

Preview Sheet for Test 3

Chapters 8, 9, and 10

Lectures from 3/5 through 3/29; Problem Sets 6 and 7

The test will be on Thursday, April 5, in Olin-Rice **250**, starting at 8:30 a.m. You will have **3 hours** to work on the exam.

Studying Strategies:

- Focus on your lecture notes and homework first, then look at your textbook. (See the course web page for class overheads and homework keys.)
- Do extra problems at the ends of the chapters.
- It is important to understand concepts from lecture not covered explicitly in the homework problems.
- If a topic was not covered in homework or in lecture, you are not responsible for it!

Test Format:

- About 75 points for problems, and about 25 points for short answer questions.
- No multiple-choice questions this time.
- The following kinds of problems are fair game: calculations requiring more than one iteration, setting up and solving (or beginning to solve) a system of equations used in a systematic treatment of equilibrium, derivations of equations just like or similar to ones used in class.

Preview of Test Instructions:

1. Write your name in the space above and on the backs of the other pages.
2. Your exam booklet should have **ten pages** total, with questions on Pages 2-7, formulas and constants on Page 8, a table of activity coefficients on Page 9, and a periodic table on Page 10. Check to see you have ten pages now. If you do not, ask for another copy of the exam.
3. You may use programmable calculators, but chemical data should not be stored in them.
4. You should always justify your answers in writing, including the written use of the quadratic formula, unless you are explicitly told not to do so. You will be awarded credit only for clear, legible work.
5. You may always assume all activity coefficients are 1 unless you are explicitly told otherwise in a problem statement.
6. You may always use Harris' shortcuts for computing equilibrium concentrations unless you are explicitly told otherwise in a problem statement.
7. You have **3 hours** to work on this exam.

Note the formulas and constants you will be given on the exam:

$$\mu = \frac{1}{2} \sum_i C_i z_i^2 \quad A_j = [j] \gamma_j \quad \log \gamma_j = \frac{-0.51 z_j^2 \sqrt{\mu}}{1 + \frac{\alpha_j \sqrt{\mu}}{305}}$$

$$K_w = [\text{H}^+][\text{OH}^-] = K_a K_b = K_1 K_{b2} = K_2 K_{b1} = 1.0 \times 10^{-14} \quad \text{p}K_w = \text{pH} + \text{pOH} = 14.00$$

$$\text{pH} = \text{p}K_a + \log \frac{[\text{A}^-]}{[\text{HA}]} \quad [\text{H}^+] = \sqrt{\frac{K_1 K_2 [\text{HA}^-] + K_1 K_w}{K_1 + [\text{HA}^-]}}$$

$$\alpha_{\text{H}_2\text{A}} = \frac{[\text{H}_2\text{A}]}{F} = \frac{[\text{H}^+]^2}{[\text{H}^+]^2 + [\text{H}^+]K_1 + K_1 K_2} \quad \alpha_{\text{HA}^-} = \frac{[\text{HA}^-]}{F} = \frac{K_1 [\text{H}^+]}{[\text{H}^+]^2 + [\text{H}^+]K_1 + K_1 K_2}$$

$$\alpha_{\text{A}^{2-}} = \frac{[\text{A}^{2-}]}{F} = \frac{K_1 K_2}{[\text{H}^+]^2 + [\text{H}^+]K_1 + K_1 K_2}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$N_A = 6.022 \times 10^{23} \text{ particle mol}^{-1} \quad 1 \text{ L} = 1000 \text{ mL} = 1000 \text{ cm}^3$$

$$1 \text{ ppm} = 1 \text{ in } 10^6 \quad 1 \text{ ppb} = 1 \text{ in } 10^9 \quad 1 \text{ ppt} = 1 \text{ in } 10^{12}$$