

Name: Key

M	T	W	Tr	F
8	9	10	11	12 1 2 3 4 5

Clearly write your letter answer on the line.B1. (Remember) According to the Bronsted-Lowry definition...

← focused on protons

A. acids are proton acceptors and bases are proton donors.

B. acids are proton donors and bases are proton acceptors. C. acids are electron pair donors and bases are electron pair acceptors. D. acids are electron pair acceptors and bases are electron pair donors. C

← acidic proton

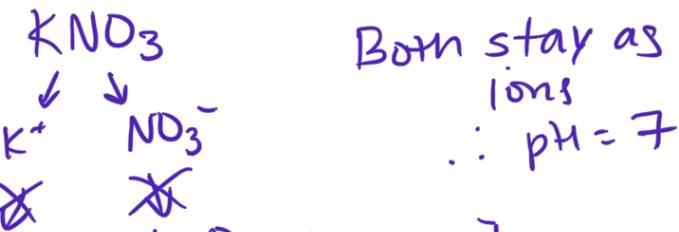
2. (Remember) If CH_3COOH were added to water, what products would be expected?A. OH^- and CH_3CO^+ B. H^+ and OH^- C. H_3O^+ and CH_3COO^- D. CH_3COOH and H_2O C

3. (Understand) A solution has a pOH of 2.34. What is the correct relationship?

A. $[\text{H}_3\text{O}^+] > [\text{OH}^-]$
 $\text{pOH} < 7 = \text{basic solution} \dots \text{so } \text{OH}^- > \text{H}_3\text{O}^+$
 or solve ...
B. $[\text{H}_3\text{O}^+] = [\text{OH}^-]$ C. $[\text{H}_3\text{O}^+] < [\text{OH}^-]$

D. Not enough information.

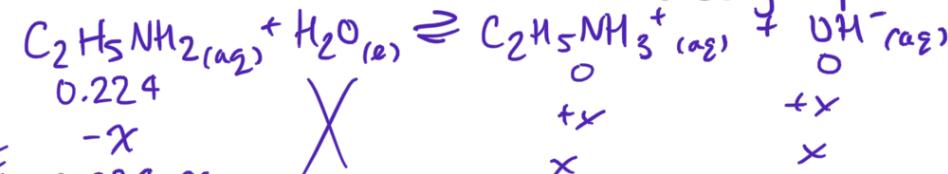
$$\begin{aligned} 10^{-2.34} &= 0.00457 \text{ M OH}^- \\ K_w &= [\text{OH}^-][\text{H}_3\text{O}^+] \quad 1.0 \times 10^{-14} = (0.00457)(x) \\ &\quad 2.19 \times 10^{-12} = x \end{aligned}$$

B4. (Understand) If KNO_3 were added to water, the solution would be characterized by what pH condition?A. $\text{pH} > 7$ B. $\text{pH} = 7$ C. $\text{pH} < 7$

D. not enough information

 strong base KOH $\text{HNO}_3 \text{ strong acid}$
D5. (Apply) The value of K_b for ethylamine ($\text{C}_2\text{H}_5\text{NH}_2$) is 4.4×10^{-4} . What is the pOH of a 0.224 M solution?

A. 12.00



B. 4.00

C. 3.36

D. 2.00

$$4.4 \times 10^{-4} = \frac{x^2}{0.224-x}$$

assume small

$$\begin{aligned} x &= 0.00993 = [\text{OH}^-] \\ \text{pOH} &= -\log(0.00993) = 2.00 \end{aligned}$$

S23 CHEM 1032 – Bloom Quiz 3 – Week 11

Circle Day and Time:

A

6. (Apply) A mixture is made of 105 mL of 0.321 M pyridine (C_5H_5N) and 155 mL of 0.297 M pyridinium chloride (C_5H_5NHCl – $K_a = 5.6 \times 10^{-6}$). What is the pH of the solution?

A. 5.11

$$\text{total } V = 105\text{mL} + 155\text{mL} = 260\text{mL}$$

B. 5.25

$$(105\text{mL})(0.321\text{M}) = (260\text{mL})(x)$$

C. 5.28

$$x = 0.1296\text{M base}$$

D. 5.38

$$(155\text{mL})(0.297\text{M}) = (260\text{mL})(x)$$

$$x = 0.177\text{M acid}$$

$$pK_a = 5.25$$

$$\text{pH} = 5.25 + \log \left(\frac{0.1296}{0.177} \right)$$

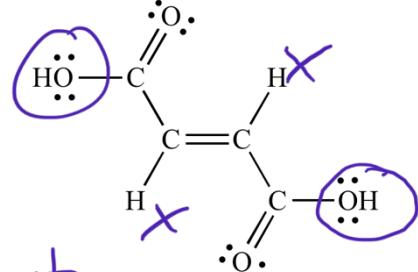
$$\text{pH} = 5.11$$

B

7. (Analyze) The molecule to the right is called fumaric acid. How many pK_a values would you expect?

