Veren A

CHEM 1423 - Exam 3 - March 31, 2016

Name Solution

				140	· · ·			
(60)	PART	I. N	MULTIPLE CHOI	CE (Circle the ON	E correct answer)			
	 The pH of a 0.10 M solution of Hypoiodous acid, HIO, is 5.80. What is the approximate Acid Dissociation Constant of HIO? 							
	<		2.5x10 ⁻¹¹ None of the abo	(B) 1.6x10 ve	0 ⁻⁵	(C) 4.0x10 ⁻¹¹		
	2.		- T	solution of a weak lis approximately:	base, B, is 8.6. The	erefore, the base		
		(A)	1.3x10 ⁻¹⁶	(B) 7.4x10 ⁻⁶	(C) 3.2x10 ⁻¹⁰	(D) 1.6x10 ^{-l1}		
	3.	Whi	ch of the followin	g aqueous solutior	ns is/are basic (pH	> 7)?		
		r (ii) r (iii)	Ammonium Chlo Potassium Nitrat Pyridinium Brom Sodium Cyanide	e (KNO3) nide (PyrHBr)				
		(A)	i & iv	(B) ii & iv	(C) i & iii	(D) iv only		
	4.	(A)	lded to 2 L of 0.4 1.20 mol of KOH 1.30 mol of NH4	(B) .30	one of the following I mol of sodium ace I mol of potassium	·		
			3: Consider the via 6.0x10 ⁻¹⁰ .	weak base, Quinoli	ne (Quin). Its base	equilibrium		
	5.	Wha	at is the approxin	nate _、 pH of a 0.05 N	/I solution of Quinol	ine?		
		(A)	11.0	(B) 5.3	(C) 8.7	(D) 9.4		
	6.	Wha	at is the approxin	nate percent prot	onation in a 0.05 M	solution of Quinoline		
		(A)	5.5x10 ⁻⁶ %	(B) 1.1x10 ⁻² %	(C) 5.5x10 ⁻⁴ %	1		
		(D)	Cannot be deter	mined without the	hydroxide concentr	ation, [OH ⁻]		
	7.		at is the approxin inHCl) ?	nate pH of a 0.01 N	/I solution of Quinol	inium Chloride,		
	((A)	3.4)	(B) 5.6	(C) 8.4	(D) 6.3		



8.	What is the approximate pH of a solution containing 0.60 M Quinoline (Quin) and 0.20 M Quinolinium Chloride (QuinHCl)?					
	(A) 4.3	(B) 5.3	(C) 8.7	(D) 9.7		
	9 - #10: Consider t ant is 3.0x10 ⁻⁸ .	the weak acid, hypocl	nlorous acid, HClO.	Its acid dissociation		
9.	What is the appro	ximate percent disso	ciation of a 0.005 M s	solution of HCIO?		
	(A) 2.4x10 ⁻³ %	(B) 3.5x10 ⁻¹ %	(C) 2.4x10 ⁻¹ %	(D) 3.5%		
10.	What is the appro	ximate pH of a 0.10 N	n potassium hypochlo	orite, KClO, solution?		
	(A) 3.7	(B) 4.3	(C) 9.7	(D) 10.3		
		s acid, H_2 TeO ₃ , is a di I_a ' = 3.0x10 ⁻³ and K_a "				
11.	What is the appro	ximate pH of a solutio	on containing 0.05 M	Na ₂ TeO ₃ ?		
((A) 10.2 (D) None of the a	(B) 9.5 bove	(C) 3	3.8		
12.	What is the appro	ximate pH of a solution	on containing pure Kl	HTeO₃?		
	(A) 7.7	(B) 5.1	(C) 2.	5		
	(D) The pH deper	nds upon the concent	ration of KHTeO ₃			
13.	What is the appro Na ₂ TeO ₃ ?	ximate pH of a solution	on containing 0.50 M	KHTeO₃ and 0.20 M		
((A) 7.3	(B) 2.9 (C	C) 2.1 (D)	8.1		
14.	What is the appro to 2.0 L of 0.30 M	ximate pH of a solution KHTeO ₃ ?	on prepared by addin	g 0.40 mol of HNO ₃		
	(A) 2.0	(B) 2.8	(D) 2.2	3.4		
15.	Approximately wh	at ratio of [TeO ₃ ²-]/[H	TeO ₃ -] will give a pH	of 7 <u>.30</u> ?		
	(A) 0.20	(B) 2.5	(C) 1.5	(D) 0.40		

Verson A

For #16 - #18: Consider the amino acid, Histidine (His). The most positive form of Histidine is His^{2+} and the most negative form is His^{1-} . The three pKa's of Histidine are: $pK_a'' = 1.8$, $pK_a'' = 6.0$, and $pK_a''' = 9.2$.

