) and the total heat added to or withdrawn from the system as a result of the cyclic process. (15%)
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5. Carbon has two allotropes, graphite and diamond. At 25 °C and 1 atm pressure, graphite is the stable form. Calculate the pressure which must be applied to graphite at 25 °C in order to bring about its transformation to diamond. Given:
 $H_{298}(\text{graphite}) - H_{298}(\text{diamond}) = -1900 \text{ joules/mole}$
 $S_{298}(\text{graphite}) = 5.73 \text{ joules/degree-mole}$
 $S_{298}(\text{diamond}) = 2.43 \text{ joules/degree-mole}$
The density of graphite at 25 °C is 2.22 gram/cm³
The density of diamond at 25 °C is 3.515 gram/cm³ (20%)
6. One mole of an ideal gas is subjected to the following sequence of steps:
a. Starting at 25°C and 1 atm, the gas expands freely into a vacuum to double its volume.
b. The gas is next heated to 225°C at constant volume
c. The gas is reversibly expanded at constant temperature until its volume is again doubled.
d. The gas is finally reversibly cooled to 25°C at constant pressure
Calculate ΔU , ΔH , q , w and ΔS for the gas (20%)
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7. Please prove $f/p = p/p_{\text{ideal}}$ for imperfect gas. Where f is fugacity and p is pressure, please give a definition for fugacity. (15%)