乙. 普通化學

1. The density of the vapor of perfume at 260°C is 0.480 $g \cdot L^{-1}$ when the pressure is 103 Torr。Calculate the molar mass of perfume molecule。 (5%)

2. Predict the trend in boiling point of HCl、HBr and HI，and explain the trend。 (5%)

3. Predict the geometries of the following species using the VSEPR method : a. PCl_3 b. $TeCl_4$ c. $AlCl_3$ d. N_2O e. XeF_4 (5%)

4. How can one measure the mass of electron ? (5%)

5. Build a period table with 6 period of elements assuming that the selection rules for assigning quantum numbers are following :
   1. The principal quantum number can be any integer greater than or equal to 1.
   2. The angular quantum number can have any value between 0 and n.
   3. The magnetic quantum number can have any value between -1 and 1.
   4. The spin quantum number can have a value of -1、0 and 1. (5%)

6. At 1 atm，liquid water is evaporated below 100°C。 For this process which of the following choices (a-d) is correct for ΔS_{surr} ? ΔS ? ΔS_{univ} ? ΔH ? ΔG ?

   a. greater than zero
   b. less than zero
   c. equal to zero
   d. cannot be determined
   (5%)

7. Consider the process

$$A(s) \rightarrow A(l)$$

if $\Delta H = 35.2$ kJ/mol and $\Delta S = 9.565$ J/mol-K。
a. What is the value ΔG of this process at melting point ?
b. Calculate the melting point of A(s)。
(5%)

8. White the structural formla of the following compounds。
a. 3-methyl-1-pentene
b. 5,5-dimethyl-1-hexyne
c. trans-2-butene
d. 4-ethyl-2-methylhexane
e. 2,2,4-trimethylpentane
(5%)

9. Define each of the following equilibrium constants。
a. K_C b. K_P c. K_W d. K_a e. K_{sp}
(5%)

10. The rate of a reaction increased from 3.00 $mol \cdot L^{-1} \cdot s^{-1}$ to 4.35 $mol \cdot L^{-1} \cdot s^{-1}$ when the temperature was raised from 18°C to 30°C。Calculate the activation energy of the reaction。 (5%)