義守大學九十二學年度轉學生入學招生考試

『物理化學』參考試題

I. 選擇題（共三十六分，每題三分）

1. The entropy of the universe tends toward (a) maximum (b) minimum (c) zero (d) constant
2. The difference between ΔH and ΔU at constant volume is equal to
   (a) constant (b) nRT (c) zero (d) $T\Delta S$.
3. The change of internal energy for an isolated system is equal to (a) q (b) W (c) PV (d) zero.
4. The overall energy change during the Carnot cycle is (a) constant (b) zero (c) q (d) W.
5. In a reversible process, the change of total entropy is equal to
   (a) zero (b) constant (c) ΔS_{sys} (d) ΔS_{surr}.

(第 6-8 題)

A gas at 250 K and 15 atm has a molar volume 12% larger than that calculated from the perfect gas law.

6. The compression factor under these conditions is (a) 0.88 (b) 0.12 (c) 1.12 (d) 1.
7. The molar volume of the gas is (a) 1.530 L (b) 1.367 L (c) 1.220 L (d) 1.203 L.
8. Which interaction is dominating in the sample?
   (a) attractive force (b) repulsive forces (c) hydrogen bonding (d) van der Waal force .

(第 9-12 題)

The equilibrium constant K_p is 1 atm at 298 K for an exothermic gas reaction A <==> B + C (assume the standard state is 1 atm)

9. What is the ΔG^o (standard Gibbs energy) at 298 K ? (a) =1 (b) = 0 (c) < 0 (d) > 0
10. What is the ΔS^o (standard entropy) ? (a) =1 (b) = 0 (c) < 0 (d) > 0
11. Equilibrium constant K_p at 320 K will be (a) < 1 atm (b) > 1 atm (c) = 1 atm.
12. The change of standard Gibbs energy ΔG^o at 320 K will be (a) =1 (b) = 0 (c) < 0 (d) > 0.

II. 填充題 (二十四分，每題三分)

13. The number of degrees of freedom at the triple point for the water system is _____ .

第 14-16 題)

The vapor pressure of each component in a mixture A and B were measured at 300 K with the following results

X_B	1.0	0.8	0.6	0.4	0.2	0.0
P_A/torr	0	35	80	140	220	300
P_B/torr	400	300	200	100	50	0

Given Henry constant K_A = 170 Torr and K_B = 180 Torr

背面有題

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14. The vapor pressure (torr) of B at 300 K is _____ .
15. The activity of B, treating it as a solvent, at $X_B = 0.8$ is _____ .
16. The activity coefficient of B, treating it as a solvent, at $X_B = 0.8$ is _____ .

(第 17-20 題)

The volume of one mole ideal diatomic gas is changed from 1 L to 2 L at 373 K by a reversible isothermal expansion.

17. The change of internal energy per mole is _____ .
18. The change of work per mole is _____ .
19. The change of free energy per mole is _____ .
20. The change of enthalpy per mole is _____ .

III. 計算(四十分)

21. (a) The experimenmtal textbook is usually stated - when the sample is warm up 10 degree, the reaction rate is increased twice. Is this always true? If not, why?
    (b) If (a) is true and the temperature is from 20°C to 30 °C, What is the activation energy of reaction?
    (c) What information can you get from the plot of *ln* k against 1/T ?
    (d) How do you tell a reaction is Arrhenius-like or non-Arrhenius-like? (20%)
22. How to distinguish a first and second order reaction by (a) integration method and (b) half-life method. (10%)
23. Show that the followlwing pre-equilibrium mechanism resulted in an overall third-order reaction
    $2A \xleftrightarrow{K} B$ *followed by* $B + C \xrightarrow{k_b} P$ (10%)

Given: Gas constant, R = 0.08206 l.atm/mol.K = 8.314 J/mol.K ; ln 2 = 0.6931