CH 223 Final Exam Prep Worksheet Name: _____

*Worksheet due dates:* **Wed, 6/5: 9AM AC 1303** *(01)* **, 1:10 PM AC 2501** *(H1),* **11:59 PM** *(W1, email)*. Show ***detailed*** *steps* on how to get the given answer for each problem. *Failure to use this form for work and answers will result in a point penalty.*

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Problem 1: Lauryl alcohol is obtained from coconut oil and is used to make detergents. A solution of 5.00 g of lauryl alcohol in 100. grams of benzene freezes at 4.1 °C. What is the molar mass of lauryl alcohol? (for benzene, $k_{fp}$ = 5.12 °C/m; normal freezing point of benzene = 5.5 °C)

*Answer to Problem #1:* **180 g/mol**

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Problem 2: Rubidium has an atomic weight of 85.470 and two primary isotopes, namely rubidium-85 (84.9118 amu) and rubidium-87 (86.9092 amu). Calculate the abundance of each isotope.

*Answer to Problem #2:* **$^{85}$Rb = 72.05%, $^{87}$Rb = 27.95%**

Problem 3: Determine both the molecular and net ionic equations for the following reactions. *To get credit for this problem, both equations must be listed for each problem, and all states of matter (and charges) provided.*

**a. Lead(II) nitrate is mixed with sodium iodide.**

*Molecular (balanced) equation:*

*Net ionic equation:*

**b. Aqueous strontium hydroxide is mixed with chromium(III) chloride.**

*Molecular (balanced) equation:*

*Net ionic equation:*

*Hints for Problem #3: a.* **$PbI_2(s)$** *and b.* **$Cr(OH)_3(s)$**

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Problem 4: *Three pH problems:*

| | | |
|---|---|---|
| Calculate the pH of a 0.200 M NaOH solution. | Calculate the pH of a 0.200 M acetic acid solution. $K_a = 1.8 \times 10^{-5}$ | Calculate the pH of a solution containing 220. mL of 0.115 M pyridine ($K_b = 1.4 \times 10^{-9}$) and 150. mL of 0.100 M HCl. |
| pH = _____ | pH = _____ | pH = _____ |

*Answer to Problem #4:* **13.301, 2.72 and 4.99** *(4.98 ok)*

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Problem 5: Determine the rate law for the following reaction and the value of the rate constant, *k*. **$2\ NO(g) + O_2(g) \rightarrow 2\ NO_2(g)$**

| Experiment | [NO] (M) | [$O_2$] (M) | Rate (M/s) |
|---|---|---|---|
| 1 | 0.0126 | 0.0125 | $1.41 \times 10^{-2}$ |
| 2 | 0.0252 | 0.0125 | $5.64 \times 10^{-2}$ |
| 3 | 0.0252 | 0.0250 | $1.13 \times 10^{-1}$ |

*Answer to Problem #5:* **rate = $k[NO]^2[O_2]$, $k = 7.11 \times 10^3$** *($7.12 \times 10^3$ ok)*