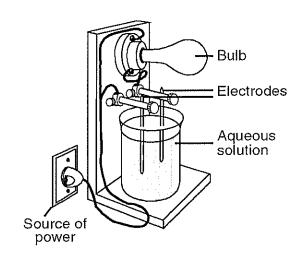
Acido & Bases Review Packet

materials.

3)

Name: _						
1)	Which compounds are both classified as electrolytes?					
	A) NH4Cl and C6H12O6	C) KCl and CH3OH				
	B) NH4Cl and KCl	D) C6H12O6 and CH3OH				
2)	Which of the following is a characteristic of a solution of HNO3?					
	A) It forms OH- ions.	C) It conducts electricity.				
	B) It turns phenolphthalein pink	D) It turns litmus blue.				



The diagram below shows an apparatus used to test the conductivity of various

Which aqueous solution will cause the bulb to light?

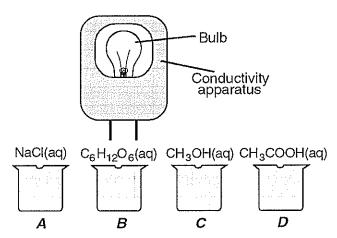
A) CH3OH(aq)

C) C6H12O6(aq)

B) LiOH(aq)

D) C12H22O11(aq)

 $\underline{}$ 4) Beakers A, B, C, and D shown below each contain a different solution.



	The bulb will glow when the conductivity apparatus is placed into which beakers?				
	A) A and D	C)	B and C		
	B) A and B	D)	Cand D		
5)	According to the Arrhenius theory, a substance positive ion in an aqueous solution is	that	yields hydrogen ions as the only		
	A) an acid	C)	a base		
	B) a salt	D)	a nonelectrolyte		
6)	According to the Arrhenius theory, when a base	z is di	ssolved in water it will produce a		
	solution containing only one kind of negative ion. To which ion does the theory refer?				
	A) hydroxide	C)	hydrogen		
	B) hydronium	D)	hydride		
7)	According to the Arrhenius theory, which list o	f com	pounds includes only bases?		
	A) KOH, NaOH, and LiOH				
	B) LiOH, Ca(OH)2, and C2H4(OH)2				
	C) KOH, Ca(OH)2, and CH3OH				
	D) NaOH, Ca(OH)2, and CH3COOH				
8)	Which compound reacts with an acid to form a salt and water?				
•	A) KOH		CH3Cl		
	B) CH3COOH	D)	KCI		
9)	According to the Bronsted-Lowry theory, an ac	id is			
<i>,</i>	A) a proton acceptor	C)	an electron acceptor		
	B) a proton donor	D)	an electron donor		
	•				

