

Exam5key

Monday, April 24, 2017 12:23 PM

Chem 105 Exam 5

This exam is due Monday April 24th at 8:00 AM. **Late work will NOT be accepted.**

If you worked with anyone, please list their names below:

Your name _____ Partner _____

By signing here, I certify that the work here is reflective of the work done by me and my group, which is listed above. I did not receive help from resources that are not part of this course.

You must sign to receive credit for this exam.

Signature _____ Date _____

Signature _____ Date _____

1. What is the difference between a strong acid and a weak acid?

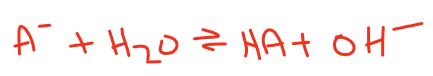
governed by \rightleftharpoons

↳ converts completely to H_3O^+

2. What does the term "conjugate base" mean?

- the molecule left over when an acid donates an H^+

3. What is a base dissociation reaction?



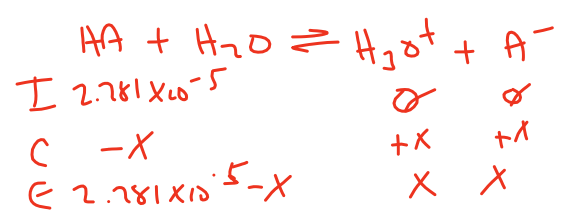
4. An acid has a pK_a of 6.75. Determine each of the following:

