Vusur A

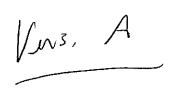
CHEM 1423 - Exam 3 - March 30, 2017

(76)	DADTI	MULTIPLE CHOICE	(Circle the	ONE correct answer	ĸ١
(70)	PAKI I.		Circle me	ONE COFFECT answer	П

ZAKI	I. MULTIPLE CH	OICE (Circle the O	NE correct answer)		
1.			ion containing 0.07 gra = 56.1 g/mol) , dissolv		
	(A) 4.3	(B) 4.6	(C) 9.7	(D) 9.4	
2.	Which of the follow	ving aqueous solutio	ons is/are acidic?		
2	(i) Ammonium Bı ⟨(ii) Potassium Bro ⟨(iii) Anilinium Chlo ⟨(iv) Sodium Lacta	omide (KBr) oride (AnilHCI)			
	(A) iv only	(B) i & iii	(C) i & ii & iv	(D) i & ii & iii	
3.		Equilibrium Constan	t of the weak base, Hy oH = 9.4?	/droxylamine, if a	
((A) 1.3x10 ⁻⁸	(B) 3.2x10 ⁻¹⁸	(C) 5.0x10 ⁻⁴	(D) 4.8x10 ⁻⁶	
	4 - #5: Consider than the consider than the consider the consideration the cons	ie weak base, Morpl	nine (Morp). Its base e	equilibrium	
4.	What is the appro	ximate percent pro	tonation in a 0.07 M s	solution of Morphine?	
	(A) 3.4x10 ⁻² %	(B) 4.8x10 ⁻³ %	(C) 3.4x10 ⁻⁴ %	(D) 0.48%	
5.	What is the appro (MorpHCI) ?	ximate pH of a 0.04	M solution of Morphin	ium Chloride,	
((A) 4.8	(B) 3.6	(C) 5.3	(D) 9.2	
6.	6. Benzoic Acid (HBenz) is a weak acid with an acid dissociation constant of 6.3x10 ⁻⁵ . What is the approximate pH of a 0.20 M solution of Sodium Benzoate (NaBenz)?				
	(A) 2.4	(B) 5.2	(C) 8.8	(D) 11.6	
7	Culturaus Asid II	-CO- is a disrotio o	aid with acid discociati	on constants	

7. Sulfurous Acid, H_2SO_3 , is a diprotic acid with acid dissociation constants, $K_a' = 1.2 \times 10^{-2}$, and $K_a'' = 6.6 \times 10^{-8}$. What is the approximate pH of a 0.10 M solution of sodium sulfite, Na_2SO_3 ?

(A) 3.9	(B) 10.1	(C) 9.9	(D) 4.1
(1) 0.0	(10) 10.1	(3) 0.0	(2)

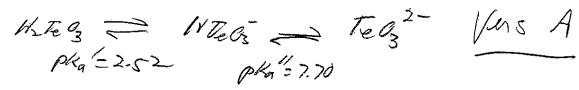


8.	Arsenous Acid, HAso the approximate per			$K_a = 8.0 \times 10^{-10}$. What is of HAsO ₂ ?		
	(A) 4.9x10 ⁻⁴ %	(B) 1.6x10 ⁻² %	(C) 9.9	(D) 1.6x10 ⁻⁴ %		
9.	If added to 2 L of 0.5	0 M NaOH, which o	one of the following	would form a buffer?		
	(A) 2. L of 0.40 M N	tric Acid (HNO ₃)				
	(B) 2. L of 0.40 M P	otassium Acetate (k	(Ac)			
ζ	(C) 2. L of 0.60 M La	actic Acid (HLac)	S			
	(D) 2. L of 0.40 M A	cetic Acid (HAc)				
10	The base equilibrium approximate pH of a Bromide (AnilHBr)?					
	(A) 9.60	(B) 4.85	(C) 4.41	(D) 9.15		
11		r 0.40 mol of NaOH	,	s 1.5x10 ⁻⁵ . What is the ition initially containing		
Š	(A) 4.65	(B) 5.00	(C) 4.42	(D) 5.22		
for	r #12 - #14: Consider m of Glutamic Acid is Glutamic Acid are: pk	Glu ¹⁺ and the most	negative form is G	•		
12	. What is the isoelectr	ic point (pl) of Gluta	amic Acid?			
	(A) 3.1	(B) 6.8	(C) 2.1	(D) 4.1		
13	13. At what pH does one have 50% Glu ⁰ (neutral) and 50% Glu ¹⁻ ?					
	(A) 3.1	(B) 9.5	(C) 6.8	(D) 4.1		
14. What is the average charge on the Glutamic Acid molecule at pH = 6.8?						
	(A) -1.5	(B) -0.5	(C) -1.0	(D) -2.0		

