# 國立中山大學107學年度碩士暨碩士專班招生考試試題

科目名稱：物理化學【材光系碩士班甲組】　　題號：439005

※本科目依簡章規定「可以」使用計算機（廠牌、功能不拘）（問答申論題）　　

1. The density of a noble gas was found to be 1.23 g/L at 330 K and 25.5 kPa. What is the molar mass of the compound? (20%)

2. Given the van der Waals constants for ethane gas as $a = 5.0\ L^2\ bar/mol^2$, $b = 0.07\ L/mol$, for 20.0 mol of ethane at 300 K and under 30 bar
   (a) Find the second virial coefficient $B$ at this temperature.
   (b) Calculate the compressibility factor $Z$ from the first two terms.
   (c) Estimate the approximate molar volume from $Z$.
   (d) What is its Boyle temperature $T_B$? (20%)

3. When 2 mole of water supercooled to -10 °C freezes isothermally, what are the entropy change of the system and surroundings? Give the molar enthalpy of the melting of ice at 0 °C is 6025 J/mol, the molar heat capacities of ice and water are 37.3 and 75.3 J/mol.K, respectively. (20%)

4. The vapor pressure of methyl bromide is 13.0 torr at -70 °C and 117 torr at -36.7 °C. Evaluate
   (1) the molar enthalpy of vaporization of methyl bromide
   (2) the vapor pressure of methyl bromide at -40 °C. (20%)

5. On the basis of the following proposed mechanism, calculate the rate law for the methane, where the mechanism was summarized as follows: (20%)

   $CH_3CHO \xrightarrow{k_{obs}} CH_4(g) + CO(g)$

   A proposed mechanism is

   $CH_3CHO \rightarrow CH_3 + CHO$ $(k_1)$
   $CH_3 + CH_3CHO \rightarrow CH_4 + CH_3CO$ $(k_2)$
   $CH_3CO \rightarrow CH_3 + CO$ $(k_3)$
   $2CH_3 \rightarrow C_2H_6$ $(k_4)$

試題隨卷繳回