

Chemistry 142U
Final Exam

Spring 2000
June 5, 2000

Name KEY Section

Information:

R = 8.314 J/mole K
ln(2) = 0.693
ln(10) = 2.303
RT = 2.479 kJ/mole (25°C)
Water (density = 1 g/cc)

Max Wt (H₂O) = 18 g/mole

K_a = 6.022 × 10⁻⁸ molecules/mole

1 liter = 10³ cc

1 mole = 10²³ Angstroms

$$\Delta G = RT \ln Q; Q = \frac{a_f}{a_r} = \frac{P_f}{P_r}$$

$$\Delta G_{\text{total}} = \Delta G_{\text{total}}^{\circ} + RT \ln Q$$

$$\Delta G_{\text{total}}^{\circ} = -RT \ln K$$

$$\Delta G_{\text{total}}^{\circ} = -nF^{\circ} - \Delta F^{\circ}$$

$$\Delta F^{\circ} = (96,485 \text{ C}) \cdot \text{vol} \cdot \text{vol}^{-1} \text{ and } -\Delta F^{\circ} = (96,485 \text{ C}) \cdot \text{vol}^{-1}$$

$$\Delta F^{\circ} = RT \ln(10) \cdot \log(10)$$

Acetic Acid (CH₃COOH) K_a = 1.8 × 10⁻⁴
pK_a = 3.74

Phosphoric Acid (H₃PO₄)
K_{a1} = 7.3 × 10⁻³; K_{a2} = 6.3 × 10⁻⁸; K_{a3} = 4.2 × 10⁻¹³
pK_{a1} = 2.14; pK_{a2} = 7.2; pK_{a3} = 12.38

Ammonia (NH₃) K_b = 1.78 × 10⁻⁵

Methylamine (CH₃NH₂) K_b = 4.4 × 10⁻⁴
pK_b = 3.35

[RT is 2.479 kJ, and 1 liter]

There are 22 problems on eight (8) pages, not counting this page. Be sure you have all pages, numbered 1 through 8. To receive full credit on a problem you must explain your answer and be clear on what calculations you performed.

Point values:

- Fig 1) 1 through 5 each 8 pts
- Fig 2) 6 20 pts
- Fig 3) 7 10 pts
- Fig 4) 8 10 pts; 9 8 pts
- Fig 5) 10 through 17 5 points each
- Fig 6) 18 10 pts; 19 10 pts
- Fig 7) 20 10 pts; 21 8 pts
- Fig 8) 22 10 pts; 23 10 pts