13) Given the reaction: $HF + H2O \iff F^- + H3O^+$ What species is the Bronsted acid in the reverse reaction? A) F- B) H2O C) HF D) H	10)	which species is cit	assitiea as a Bronstec	i acia?			
— 11) As HF dissolves in water, the following ionization reaction occurs: HF + H2O ← H3O+ + F- In this reaction, a proton is donated to A) H3O+ by F- B) H3O+ by H2O D) H2O by HF — 12) Given the reaction at equilibrium: NH4++OH- ← H2O+ NH3 What species is the Bronsted-Lowry acid in the forward reaction? A) OH- B) NH3 C) H2O D) N — 13) Given the reaction: HF + H2O ← F- + H3O+ What species is the Bronsted acid in the reverse reaction? A) F- B) H2O C) HF D) H — 14) In the reaction NO2-(aq) + H2O(ℓ) → HNO2(aq) + OH-(aq), the NO2-(aq) acid A) a Bronsted acid C) an Arrhenius acid B) a Bronsted base D) an Arrhenius base — 15) Which formula represents a conjugate acid-base pair? A) H3O+ and OH- C) CH3COOH and CH3COOH B) H3PO4 and PO4³- D) H2SO4 and SO4²- — 16) In the reaction HBr + H2O ← H3O+ Br-, which is a conjugate acid-base pair A) HBr and Br- C) H3O+ and HBr		A) H2SO4		C)	NaCl		
HF + H2O ← H3O+ + F- In this reaction, a proton is donated to A) H3O+ by F- B) H3O+ by H2O D) H2O by HF — 12) Given the reaction at equilibrium: NH4+ + OH- ← H2O + NH3 What species is the Bronsted-Lowry acid in the forward reaction? A) OH- B) NH3 C) H2O D) N — 13) Given the reaction: HF + H2O ← F- + H3O+ What species is the Bronsted acid in the reverse reaction? A) F- B) H2O C) HF D) H — 14) In the reaction NO2-(aq) + H2O(ℓ) → HNO2(aq) + OH-(aq), the NO2-(aq) acid B) a Bronsted acid C) an Arrhenius acid B) a Bronsted base D) an Arrhenius base — 15) Which formula represents a conjugate acid-base pair? A) H3O+ and OH- B) H3PO4 and PO4³- D) H25O4 and SO4²- — 16) In the reaction HBr + H2O ← H3O+ Br-, which is a conjugate acid-base pair A) HBr and Br- C) H3O+ and HBr		В) СН3ОН		D)	LiOH		
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A) H3O+ by F- B) H3O+ by H2O D) H2O by HF B) H3O+ by H2O D) H2O by HF I2) Given the reaction at equilibrium: NH4+ + OH- \(\infty \) H2O + NH3 What species is the Bronsted-Lowry acid in the forward reaction? A) OH- B) NH3 C) H2O D) N I3) Given the reaction: HF + H2O \(\infty \) F- + H3O+ What species is the Bronsted acid in the reverse reaction? A) F- B) H2O C) HF D) H In the reaction NO2-(aq) + H2O(l) \(\to \) HNO2(aq) + OH-(aq), the NO2-(aq) acid A) a Bronsted acid C) an Arrhenius acid B) a Bronsted base D) an Arrhenius base I5) Which formula represents a conjugate acid-base pair? A) H3O+ and OH- B) H3PO4 and PO43- D) H2SO4 and SO42- In the reaction HBr + H2O \(\infty \) H3O+ and HBr		HF + H2O ← → F	130+ + F-				
B) H3O+ by H2O B) H2O by HF Given the reaction at equilibrium: NH4++ OH- H2O + NH3 What species is the Bronsted-Lowry acid in the forward reaction? A) OH- B) NH3 C) H2O D) N Given the reaction: HF + H2O F- + H3O+ What species is the Bronsted acid in the reverse reaction? A) F- B) H2O C) HF D) H 14) In the reaction NO2-(aq) + H2O(l) HNO2(aq) + OH-(aq), the NO2-(aq) acid A) a Bronsted acid C) an Arrhenius acid B) a Bronsted base D) an Arrhenius base Mich formula represents a conjugate acid-base pair? A) H3O+ and OH- C) CH3COOH and CH3COO- B) H3PO4 and PO43- D) H2SO4 and SO42- 16) In the reaction HBr + H2O H3O+ Br-, which is a conjugate acid-base pair A) HBr and Br- C) H3O+ and HBr		In this reaction, a p	proton is donated to				
		A) H3O+ by F-		C)	HF by F-		
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A) OH- B) NH3 C) H2O D) N — 13) Given the reaction: HF + H2O \$\iff F^-\$ + H3O^+ What species is the Bronsted acid in the reverse reaction? A) F- B) H2O C) HF D) H — 14) In the reaction NO2-(aq) + H2O(l) \$\iff HNO2(aq)\$ + OH-(aq), the NO2-(aq) acid A) a Bronsted acid C) an Arrhenius acid B) a Bronsted base D) an Arrhenius base — 15) Which formula represents a conjugate acid-base pair? A) H3O+ and OH- C) CH3COOH and CH3COO- B) H3PO4 and PO43- D) H2SO4 and SO42- — 16) In the reaction HBr + H2O \$\iff H3O^+\$ + Br^-, which is a conjugate acid-base pair A) HBr and Br- C) H3O+ and HBr		NH4+ + OH- ←	= H2O + NH3				
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HF + H2O ← F- + H3O+ What species is the Bronsted acid in the reverse reaction? A) F- B) H2O C) HF D) H 14) In the reaction NO2-(aq) + H2O(ℓ) → HNO2(aq) + OH-(aq), the NO2-(aq) acid A) a Bronsted acid C) an Arrhenius acid B) a Bronsted base D) an Arrhenius base 15) Which formula represents a conjugate acid-base pair? A) H3O+ and OH- C) CH3COOH and CH3COO- B) H3PO4 and PO4³- D) H2SO4 and SO4²- 16) In the reaction HBr + H2O ← H3O+ Br-, which is a conjugate acid-base pair A) HBr and Br- C) H3O+ and HBr		A) OH-	B) NH3	C)	H20	D)	NH4+
What species is the Bronsted acid in the reverse reaction? A) F- B) H2O C) HF D) H 14) In the reaction NO2-(aq) + H2O(ℓ) → HNO2(aq) + OH-(aq), the NO2-(aq) acid A) a Bronsted acid C) an Arrhenius acid B) a Bronsted base D) an Arrhenius base 15) Which formula represents a conjugate acid-base pair? A) H3O+ and OH- C) CH3COOH and CH3COO- B) H3PO4 and PO4³- D) H2SO4 and SO4²- 16) In the reaction HBr + H2O ← H3O+ + Br-, which is a conjugate acid-base pair A) HBr and Br- C) H3O+ and HBr	13)	Given the reaction:					
A) F- B) H2O C) HF D) H — 14) In the reaction NO2-(aq) + H2O(ℓ) → HNO2(aq) + OH-(aq), the NO2-(aq) ac A) a Bronsted acid C) an Arrhenius acid B) a Bronsted base D) an Arrhenius base — 15) Which formula represents a conjugate acid-base pair? A) H3O+ and OH- C) CH3COOH and CH3COO- B) H3PO4 and PO4³- D) H2SO4 and SO4²- — 16) In the reaction HBr + H2O ← H3O+ Br-, which is a conjugate acid-base pair A) HBr and Br- C) H3O+ and HBr		HF + H2O ← F	~- + H3O+				
 14) In the reaction NO2-(aq) + H2O(ℓ) → HNO2(aq) + OH-(aq), the NO2-(aq) ad A) a Bronsted acid C) an Arrhenius acid B) a Bronsted base D) an Arrhenius base 15) Which formula represents a conjugate acid-base pair? A) H3O+ and OH-C) CH3COOH and CH3COOB) H3PO4 and PO4³-D) H2SO4 and SO4²- In the reaction HBr + H2O ← H3O+ Br-, which is a conjugate acid-base pair A) HBr and Br-C) H3O+ and HBr 		What species is the	Bronsted acid in the	reverse rea	ction?		
A) a Bronsted acid B) a Bronsted base D) an Arrhenius acid D) an Arrhenius base D) an Arrhenius base C) CH3COOH and CH3COOH B) H3PO4 and PO43- D) H2SO4 and SO42- C) CH3COOH and SO42- D) H2SO4 and SO42- C) CH3COOH and CH3COOH D) H2SO4 and SO42- C) H3O+ and HBr		A) F-	B) H2O	<i>C</i>)	HF	D)	H3O+
B) a Bronsted base D) an Arrhenius base Mhich formula represents a conjugate acid-base pair? A) H3O+ and OH- B) H3PO4 and PO4 ³ - D) H2SO4 and SO4 ² - Mich is a conjugate acid-base pair A) HBr and Br- C) H3O+ and HBr	14)	In the reaction NO2-(aq) + H2O(ℓ) \longrightarrow HNO2(aq) + OH-(aq), the NO2-(aq) acts as					
 Which formula represents a conjugate acid-base pair? A) H3O+ and OH- C) CH3COOH and CH3COO- B) H3PO4 and PO4³- D) H2SO4 and SO4²- In the reaction HBr + H2O H3O+ Br-, which is a conjugate acid-base pair A) HBr and Br- C) H3O+ and HBr 		A) a Bronsted acid		,			
A) H3O+ and OH- B) H3PO4 and PO4 ³ - 16) In the reaction HBr + H2O - H3O+ Br-, which is a conjugate acid-base pair A) HBr and Br- C) CH3COOH and CH3COO- D) H25O4 and 5O4 ² - C) H3O+ and HBr		B) a Bronsted base	2	D)	an Arrhenius b	ase	
B) H3PO4 and PO4 ³ - D) H25O4 and 5O4 ² - 16) In the reaction HBr + H2O - H3O ⁺ + Br ⁻ , which is a conjugate acid-base pai A) HBr and Br ⁻ C) H3O ⁺ and HBr	15)						
16) In the reaction HBr + H2O \iff H3O+ + Br-, which is a conjugate acid-base pai A) HBr and Br- C) H3O+ and HBr		. –		·	-	_)-
A) HBr and Br- C) H3O+ and HBr		B) H3PO4 and POA	43-	D)	H2SO4 and SC	042-	
,	16)	In the reaction HBr	· + H2O === H3O+ +	Br-, which i	s a conjugate aci	id-base po	air?
B) H3O+ and Br- D) HBr and H2O		A) HBr and Br-		C)	H3O+ and HBr		
		B) H3O+ and Br-		D)	HBr and H2O		