16. What is the isoelectric point (pl) of Histidine?							
(A) 3.9	(B) 6.0	(C) 7.6	(D) 1.8				
17. At what pH does	one have 50% His	s ¹⁺ and 50% His ⁰ ?					
(A) 6.0	(B) 3.9	(C) 1.8	(D) 7.6				
18. What is the avera	ge charge on the	Histidine molecule a	at pH = 9.2 ?				
(A) +1.5	(B) +1.0	(C) +0.5	(D) - 0.5				
19. If one mixes 99. n resultant solution		to 100. mL of 0.10 N	NaOH, the pH of the				
(A) 9.0	(B) 10.7	(C) 5.0	(D) 3.3				
	, ,,	•	neutralize 200 mL of an Molarity of the NaOH(aq)				
(A) 0.54 M	(B) 0	.06 M	(C) 0.18 M				
(D) None of the a	bove						

PART II. THREE (3) PROBLEMS BELOW: REMEMBER TO SHOW WORK FOR CREDIT

Jenson A

(10) 1. Pyridine $[C_5H_5N = Pyr]$ is a weak base with a base equilibrium constant, $K_b = 1.8 \times 10^{-9}$. The pH of an aqueous solution containing Pyridinium Bromide [C₅H₅NHBr = PyrHBr, M = 160.] is pH = 3.1. Calculate the mass percent of PyrHBr in the aqueous solution.

Note: Assume that the density of the aqueous solution is 1.0 g/mL.

 $Ra = \frac{10^{-14}}{K_h} = \frac{10^{-14}}{1.8 \times 10^{-6}} = 5.50 \times 10^{-6}$ Py At = At + Pyr.

Kaz [M][PW] => 5.56×10-6= (7.94×10-4)2

ERYND] = [PYND] = (7.94×10-4)2

- 211-11.

=0.112 m/2

14=1000 mL PRNB(20.113 m/ × 1L =0.113 m). Manuel = 0.113 ml x1608 hl. 2/8.19. Mux = 6000 ml x (9 = 10009

mg= 18.1

(20) 2. Phosphoric Acid (H ₃ PO ₄) is a triprotic acid with acid dissociation constants, $K_a' = 7.5 \times 10^{-3}$, $K_a'' = 6.2 \times 10^{-8}$ and $K_a''' = 3.6 \times 10^{-13}$
$\frac{I_{n,l}}{I_{n,l}} (7) (a) Calculate the pH of a solution prepared by mixing 350 mL of 0.60 M HCI with 800 mL of 0.40 M K3PO4. Pa_{3}^{2} = 0.60 \text{ M/s} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} = 0.21 \text{ M} \times 0.36 \text{ L} \qquad Pa_{3}^{2} =$
$PW=12.44 t log \frac{PQ_3-1}{FWR_2}=12.44 t log \left(\frac{C_1}{C_1}\right)$ $= \sqrt{2.16}$ (7) (b) Calculate the pH of a solution prepared by mixing 900 mL of 0.50 M KOH with 700 mL of 0.40 M H ₃ PO ₄ . Step 2
$ \frac{I_{n}t}{I_{n}t} = 0.5 \times 0.9 $ $ = 0.45 $ $ I_{n}t = 0.5 \times 0.9 $ $ = 0.45 $ $ I_{n}t = 0.5 \times 0.9 $ $ I_{n}t = 0.45 $ $ I_{n}t = 0.5 \times 0.9 $ $ I_{n}t = 0.45 $ $ I_{n}t = 0.5 \times 0.9 $ $ I_{n}t = 0.45 $ $ I_{$
pU = 7.210 log 5 403-7 $= 7.210 log 600 $ $= 17.40$

Verson A

Prob. 2 (Cont'd)

(6) (c) Calculate the ratio, $[H_3PO_4]/[H_2PO_4]$ required to prepare a buffer solution with pH = 2.62.

& la [alay] = 2.62-2/16= 80.50

(10) 3. When 7.50 grams of a sample of impure Calcium Hydroxide [Ca(OH)₂, M = 74.1] is titrated with 0.35 M H₃PO₄, it takes 150. mL of H₃PO₄ to completely titrate the base. Calculate the **mass percent of impurity** in the Calcium Hydroxide sample.

242 PC4 + 3 G(M)2 - Ca3 (Pax) + 6 P20

MBP94 30.35 Wh x 215 L=0,0025 W.