Vers. A

15. 240 mL of 0.40 M NaOH(aq) is needed to completely neutralize 120 mL of an aqueous H ₃ PO ₄ (aq) solution? What is the Molarity of the H ₃ PO ₄ (aq) solution?				
(A) 0.27 M	(B) 0.47 M	(C) 0.80 M	(D) 0.21 M	
For #16 - #19: Arsenous addissociation constants, Ka' =			5x10 ⁻¹²	
16. Which one of the solution $pH = 7.2$?	utions below would l	oe best to prepare a	a buffer with	
(A) K ₂ HAsO ₃ /Na ₃ As	О3	(B) Na₂HAsO₃		
(C) KH ₂ AsO ₃ /Na ₂ HA	\sO ₃	(D) KH ₂ AsO ₃ /Na ₃ A	√sO₃	
17. What is the approxim	nate pH of a solution	containing pure K ₂	HAsO₃?	
(A) 6.8	(B) 9.2	(C) 11	.6	
(D) The pH depends	s upon the K ₂ HAsO ₃	concentration.		
18. What is the approxim to 2.0 L of 0.40 M KH		prepared by adding	g 0.30 mol of NaOH	
(A) 7.20	(B) 7.00	(C) 6.34	(D) 6.55	
19. Approximately what ratio of [H ₃ AsO ₃]/[H ₂ AsO ₃ -] will give a solution with				
(A) 0.2	(B) 0.6	(C) 5.6	(D) 4.5	
	•			

PART II. TWO (2) PROBLEMS BELOW: REMEMBER TO SHOW WORK FOR CREDIT



Tellurous acid, H₂TeO₃, is a diprotic acid with acid dissociation constants, (16) 1. $K_a' = 3.0x10^{-3}$ and $K_a'' = 2.0x10^{-8}$

(6) (a) Calculate the pH of a solution prepared by mixing 2.0 L of 0.60 M K₂TeO₃ with ے 1.0 L of 0.70 M HCl.

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(6) (b) Calculate the pH of a solution prepared by mixing 2.0 L of 0.60 M H₂TeO₃ with 2.0 L of 0.80 M NaOH.

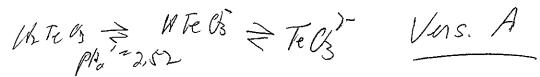
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2 op/ Styp2

NRECZ OON -> TeCz + 129

Met 1.2 6.4 00,4

cls. -0.4 -0.4 00,4



(16) 1. (Continued) Tellurous acid, H_2TeO_3 , is a diprotic acid with acid dissociation constants, $K_a' = 3.0 \times 10^{-3}$ and $K_a'' = 2.0 \times 10^{-8}$

(4) (c) Calculate the ratio, $[HTeO_3^-]/[H_2TeO_3]$, needed to prepare a buffer solution with

pH = 3.20

pWz pka + los [NRO3]

3.2 = 2(2+ los [NRG])

Fur Re37

(08) 2. Hypobromous Acid, HBrO, has an Acid Dissociation Constant, $K_a = 2.0x10^{-9}$. Calculate the pH of a solution of Sodium Hypobromite, NaBrO (M = 118.9 g/mol) that is 3.0% NaBrO by weight.

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

Cale of [Na BNO] = [BNO]

Acome 12 = 1000ml = 1000g.

Mago = 3.0 × 1000 = 309

Masio = 30g x 1 ml = 0.252 ml

[rabio]=[BVO]= 0,252 M (Since V=1.04) he solution is 1.0 g/mL

Calc \sqrt{pM} $K_{A}(B_{V}O) = \frac{10^{-14}}{8a(MB_{M})}$ $K_{A}(B_{V}O) = \frac{10^{-14}}{2800}$ $K_{A}O = MB_{A}O + OM = \frac{10^{-14}}{2800}$ $K_{A}O = MB_{A}O + OM = \frac{10^{-14}}{2800}$ $K_{A}O = \frac{10^{-14}}{2800}$ K_{A}

un B

CHEM 1423 - Exam 3 - March 30, 2017 - Version B

/7C	DADTI	MULTIPLE CHOICE	(Circle the	ONE	correct answer)
(70)	PARII.		(Circle nie	CIAL	COLLECT WILL A