- A. one
B. two
C. three
D. four

→ are from K_a values. Each acidic H will have a K_a
→ Acidic H are bonded to EN elements

B

8. (Analyze) Four equimolar solutions were made with the compounds below. Rank the pH of the solutions from lowest to highest.

W	X	Y	Z
CH_3COOH	$CHCl_2COOH$	$CH_2ClCOOH$	CCl_3COOH

- A. $pH_W < pH_X < pH_Y < pH_Z$
B. $pH_Z < pH_X < pH_Y < pH_W$
C. $pH_W < pH_Y < pH_X < pH_Z$
D. $pH_Z = pH_Y = pH_X = pH_W$

→ More EN elements in structure, the more acidic the proton.

→ More acidic the proton, the lower pH of solution

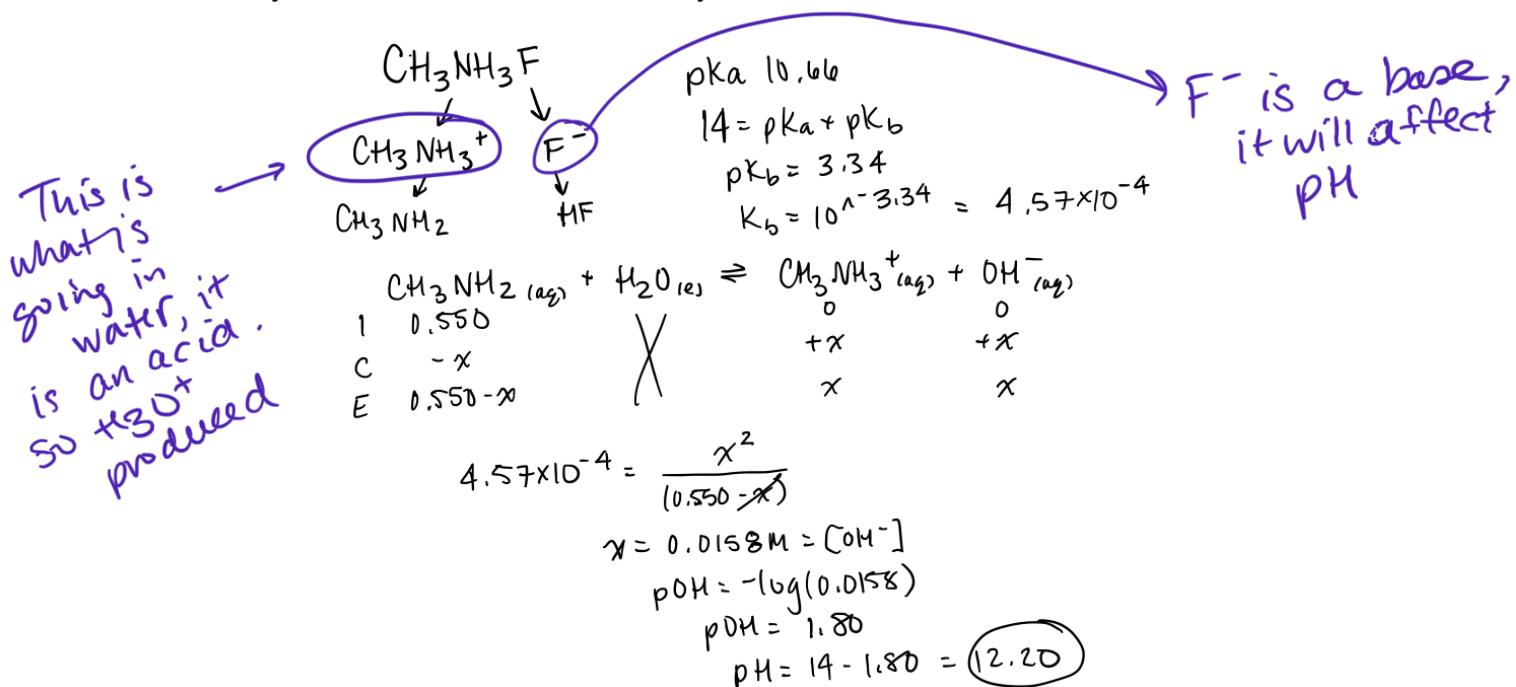
Z has most EN atoms - lowest pH

W fewest EN atoms - highest pH

- Regions are the same

- Regions are different

9. (Evaluate) A student calculates the pH of 0.550 M $\text{CH}_3\text{NH}_3\text{F}$ (pK_a of CH_3NH_3^+ 10.66). Identify their mistake and reason why it is incorrect.