17)	Given the reaction at ec	quilibrium:				
	H5O4- + H2O ← 1	-130+ + SO4 ² -				
	The two Bronsted bases	are				
	A) H3O+ and SO42-		C)	H3O+ and HSO4-		
	B) H2O and 504 ² -		D)	H2O and H3O+		
18)	What is the conjugate b	ase of water?				
	A) H ₃ O+	B) H+	C)	H20	D)	OH-
19)	A 0.1 M solution of whi	ch acid is the <i>best</i> conduc	tor	of electricity at 25°	C?	
	A) H ₃ PO ₄ ($K_a = 7.1 \times$	10-3)	C)	$CH_3COOH\ (K_a = 1.8)$	3 × 1	0-5)
	B) HNO ₂ ($K_a = 5.1 \times 1$	0-4)	D)	$H_2S (K_a = 1.0 \times 10^{-1})$	7)	
20)	The ionization constants $(K_a$'s) of four acids are shown below. Which represents the					
	weakest of these acids?					
	A) $K_a = 1.7 \times 10^{-2}$		C)	$K_a = 1.0 \times 10^{-5}$		
	B) $K_a = 1.0 \times 10^{-4}$		D)	$K_a = 7.1 \times 10^{-3}$		
21)	Which equation illustrates the amphiprotic properties of a reactant species?					
	A) NH3(aq) + H2O(ℓ) \longrightarrow NH4+(aq) + OH-(aq)					
	B) $H_2O(\ell) + H_2O(\ell) \longrightarrow H_3O^+(aq) + OH^-(aq)$					
	C) $HCl(aq) + H2O(l) -$					
	D) 2H ₂ (g) + O ₂ (g) —					
22)	_	a 0.1 M solution of HCl w	/ill c	ause the pH of the so	olutio	on to
	A) decreaseB) remain the same					
	C) increase					
23)	An acidic solution could	have a pH of				
	A) 3	B) 7	C)	10	D)	14
24)	Pure water at 25°C has	a pH of				
	A) 1×10^{-14}		C)			
	B) 7		D)	1 × 10-7		