6)	PART I.	MULTIPLE CHO	DICE (Circle the (ONE correct answer)	
	1. \	Which of the follow	ing aqueous solut	tions is/are acidic?	
	(i) Ammonium Bro ii) Potassium Bror iii) Anilinium Chlor iv) Sodium Lactat	nide (KBr) ride (AnilHCl)		
	((A) iv only	(B) i & ii & iii	(C) i & ii & iv	(D) i & iii
		- #3: Consider the nt is 1.6x10 ⁻⁶ .	e weak base, Mor	ohine (Morp). Its base	e equilibrium
	2. \	What is the approx	imate percent pr	otonation in a 0.07 M	I solution of Morphine?
		(A) 3.3x10 ⁻² %	(B) 0.48%	(C) 3.3x10 ⁻⁴ %	(D) 4.8x10 ⁻³ %
		What is the approx (MorpHCl) ?	imate pH of a 0.0	4 M solution of Morph	inium Chloride,
	((A) 3.6	(B) 4.8	(C) 5.3	(D) 9.2
	i	What is the approx base, potassium hy solution?	imate pH of a solo ydroxide, KOH (M	ution containing 0.07 (= 56.1 g/mol) , disso	grams of the strong olved in 50 L of aqueous
		(A) 9.4	(B) 4.6	(C) 9.7	(D) 4.3
		What is the Base E 0.05 M hydroxylam		ant of the weak base, a pH = 9.4?	Hydroxylamine, if a
	• ((A) 5.0x10 ⁻⁴	(B) 3.2x10 ⁻¹⁸	(C) 1.3x10 ⁻⁸	(D) 4.8x10 ⁻⁶
		Sulfurous Acid, H ₂ : K _a ' = 1.2x10 ⁻² , and solution of sodium	$K_a'' = 6.6 \times 10^{-8}$. W	acid with acid dissocia /hat is the approximat	ation constants, e pH of a 0.10 M
		(A) 3.9	(B) 10.1	(C) 9.9	(D) 4.1
	(is the approximate	d with an acid dissocia e pH of a 0.20 M solut	

(B) 5.2

(A) 2.4

(C) 11.6

Vers. B

For #8 - #10: Consider the amino acid, Glutamic Acid (Glu). The most positive form of Glutamic Acid is Glu^{1+} and the most negative form is Glu^{2-} . The three pKa's of Glutamic Acid are: $pK_a' = 2.1$, $pK_a'' = 4.1$, and $pK_a''' = 9.5$.

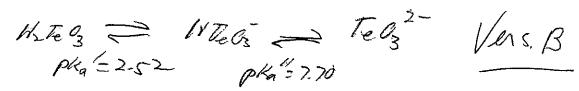
Glu	Glutamic Acid are: $pK_a' = 2.1$, $pK_a'' = 4.1$, and $pK_a''' = 9.5$.				
8.	At what pH does one have 50% Glu ⁰ (neutral) and 50% Glu ¹⁻ ?				
	(A) 3.1	(B) 9.5	(C) 4.1	(D) 6.8	
9.	What is the isoelectr	ic point (pl) of Gl	utamic Acid?		
	(A) 4.1	(B) 3.1	(C) 6.8	(D) 4.1	
10.	What is the average	charge on the G	lutamic Acid molecul	e at pH = 6.8 ?	
	(A) -1.0	(B) -0.5	(C) -1.5	(D) -2.0	
11.	If added to 2 L of 0.5	0 M NaOH, whic	ch one of the following	g would form a buffer?	
	(A) 2. L of 0.40 M N	itric Acid (HNO₃)		·	
	(B) 2. L of 0.40 M P	otassium Acetate	e (KAc)		
	(C) 2. L of 0.40 M A	cetic Acid (HAc)			
	(D) 2. L of 0.60 M La	actic Acid (HLas)	>		
12.	-		dissociation constant, of a 0.03 M solution	$_{0}$, K_{a} = 8.0x10 ⁻¹⁰ . What is of HAsO ₂ ?	
((A) 1.6x10 ⁻² %	(B) 4.9x10 ⁻⁴ %	(C) 9.9	(D) 1.6x10 ⁻⁴ %	
13.		r 0.40 mol of Na		is 1.5x10 ⁻⁵ . What is the lution initially containing	
	(A) 4.42	(B) 5.00	(C) 4.65	(D) 5.22	
14.	The base equilibrium approximate pH of a Bromide (AnilHBr)?		iline (Anil) is 4.3x10 ⁻¹ ing 0.30 M Aniline ar		
	(A) 9.60	(B) 4.41	(C) 4.85	(D) 9.15	