- A. The student used K_a and should have used K_b . This work is incorrect because $\text{CH}_3\text{NH}_3\text{F}$ is a weak base not a weak acid.
- B. The student assumed x was small in the denominator. This work is incorrect because the value of x is greater than 5% of the initial concentration.
- C. The student wrote the chemical reaction as producing OH^- . This work is incorrect because $\text{CH}_3\text{NH}_3\text{F}$ will produce H_3O^+ when added to water.
- D. The student did consider how F^- contributes to the pH of the solution. This work is incorrect because F^- is a weak base.
- Both are correct!

D 10. (Create) Select the compounds below which are **not** present in an aqueous solution of H_3PO_4 .

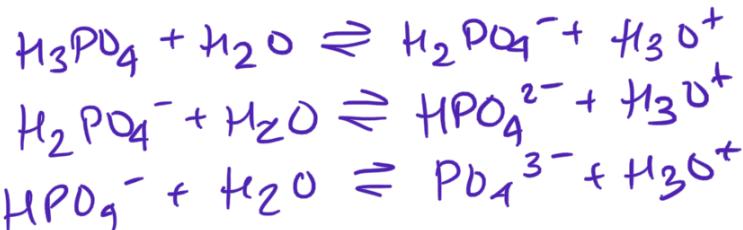
polyprotic

1	2	3	4	5
OH^-	PO_4^{3-}	H_2PO_4^-	H_3O^+	$\text{H}_4\text{PO}_4^{4-}$

missing (-)

H_3PO_4 is an acid... not a base.

- A. Compounds 1 and 3
 B. Compounds 2 and 5
 C. Compounds 1, 3, and 5
 D. Compounds 3 and 5



Because $K_w = [\text{OH}^-][\text{H}_3\text{O}^+]$ must be satisfied, OH^- must also be in solution

H_2O always has $\text{H}_3\text{O}^+ \rightleftharpoons \text{OH}^-$!

S23 CHEM 1032 – Bloom Quiz 3 – Week 11

Circle Day and Time:

Useful information:

$$1 \text{ atm} = 760 \text{ mmHg} \quad 1 \text{ mmHg} = 1 \text{ torr} \quad 0^\circ \text{C} = 273 \text{ K}$$

$$R = 8.314 \text{ J/(mol K)} = 0.08206 \text{ (L atm)/(mol K)}$$

$$\text{At } 25^\circ \text{C: } K_w = [\text{H}_3\text{O}^+][\text{OH}^-] = 1.0 \times 10^{-14}$$

$$K_a K_b = K_w$$

$$\text{pH} = -\log[\text{H}_3\text{O}^+]$$

$$\text{pOH} = -\log[\text{OH}^-]$$

$$\text{pH} + \text{pOH} = 14.00$$

$$\text{pK}_a + \text{pK}_b = 14.00$$

$$\text{pH} = \text{pK}_a + \log \left(\frac{[\text{base}]}{[\text{acid}]} \right)$$

Periodic Table of the Elements

		VIIA 8A																				
		VIA 8A																				
		VVA 8A																				
1	IA	2	IIA 2A	3	Li	Be	Boron 9.012	4	Na	Mg	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	5	B
1	H	Hydrogen 1.008	4	Lithium 6.941	Magnesium 24.305	11	Sodium 22.990	12	K	19	20	21	22	23	24	25	26	27	28	29	13	VA 3A
1			3			4		5		6		7		8		9		10		11	IVA 4A	
1			4			5		6		7		8		9		10		11	IIIIB 3B			
1			5			6		7		8		9		10		11	VIIB 7B					
1			6			7		8		9		10		11	VIB 6B							
1			7			8		9		10		11	VIII	8								
1			8			9		10		11		12	VIIIB 8B	8								
1			9			10		11		12		13	VIIIB 8B	8								
1			10			11		12		13		14	VIIIB 8B	8								
1			11			12		13		14		15	VIIIA 8A	8								
1			12			13		14		15		16	VIIIA 8A	8								
1			13			14		15		16		17	VIIIA 8A	8								
1			14			15		16		17		18	VIIIA 8A	8								
1			15			16		17		18		19	VIIIA 8A	8								
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