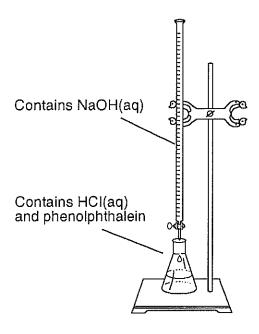
25)	Which substance, if added to a standard solution of NH40H, would cause the pH of the solution to increase?				
	A) LiOH	C) NH4Cl			
	B) HCl	D) CH3OH			
26)	Which relationship between ion concentrations a is basic?	lways exists in an aqueous solution that			
	A) [H+] equals [OH-].	C) [H+] is greater than [OH-].			
	B) [H+] is less than [OH-].	D) [H+] equals zero.			
27)	An aqueous solution that has a hydrogen ion concentration of 1.0×10^{-8} mole per liter has a pH of				
	A) 8, which is acidic	C) 8, which is basic			
	B) 6, which is acidic	D) 6, which is basic			
28)	A water solution that has an H^+ ion concentratio classified as	n of 1×10^{-8} mole per liter is			
	 A) basic, with a pH less than 7 B) basic, with a pH greater than 7 C) acidic, with a pH greater than 7 D) acidic, with a pH less than 7 				
29)	What is the concentration of $H3O^+$ ions, in moles per liter, of a 0.0001 M HCl solution?				
	A) 1×10^{-2}	C) 1 × 10-4			
	B) 1×10^{-1}	D) 1 × 10-3			
30)	What is the H3O+ ion concentration of a solution	n whose OH- ion concentration is			
· ,	$1 \times 10^{-3} \text{ M}$?				
	A) $1 \times 10^{-11} \text{ M}$	C) 1 × 10-4 M			
	B) $1 \times 10^{-7} \text{ M}$	D) $1 \times 10^{-14} \text{ M}$			
31)	The [H+] of a solution is 1×10^{-2} at 298 K. Wha	t is the [OH-] of this solution?			
•	A) 1 × 10-7	C) 1 × 10-12			
	B) 1 × 10-14	D) 1 × 10-2			
32)	Which solution will turn litmus from red to blue?	· •			
-	A) NH3(aq)	C) SO2(aq)			
	B) CO2(aq)	D) H25(aq)			