Vns B

For #15 - #18: Arsenous acid, H_3AsO_3 , is a triprotic acid with acid dissociation constants, $K_a{}^{\prime}=5.6x10^{-3}$, $K_a{}^{\prime\prime}=1.7x10^{-7}$, and $K_a{}^{\prime\prime\prime}=2.5x10^{-12}$

15.	15. What is the approximate pH of a solution containing pure K₂HAsO₃?				
	(A) 9.2	(B) 11.6	(C) (6.8	
	(D) The pH depend	ls upon the K₂HAs	O ₃ concentration.		
16.	Which one of the sc pH = 7.2?	olutions below wou	ıld be best to prepare	a buffer with	
	(A) K ₂ HAsO ₃ /Na ₃ A ₃	sO ₃	(B) Na ₂ HAsO ₃		
	(C) KH ₂ AsO ₃ /Na ₃ A	sO ₃	(D) KH ₂ AsO ₃ /Na ₂ H	AsO ₃	
17.	What is the approxi to 2.0 L of 0.40 M K	•	tion prepared by addir	ng 0.30 mol of NaOH	
((A) 6.55	(B) 7.00	(C) 6.34	(D) 7.20	
18.	Approximately what pH = 2.9 ?	t ratio of [H₃AsO₃],	/[H ₂ AsO ₃ -] will give a s	olution with	
	(A) 2.5	(B) 0.6	(C) 5.6	(D) 0.2	
19.	19. 240 mL of 0.40 M NaOH(aq) is needed to completely neutralize 120 mL of an aqueous H ₃ PO ₄ (aq) solution? What is the Molarity of the H ₃ PO ₄ (aq) solution?				
	(A) 0.47 M	(B) 0.80 M	(C) 0.27 M	(D) 0.21 M	
······································					

PART II. TWO (2) PROBLEMS BELOW: REMEMBER TO SHOW WORK FOR CREDIT



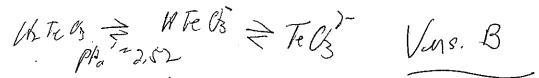
Tellurous acid, H₂TeO₃, is a diprotic acid with acid dissociation constants, (16) 1. $K_a' = 3.0x10^{-3}$ and $K_a'' = 2.0x10^{-8}$

(6) (a) Calculate the pH of a solution prepared by mixing 2.0 L of 0.60 M K₂TeO₃ with ___ 1.0 L of 0.70 M HCl.

Con Sui by U(301) To

(6) (b) Calculate the pH of a solution prepared by mixing 2.0 L of 0.60 M H₂TeO₃ with 2.0 L of 0.80 M NaOH.

1.60%.



(16) 1. (Continued) Tellurous acid, H_2TeO_3 , is a diprotic acid with acid dissociation constants, $K_a' = 3.0 \times 10^{-3}$ and $K_a'' = 2.0 \times 10^{-8}$

(4) (c) Calculate the ratio, [HTe_iO₃-]/[H₂TeO₃], needed to prepare a buffer solution with

pH = 3.20

PM2 pka + / 5 [WR03]

3.2 = 2(2+ 6) [WR9]

TURGT

(08) 2. Hypobromous Acid, HBrO, has an Acid Dissociation Constant, $K_a = 2.0x10^{-9}$. Calculate the pH of a solution of Sodium Hypobromite, NaBrO (M = 118.9 g/mol) that is 3.0% NaBrO by weight.

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

Cale of [Ng BNO] = [BNO] Asome 12 = locant = locay.

Mago = 3.0 × 1000 = 30g.

Masso = 30g x 12l -0.252 ml

[Sace V21.0] = 0,252 M

Calc of ph ($R_{A}(B_{V}o) = \frac{10}{R_{A}(B_{B}o)}$) = $\frac{10^{-14}}{R_{A}(B_{B}o)}$ $R_{V}O = R_{A}O = R_{B}O = 0$ = $\frac{10^{-14}}{2 \times 10^{-9}}$ $R_{V}O = \frac{10^{-14}}{2 \times 10^{-9}}$ $R_{V}O = \frac{1$

=14-2,9== 11.00

= 11.0 n N.1