a. K_a $10^{-6.75} = 1.78 \times 10^{-7}$

b. pK_b of the conjugate base $14 - 6.75 = 7.25$

c. K_b of the conjugate base $10^{-7.25} = 5.62 \times 10^{-8}$

5. Calculate the pH and pOH of 22.81 μM acetic acid.



pH = 4.76

pOH = 9.24

pH + pOH = 14

$$10^{-4.75} = \frac{x^2}{2.281 \times 10^{-5} - x}$$

$$0 = x^2 + 10^{-4.25}x - 10^{-4.25}(2.281 \times 10^{-5})$$

$$x = [H_3O^+] = 1.728 \times 10^{-5}$$

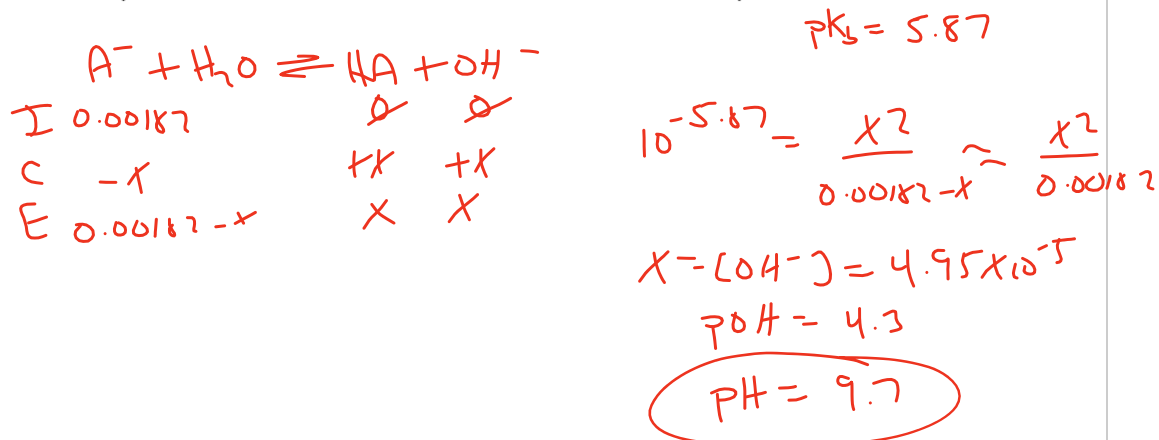
$$pH = -\log \uparrow = 4.76$$

6. Consider each of the following solution. Rank them by increasing acidity (most acidic will be last)

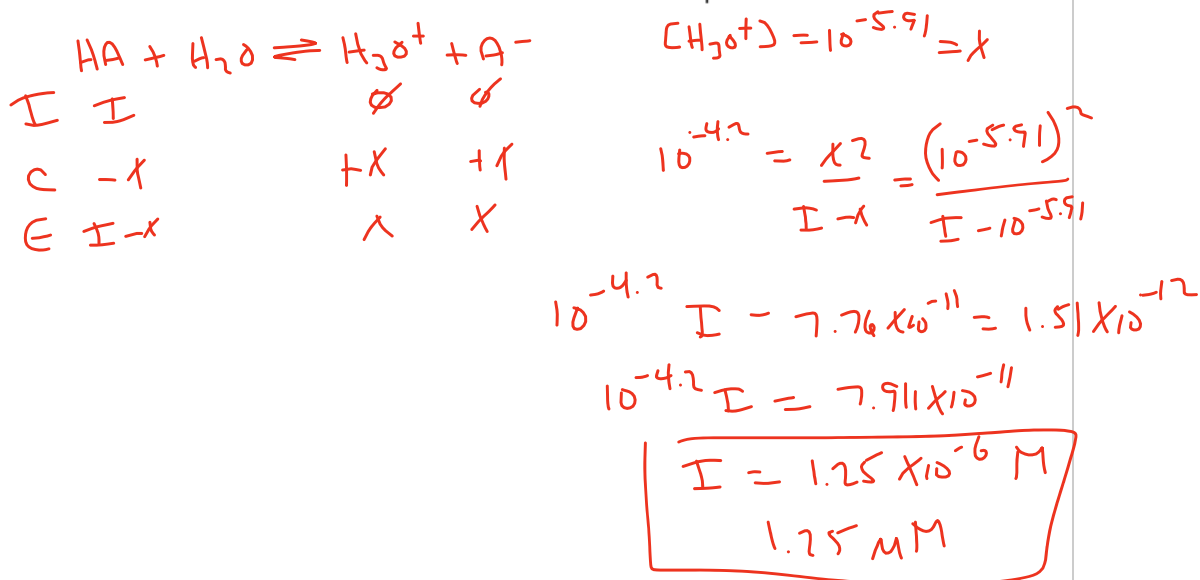
10 mM HNO ₂	10 mM NaNO ₂	10 mM HNO ₃	10 mM H ₂ SO ₄	10 μM HNO ₂	10 mM NaOH
WA	WB	SA	SA	WA	SB



7. Calculate the pH of a 50 mL solution of 1.82 mM weak base that has a pK_b of 5.13.



8. What concentration of benzoic acid is needed to have a solution with a pH of 5.91?



9. What concentration of magnesium hydroxide is needed to have a solution with a pH of 8.91?

$$10^{-5.09} \text{ mol OH}^- \quad | \quad 1 \text{ mol Mg(OH)}_2$$

$$\text{L} \quad | \quad 2 \text{ mol OH}^-$$

pOH = 5.09
[OH⁻] = 10^{-5.09}

$$[\text{Mg(OH)}_2] = 4.06 \times 10^{-6}$$

$$4.06 \text{ mM}$$

10. Consider a 600 mL solution that contains 280 mM ammonia and 65 mM ammonium.

a. What is the pH of this solution?

$$\text{pH} = 9.25 + \log \frac{280}{65} = 9.88$$

b. Calculate the pH if 3.4 mL of 1.5 M NaOH is added.

$$0.0034 \text{ L} \quad | \quad 1.5 \text{ mol}$$

$$\text{L} \quad | \quad \text{L}$$

$$= 0.0051 \text{ mol OH}^-$$

$$\text{NH}_4^+ : \quad 0.6 \text{ L} \quad | \quad 0.065 \text{ mol}$$

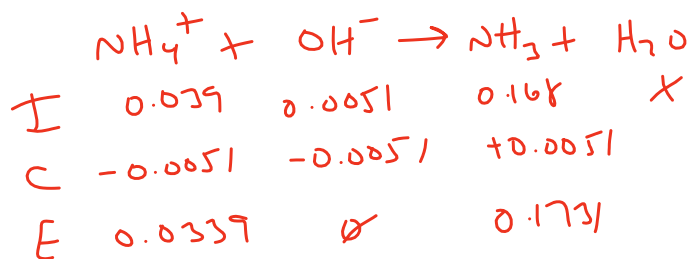
$$\text{L} \quad | \quad \text{L}$$

$$= 0.039 \text{ mol NH}_4^+$$

$$\text{NH}_3 : \quad 0.6 \text{ L} \quad | \quad 0.28 \text{ mol}$$

$$\text{L} \quad | \quad \text{L}$$

$$= 0.168 \text{ mol NH}_3$$



$$\text{pH} = 9.25 + \log \frac{0.1731}{0.0339} = 9.95$$