Macmin = 0.0525 ml BPap x 3 Malor = 0.0788 ml.

Malon = 0.0 788 W/x 74.19/1 = 5.849 Calon) Minipon = 7.50-5.84 = 1.665

my(inpm) = 666 × 100 = 22.12 = [25]

VermB

CHEM 1423 - Exam 3 - March 31, 2016

ART	. MULTIPLE C	HOICE (Circle the O	NE correct answe	r)
1.	Which of the follo	owing aqueous solutio	ns is/are basic (pH	I > 7)?
3	(ii) Potassium N (iii) Pyridinium E (iv) Sodium Cya	Bromide (PyrHBr) Inide (NaCN)	(C) ; 8 ;;;	(D) ; 8 iv
((A) iv only	(B) ii & iv	(C) i&iii	(D) i & iv
2.	If added to 2 L o	f 0.40 M HNO ₃ , which	one of the followin	g would form a buffer?
	(A) 1.20 mol of l	KOH (B)	0.60 mol of potassi	ium lactate (KLac)
	(C) 1.30 mol of	NH ₄ CI (D)	1.30 mol of sodium	acetate (NaAc)
3.		5 M solution of a weak tant is approximately:	base, B, is 8.6. T	herefore, the base
	(A) 1.3x10 ⁻¹⁶	(B) 3.2x10 ⁻¹⁰	(C) 7.5x10 ⁻⁶	(D) 1.6x10 ^{-!1}
4.		M solution of Hypoio d Dissociation Consta		5.80. What is the
	(A) 4.0x10 ⁻¹¹	(B) 1.6x	10 ⁻⁵	(C) 2.5×10^{-11})
	(D) None of the	above		
	5 - #8: Consider ant is 6.0x10 ⁻¹⁰ .	the weak base, Quino	line (Quin). Its bas	se equilibrium
5.	What is the appropriate (QuinHCl)?	roximate pH of a 0.01	M solution of Quin	olinium Chloride,
	(A) 5.6	(B) 3.4	(C) 8.4	(D) 6.3
6.		roximate pH of a solut ium Chloride (QuinHC		M Quinoline (Quin) and
	(A) 4.3	(B) 9.7	(C) 8.7	(D) 5.3
7.	What is the app	roximate pH of a 0.05	M solution of Quin	oline?
((A) 8.7	(B) 5.3	(C) 11.0	(D) 9.4

