Name-Surname ... ... Student ID ... ...

Prince of Songkla University

Faculty of Engineering

Final Examination: Semester 2 Academic year: 2013

Date: October 9, 2013 Time: 13.30-16.30

Subject: 230-510 Fluid Phase Equilibria Room: S817

ทุจริตในการสอบ โทษขั้นต่ำ คือ ปรับตกในรายวิชาที่ทุจริต และพักการเรียน 1 ภาคการศึกษา

- อนุญาตให้นำเอกสาร ตำรา พจนานุกรมอิเล็กโทรนิก และเครื่องคิดเลขทุกรุ่นเข้าห้องสอบได้
- ห้ามหยิบยืมเอกสาร และเครื่องคิดเลขจากผู้อื่น
- เขียนชื่อ และรหัสทุกหน้า
- กรณีกระดาษคำตอบไม่พอให้ใช้ด้านหลังได้
- ใช้ดินสอทำข้อสอบได้
- ข้อสอบมีทั้งหมด 5 ข้อ (9 หน้า รวมปก)

Problem #	Full points	Gained points
1	30	
2	30	
3	50	
4	25	
5	25	
	160	

Name-Surname ... ... Student ID ... ...

1. (30 points) **Multiple choices**: Choose the answer by **circling** the selective number.

1.1. The characteristic property of an acid is due to the presence of____.

1. hydride ions
2. hydroxyl ions
3. hydronium ions
4. oxide ions

1.2 A strong acid in solution is _____.

1. mostly molecules
2. mostly ions
3. both molecules and ions
4. mostly water

1.3 A weak acid in solution is _____.

1. mostly molecules
2. mostly ions
3. both molecules and ions
4. less water

1.4 The pH of a carbonated drink is _____.

1. less than 7
2. more than 7
3. equal to 7
4. approximately 7.8

1.5. A salt derived from a strong base and a weak acid will give a salt that is _____.

1. acidic
2. basic
3. neutral
4. volatile

Name-Surname ... ... Student ID ... ...

1.6. When litmus is added to a solution of borax it turns_____.

1. red
2. pink
3. remains colorless
4. blue

1.7 Which of the following is not a mixed salt?

1. $K.Ca.PO_4$
2. $Ca(OCl)Cl$
3. $Na.K.CO_3$
4. KCl

1.8 Which is a soluble base in water?

1. $Fe(OH)_3$
2. $Cu(OH)_2$
3. $Zn(OH)_2$
4. NaOH

1.9 Which of the following is a weak base?

1. NaOH
2. KOH
3. NH_4OH
4. $Ca(OH)_2$

1.10 Choose the acid salt from the following:

1. $NaNO_3$
2. Na_2SO_4
3. $NaHSO_4$
4. Na_2CO_3

Name-Surname ... ... Student ID ... ...

2. (30 points) The activity coefficient for species 1 in a binary mixture can be represented by $\ln\gamma_1 = x_2^2[A + 2(B - C)x_1]$, where A and B are concentration-independent parameters. What is the expression for $\ln\gamma_2$ in the terms of these same parameters?

Name-Surname ... ... S tudent ID ... ...

3. (50 points) (a) Calculate mean ionic activity coefficient ($\gamma_{\pm}$) of electrolyte solution of 0.30 M of Na_2SO_4 using Davies equation to evaluate activity coefficients.

(b) Calculate activity coefficient **at infinite dilution** of methanol and benzene at 50°C using NRTL equation which given interaction parameters on text book (page 140 and 174):

[Hint $\frac{b_{12}}{RT} = \tau_{12}, \frac{b_{21}}{RT} = \tau_{21}$; $\alpha_{12} = \alpha_{21}$ and R =1.98721 cal mol^{-1} K^{-1}]

Name-Surname.....Student ID.....

4. (25 points) For hypochlorous acid (HOCl), find the *p*H of a solution made from 1.000 mol of this acid and 1.000 kg of water at 298.15 K. Do the calculation by assuming that $\gamma_{\pm}$ equal unity and assume the obtained volume of the solution is 1 liter.

Name-Surname ... ... Student ID ... ...

5. (25 points) Write down charge balances of the following chemical equilibrium systems.

(a) Put $Na_2(HPO_4)$ into pure water

(b) Put Na_2SO_4 and H_3AsO_4 into pure water