Versin B

8. What is the approximate percent protonation in a 0.05 M solution of Quinoline (A) 5.5x10-6 % (B) 5.5x10-4 % (1.1x10-2 %) (D) Cannot be determined without the hydroxide concentration, [OH] For #9 - #13: Tellurous acid, H ₂ TeO ₃ , is a diprotic acid with acid dissociation constants, K _a ' = 3.0x10-3 and K _a " = 2.0x10-8 9. What is the approximate pH of a solution containing pure KHTeO ₃ ? (A) 5.1 (B) 7.7 (C) 2.5 (D) The pH depends upon the concentration of KHTeO ₃ 10. What is the approximate pH of a solution containing 0.05 M Na ₂ TeO ₃ ? (A) 9.5 (B) 10.2 (C) 3.8 (D) None of the above 11. What is the approximate pH of a solution containing 0.50 M KHTeO ₃ and 0.20 M Na ₂ TeO ₃ ? (A) 8.1 (B) 2.9 (C) 2.1 (D) 7.3 12. What is the approximate pH of a solution prepared by adding 0.40 mol of HNO ₃ to 2.0 L of 0.30 M KHTeO ₃ ? (A) 2.0 (B) 2.8 (C) 2.2 (D) 3.4 13. Approximately what ratio of [TeO ₃ ²]/[HTeO ₃ -] will give a pH of 7.30? (A) 0.20 (B) 2.5 (C) 1.5 (D) 0.40 For #14 - #15: Consider the weak acid, hypochlorous acid, HCIO. Its acid dissociation constant is 3.0x10-3. 14. What is the approximate pH of a 0.10 M potassium hypochlorite, KCIO, solution (A) 10.3 (B) 4.3 (C) 9.7 (D) 3.7 15. What is the approximate percent dissociation of a 0.005 M solution of HCIO? (A) 2.4x10-3 % (B) 2.4x10-1 % (C) 3.5x10-1 % (D) 3.5%		_							
(D) Cannot be determined without the hydroxide concentration, [OH] For #9 - #13: Tellurous acid, H2TeO3, is a diprotic acid with acid dissociation constants, Ka' = 3.0x10 ⁻³ and Ka'' = 2.0x10 ⁻⁸ 9. What is the approximate pH of a solution containing pure KHTeO3? (A) 5.1 (B) 7.7 (C) 2.5 (D) The pH depends upon the concentration of KHTeO3 10. What is the approximate pH of a solution containing 0.05 M Na2TeO3? (A) 9.5 (B) 10.2 (C) 3.8 (D) None of the above 11. What is the approximate pH of a solution containing 0.50 M KHTeO3 and 0.20 M Na2TeO3? (A) 8.1 (B) 2.9 (C) 2.1 (D) 7.3 12. What is the approximate pH of a solution prepared by adding 0.40 mol of HNO3 to 2.0 L of 0.30 M KHTeO3? (A) 2.0 (B) 2.8 (C) 2.2 (D) 3.4 13. Approximately what ratio of [TeO3 ²]/[HTeO3 ⁻] will give a pH of 7.30? (A) 0.20 (B) 2.5 (C) 1.5 (D) 0.40 For #14 - #15: Consider the weak acid, hypochlorous acid, HCIO. Its acid dissociation constant is 3.0x10 ⁻⁸ . 14. What is the approximate pH of a 0.10 M potassium hypochlorite, KCIO, solution (A) 10.3 (B) 4.3 (C) 9.7 (D) 3.7		8.	What is the approximate percent protonation in a 0.05 M solution of Quinoline?						?
For #9 - #13: Tellurous acid, H ₂ TeO ₃ , is a diprotic acid with acid dissociation constants, K ₈ ' = 3.0x10 ⁻³ and K ₈ " = 2.0x10 ⁻⁸ 9. What is the approximate pH of a solution containing pure KHTeO ₃ ? (A) 5.1 (B) 7.7 (C) 2.5 (D) The pH depends upon the concentration of KHTeO ₃ 10. What is the approximate pH of a solution containing 0.05 M Na ₂ TeO ₃ ? (A) 9.5 (B) 10.2 (C) 3.8 (D) None of the above 11. What is the approximate pH of a solution containing 0.50 M KHTeO ₃ and 0.20 M Na ₂ TeO ₃ ? (A) 8.1 (B) 2.9 (C) 2.1 (D) 7.3 12. What is the approximate pH of a solution prepared by adding 0.40 mol of HNO ₃ to 2.0 L of 0.30 M KHTeO ₃ ? (A) 2.0 (B) 2.8 (C) 2.2 (D) 3.4 13. Approximately what ratio of [TeO ₅ ²]/[HTeO ₅ ²] will give a pH of 7.30 ? (A) 0.20 (B) 2.5 (C) 1.5 (D) 0.40 For #14 - #15: Consider the weak acid, hypochlorous acid, HCIO. Its acid dissociation constant is 3.0x10 ⁻³ . 14. What is the approximate pH of a 0.10 M potassium hypochlorite, KCIO, solution (A) 10.3 (B) 4.3 (C) 9.7 (D) 3.7 15. What is the approximate percent dissociation of a 0.005 M solution of HCIO?			(A) 5.5x10 ⁻⁶ %	(B) 5.5x10 ⁻⁴ 9	%	(C) 1.1x10)-2 %		
9. What is the approximate pH of a solution containing pure KHTeO ₃ ? (A) 5.1 (B) 7.7 (C) 2.5 (D) The pH depends upon the concentration of KHTeO ₃ 10. What is the approximate pH of a solution containing 0.05 M Na ₂ TeO ₃ ? (A) 9.5 (B) 10.2 (C) 3.8 (D) None of the above 11. What is the approximate pH of a solution containing 0.50 M KHTeO ₃ and 0.20 M Na ₂ TeO ₃ ? (A) 8.1 (B) 2.9 (C) 2.1 (D) 7.3 12. What is the approximate pH of a solution prepared by adding 0.40 mol of HNO ₃ to 2.0 L of 0.30 M KHTeO ₃ ? (A) 2.0 (B) 2.8 (C) 2.2 (D) 3.4 13. Approximately what ratio of [TeO ₃ ²]/[HTeO ₃] will give a pH of 7.30? (A) 0.20 (B) 2.5 (C) 1.5 (D) 0.40 For #14 - #15: Consider the weak acid, hypochlorous acid, HCIO. Its acid dissociation constant is 3.0x10 ⁻⁸ . 14. What is the approximate pH of a 0.10 M potassium hypochlorite, KCIO, solution (A) 10.3 (B) 4.3 (C) 9.7 (D) 3.7			(D) Cannot be det	ermined without	the hyd	droxide cond	entration	n, [OH ⁻]	
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(A) 5.1 (B) 7.7 (C) 2.5 (D) The pH depends upon the concentration of KHTeO ₃ 10. What is the approximate pH of a solution containing 0.05 M Na ₂ TeO ₃ ? (A) 9.5 (B) 10.2 (C) 3.8 (D) None of the above 11. What is the approximate pH of a solution containing 0.50 M KHTeO ₃ and 0.20 M Na ₂ TeO ₃ ? (A) 8.1 (B) 2.9 (C) 2.1 (D) 7.3 12. What is the approximate pH of a solution prepared by adding 0.40 mol of HNO ₃ to 2.0 L of 0.30 M KHTeO ₃ ? (A) 2.0 (B) 2.8 (C) 2.2 (D) 3.4 13. Approximately what ratio of [TeO ₃ ²]/[HTeO ₃] will give a pH of 7.30? (A) 0.20 (B) 2.5 (C) 1.5 (D) 0.40 For #14 - #15: Consider the weak acid, hypochlorous acid, HCIO. Its acid dissociation constant is 3.0x10-8. 14. What is the approximate pH of a 0.10 M potassium hypochlorite, KCIO, solution (A) 10.3 (B) 4.3 (C) 9.7 (D) 3.7									
(D) The pH depends upon the concentration of KHTeO ₃ 10. What is the approximate pH of a solution containing 0.05 M Na ₂ TeO ₃ ? (A) 9.5 (B) 10.2 (C) 3.8 (D) None of the above 11. What is the approximate pH of a solution containing 0.50 M KHTeO ₃ and 0.20 M Na ₂ TeO ₃ ? (A) 8.1 (B) 2.9 (C) 2.1 (D) 7.3 12. What is the approximate pH of a solution prepared by adding 0.40 mol of HNO ₃ to 2.0 L of 0.30 M KHTeO ₃ ? (A) 2.0 (B) 2.8 (C) 2.2 (D) 3.4 13. Approximately what ratio of [TeO ₃ ² -]/[HTeO ₃ -] will give a pH of 7.30? (A) 0.20 (B) 2.5 (C) 1.5 (D) 0.40 For #14 - #15: Consider the weak acid, hypochlorous acid, HClO. Its acid dissociation constant is 3.0x10-8. 14. What is the approximate pH of a 0.10 M potassium hypochlorite, KClO, solution (A) 10.3 (B) 4.3 (C) 9.7 (D) 3.7		9.	What is the approx	rimate pH of a so	lution o	containing p	ure KHTe	eO₃?	
10. What is the approximate pH of a solution containing 0.05 M Na ₂ TeO ₃ ? (A) 9.5 (B) 10.2 (C) 3.8 (D) None of the above 11. What is the approximate pH of a solution containing 0.50 M KHTeO ₃ and 0.20 M Na ₂ TeO ₃ ? (A) 8.1 (B) 2.9 (C) 2.1 (D) 7.3 12. What is the approximate pH of a solution prepared by adding 0.40 mol of HNO ₃ to 2.0 L of 0.30 M KHTeO ₃ ? (A) 2.0 (B) 2.8 (C) 2.2 (D) 3.4 13. Approximately what ratio of [TeO ₃ ² -]/[HTeO ₃ -] will give a pH of 7.30 ? (A) 0.20 (B) 2.5 (C) 1.5 (D) 0.40 For #14 - #15: Consider the weak acid, hypochlorous acid, HClO. Its acid dissociation constant is 3.0x10 ⁻⁸ . 14. What is the approximate pH of a 0.10 M potassium hypochlorite, KClO, solution (A) 10.3 (B) 4.3 (C) 9.7 (D) 3.7		<	(A) 5.1	(B) 7.7	7	((C) 2.5		
(A) 9.5 (D) None of the above 11. What is the approximate pH of a solution containing 0.50 M KHTeO ₃ and 0.20 M Na ₂ TeO ₃ ? (A) 8.1 (B) 2.9 (C) 2.1 (D) 7.3 12. What is the approximate pH of a solution prepared by adding 0.40 mol of HNO ₃ to 2.0 L of 0.30 M KHTeO ₃ ? (A) 2.0 (B) 2.8 (C) 2.2 (D) 3.4 13. Approximately what ratio of [TeO ₃ ² -]/[HTeO ₃ -] will give a pH of 7.30 ? (A) 0.20 (B) 2.5 (C) 1.5 (D) 0.40 For #14 - #15: Consider the weak acid, hypochlorous acid, HClO. Its acid dissociation constant is 3.0x10-8. 14. What is the approximate pH of a 0.10 M potassium hypochlorite, KClO, solution (A) 10.3 (B) 4.3 (C) 9.7 (D) 3.7			(D) The pH depen	ds upon the cond	centrat	ion of KHTe	Оз		
(D) None of the above 11. What is the approximate pH of a solution containing 0.50 M KHTeO ₃ and 0.20 M Na ₂ TeO ₃ ? (A) 8.1 (B) 2.9 (C) 2.1 (D) 7.3 12. What is the approximate pH of a solution prepared by adding 0.40 mol of HNO ₃ to 2.0 L of 0.30 M KHTeO ₃ ? (A) 2.0 (B) 2.8 (C) 2.2 (D) 3.4 13. Approximately what ratio of [TeO ₃ ² -]/[HTeO ₃ -] will give a pH of 7.30? (A) 0.20 (B) 2.5 (C) 1.5 (D) 0.40 For #14 - #15: Consider the weak acid, hypochlorous acid, HClO. Its acid dissociation constant is 3.0x10-8. 14. What is the approximate pH of a 0.10 M potassium hypochlorite, KClO, solution (A) 10.3 (B) 4.3 (C) 9.7 (D) 3.7		10.	What is the approx	timate pH of a so	lution o	containing 0	.05 M Na	ı₂TeO₃?	
11. What is the approximate pH of a solution containing 0.50 M KHTeO ₃ and 0.20 M Na ₂ TeO ₃ ? (A) 8.1 (B) 2.9 (C) 2.1 (D) 7.3 12. What is the approximate pH of a solution prepared by adding 0.40 mol of HNO ₃ to 2.0 L of 0.30 M KHTeO ₃ ? (A) 2.0 (B) 2.8 (C) 2.2 (D) 3.4 13. Approximately what ratio of [TeO ₃ ²]/[HTeO ₃ ⁻] will give a pH of 7.30 ? (A) 0.20 (B) 2.5 (C) 1.5 (D) 0.40 For #14 - #15: Consider the weak acid, hypochlorous acid, HClO. Its acid dissociation constant is 3.0x10 ⁻⁸ . 14. What is the approximate pH of a 0.10 M potassium hypochlorite, KClO, solution (A) 10.3 (B) 4.3 (C) 9.7 (D) 3.7			(A) 9.5	(B) 10).2		(C) 3.8		
Na ₂ TeO ₃ ? (A) 8.1 (B) 2.9 (C) 2.1 (D) 7.3 12. What is the approximate pH of a solution prepared by adding 0.40 mol of HNO ₃ to 2.0 L of 0.30 M KHTeO ₃ ? (A) 2.0 (B) 2.8 (C) 2.2 (D) 3.4 13. Approximately what ratio of [TeO ₃ ² -]/[HTeO ₃ -] will give a pH of 7.30? (A) 0.20 (B) 2.5 (C) 1.5 (D) 0.40 For #14 - #15: Consider the weak acid, hypochlorous acid, HCIO. Its acid dissociation constant is 3.0x10 ⁻⁸ . 14. What is the approximate pH of a 0.10 M potassium hypochlorite, KCIO, solution (A) 10.3 (B) 4.3 (C) 9.7 (D) 3.7 15. What is the approximate percent dissociation of a 0.005 M solution of HCIO?			(D) None of the ab	oove					
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to 2.0 L of 0.30 M KHTeO ₃ ? (A) 2.0 (B) 2.8 (C) 2.2 (D) 3.4 13. Approximately what ratio of [TeO ₃ ² -]/[HTeO ₃ -] will give a pH of 7.30? (A) 0.20 (B) 2.5 (C) 1.5 (D) 0.40 For #14 - #15: Consider the weak acid, hypochlorous acid, HClO. Its acid dissociation constant is 3.0x10-8. 14. What is the approximate pH of a 0.10 M potassium hypochlorite, KClO, solution (A) 10.3 (B) 4.3 (C) 9.7 (D) 3.4			(A) 8.1	(B) 2.9	(C)	2.1	(D) 7.	3	
13. Approximately what ratio of [TeO ₃ ² -]/[HTeO ₃ -] will give a pH of 7.30? (A) 0.20 (B) 2.5 (C) 1.5 (D) 0.40 For #14 - #15: Consider the weak acid, hypochlorous acid, HClO. Its acid dissociation constant is 3.0x10-8. 14. What is the approximate pH of a 0.10 M potassium hypochlorite, KClO, solution (A) 10.3 (B) 4.3 (C) 9.7 (D) 3.7 15. What is the approximate percent dissociation of a 0.005 M solution of HClO?		12.			lution p	orepared by	adding 0	0.40 mol of HNO₃	
(A) 0.20 (B) 2.5 (C) 1.5 (D) 0.40 For #14 - #15: Consider the weak acid, hypochlorous acid, HCIO. Its acid dissociation constant is 3.0x10 ⁻⁸ . 14. What is the approximate pH of a 0.10 M potassium hypochlorite, KCIO, solution (A) 10.3 (B) 4.3 (C) 9.7 (D) 3.7 15. What is the approximate percent dissociation of a 0.005 M solution of HCIO?			(A) 2.0	(B) 2.8	(C)	2.2	(D) 3.	4	
For #14 - #15: Consider the weak acid, hypochlorous acid, HCIO. Its acid dissociation constant is 3.0x10 ⁻⁸ . 14. What is the approximate pH of a 0.10 M potassium hypochlorite, KCIO, solution (A) 10.3 (B) 4.3 (C) 9.7 (D) 3.7 15. What is the approximate percent dissociation of a 0.005 M solution of HCIO?		13.	Approximately wha	at ratio of [TeO ₃ 2-]]/[HTe	D ₃ -] will give	a pH of 7	7.30 ?	
14. What is the approximate pH of a 0.10 M potassium hypochlorite, KCIO, solution (A) 10.3 (B) 4.3 (C) 9.7 (D) 3.7 15. What is the approximate percent dissociation of a 0.005 M solution of HCIO?			(A) 0.20	(B) 2.5		(C) 1.5		(D) 0.40	
(A) 10.3 (B) 4.3 (C) 9.7 (D) 3.7 15. What is the approximate percent dissociation of a 0.005 M solution of HCIO?				the weak acid, h	ypochl	orous acid,	HCIO. Its	s acid dissociatio	n
15. What is the approximate percent dissociation of a 0.005 M solution of HCIO?		14.	What is the approx	kimate pH of a 0.1	10 M p	otassium hy	pochlorit	e, KClO, solution	?
			(A) 10.3	(B) 4.3		(C) 9.7	(1	D) 3.7	
(A) $2.4 \times 10^{-3} \%$ (B) $2.4 \times 10^{-1} \%$ (C) $3.5 \times 10^{-1} \%$ (D) 3.5%		15.	What is the approx	imate percent di	ssociat	tion of a 0.0	05 M solu	ution of HCIO?	
)				

Versin B

For #16 - #18: Consider the amino acid, Histidine (His). The most positive form of Histidine is His^{2+} and the most negative form is His^{1-} . The three pKa's of Histidine are: $pK_a' = 1.8$, $pK_a'' = 6.0$, and $pK_a''' = 9.2$.

16. At what pH does one have 50% His¹+ and 50% His⁰?					
(A) 1.8	(B) 3.9	(C) 6.0	(D) 7.6		
. What is the ave	erage charge on the H	listidine molecule at	pH = 9.2 ?		
(A) +1.5	(B) +1.0	(C) +0.5	(D) -0.5		
. What is the iso	electric point (pl) of H	istidine?			
(A) 7.6	(B) 6.0	(C) 3.9	(D) 1.8		
(A) 0.18 M	(B) 0.0	96 M	(C) 0.54 M		
(D) None of the	e above				
		100. mL of 0.10 M	NaOH, the pH of th	ne	
(A) 9.0	(B) 10.7	(C) 5.0	(D) 3.3		
			AND THE RESIDENCE OF THE PROPERTY OF THE PROPE		
	(A) 1.8 What is the ave (A) +1.5 What is the ison (A) 7.6 180 mL of 0.20 aqueous NaOH solution? (A) 0.18 M (D) None of the lift one mixes 99 resultant solution.	(A) 1.8 (B) 3.9 What is the average charge on the H (A) +1.5 (B) +1.0 What is the isoelectric point (pl) of H (A) 7.6 (B) 6.0 180 mL of 0.20 M H ₃ PO ₄ (aq) is need aqueous NaOH(aq) solution? What solution? (A) 0.18 M (B) 0.0 (D) None of the above If one mixes 99. mL of 0.10 M HCl to resultant solution is approximately:	(A) 1.8 (B) 3.9 (C) 6.0 What is the average charge on the Histidine molecule at (A) +1.5 (B) +1.0 (C) +0.5 What is the isoelectric point (pl) of Histidine? (A) 7.6 (B) 6.0 (C) 3.9 180 mL of 0.20 M H ₃ PO ₄ (aq) is needed to completely neaqueous NaOH(aq) solution? What is the approximate is solution? (A) 0.18 M (B) 0.06 M (D) None of the above	(A) 1.8 (B) 3.9 (C) 6.0 (D) 7.6 What is the average charge on the Histidine molecule at pH = 9.2? (A) +1.5 (B) +1.0 (C) +0.5 (D) -0.5 What is the isoelectric point (pI) of Histidine? (A) 7.6 (B) 6.0 (C) 3.9 (D) 1.8 180 mL of 0.20 M H ₃ PO ₄ (aq) is needed to completely neutralize 200 mL of aqueous NaOH(aq) solution? What is the approximate Molarity of the NaO solution? (A) 0.18 M (B) 0.06 M (C) 0.54 M (D) None of the above	

(10) 1. Pyridine [C₅H₅N = Pyr] is a weak base with a base equilibrium constant, K₀ = 1.8x10⁻⁰. The pH of an aqueous solution containing Pyridinium Bromide [C₅H₅NHBr = PyrHBr, M = 160.] is pH = 2.8. Calculate the mass percent of PyrHBr in the aqueous solution.

Note: Assume that the density of the aqueous solution is 1.0 g/mL.

 $K_{a} = \frac{10^{-17}}{Rb} = 5.56 \times 10^{7}$ $F_{b} = \frac{1}{Rb} = \frac{1$

185me 12: 1000 mL

Many 20149 ml/2 ×1220,449, ml.

Many 20149 ml ×160 ght = 71.89

Mill = 1000 ml × 19 = 1000 g.

Me = 21.8

1000 × 100 = 2.18 = 17.281

	1/31	004 = M	PO4 = MA	12.44	- 11 esc	mB	
Plan &		2112	7.34	12,44	12015		
) 2.			a triprotic acid w and Ka''' = 3.6x		ation consta	nts,
mel	(7)		0.40 M K ₃ PO ₄			nL of 0.60 M	HCI with
Nest = 6,60	x635	agente.	Pays	+ Wt -	& Pay		
=0.2	-/ m/	<i>,</i> ,	1ml 934	(0,2)	8 C \	•	
npas: 20.	40 x0	785	5 -012,	1. 20	0,21		
=0	34,	<i>J</i> .					
		PN=	12,44 +	18 5043-7 54004-7	= 12.44	t 15	0,13
				,, ,]	$=\sqrt{2.2}$	3/	
	(7)	(b) Calculate	the pH of a sol	ution prepared b	 ov mixina 900 n	~√ nL of 0.50 M	KOH with
<i>-</i> '\	(-)		0.40 M H₃PO₄			0. 0.00	
-Inco	- 6	Sky	<u>-</u>		1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		7_
7)00 = 0.5	~~ ~~	Napo	4 +M -1	X POy	W. Por	500 -	proy
h = 1/2	.	11/ 0	26 0.45	O Inil	0.26	0.13	8
Mafor C. F.	×0,65	G0	7.26 -0.26	80,17	-0.19	-0.19	80,19
-02	26	•	02/9	0 mil	0.07	~	0.19
		PUZ	2.218/03	[NAOY] [N. Pay]			
		= 7	221 +/5/	(0.19)			
		=	= [7.64	7			

Version B

Prob. 2 (Cont'd)

(6) (c) Calculate the ratio, $[H_3PO_4]/[H_2PO_4]$ required to prepare a buffer solution with pH = 2.66.

PM= PRá 6 lg SM3 PAJ - 2.66 = 2.126/g [M3 PAJ]

[[MPG] - 2.66 = 2.126/g [M3 PAJ]

15 [KPB] = 2.66-2,12=+0.54

[12 Pay] = 10 = 3.47 -> [13 Pay] = 1 [14 Pay] = 10 = 3.47 -> [14 Pay] = 1 = 10 > 9

(10) 3. When 7.80 grams of a sample of impure Calcium Hydroxide [Ca(OH)₂, M = 74.1] is titrated with 0.35 M H₃PO₄, it takes 150. mL of H₃PO₄ to completely titrate the base. Calculate the **mass percent of impurity** in the Calcium Hydroxide sample.

213 Pax 63 Calon) - Ca3(Pax) 6 6100

Mason = 0.35 uff x a15120.0025 N

Maint = acris willistax 3 william = a>88 william

Maring = 0,788 21× 24/36 = 5.84 g alon)

Minpu = 7.80-5.84 = 1.965.

Mho (impm) = 1.96 × 100 = 2521/2

=[25%]