33)	Which solution will change litmus	s paper red	?		_	
	A) CH3COOH(aq)		C)	NH4OH(aq)		
	B) CH3OO-(aq)		D)	NaOH(aq)		
34)	One sample of a solution with a part sample of this solution is tested A) blue and the phenolphthalein B) blue and the phenolphthalein C) red and the phenolphthalein D) red and the phenolphthalein	with litmus n is colorles n is pink is pink	. In this s	•		
35)	The table below shows the color			ecific pH ranges.		
				_		
		Color	pH Range	2		
		Red	1-4	_		
		Orange	5-6			
		Green Blue	6-7 8-10			
		Violet	11-14			
	If this indicator is used when tit the color of the indicator will ch	_		- , -	g a strong acid	
	A) green to blue		C)	green to orange		
	B) blue to green		(۵	orange to green		
36)	Which indicators would cause a sblue?	sodium hydr	oxide solı	ution with a pH of 10	0.0 to turn	
	A) litmus and phenolphthalein		C)	litmus and methyl o	range	
	B) thymol blue and litmus		D)	thymol blue and me	thyl orange	
37)	What is the pH of a solution tha red?	it changes <i>b</i>	<i>oth</i> methy	l orange and litmus i	indicators	
	A) 6 B) 2		C)	8	D) 4	
38)	Which equation represents a neutralization reaction?					
	A) AgNO3 + NaCl → AgCl + NaNO3					
	B) $Zn + CuSO_4 \longrightarrow ZnSO_4 + Cu$					
	C) NaOH + HCl \longrightarrow NaCl + H2O					
	•					
	D) $2Na + 2H_2O \longrightarrow 2NaOH +$	「【				

39)	What products are formed when an acid reacts with a base?				
	A) a salt and water		C)	an ester and wate	r
	B) an alcohol and cart	bon dioxide	D)	a soap and glyceri	ne
40)	Which compound is a s	alt?			
	A) Na3PO4		C)	СН3СООН	
	B) H3PO4		D)	Ca(OH)2	
41)	If 50. milliliters of 0.3 solution, what is the ma		completely	y neutralize 25 mil	liliters of KOI
	A) 0.50 M	•	C)	1.0 M	
	B) 2.5 M		D)	0.25 M	
42)	What is the molarity of a KOH solution if it requires 20. milliliters of 2.0 M HCl to exactly neutralize 20. milliliters of the KOH solution?				
	A) 1.0 M	B) 2.0 M	C)	10. M	D) 20. M
43)	If 20. milliliters of 2.0 molarity of the HCl is	0 M KOH is exactly 1	neutralize	d by 10. milliliters	of HCI, the
	A) 1.0 M	B) 2.0 M	C)	3.0 M	D) 4.0 M
44)	If 20. milliliters of 1.0 M HCl was used to completely neutralize 40. milliliters of an NaOH solution, what was the molarity of the NaOH solution?				
	A) 0.50 M	·	C)	1.5 M	
	B) 2.0 M		D)	4.0 M	
45)	Which salt hydrolyzes	in water to form a sc	olution the	at is acidic?	
	A) NaCl		C)	KCI	
	B) LiCl		D)	NH4Cl	
46)	When the salt Na2CO3	3 undergoes hydrolys	is, the res	ulting solution will	be
	A) acidic with a pH gr	reater than 7	C)	basic with a pH le	ss than 7
	B) basic with a pH gr	eater than 7	D)	acidic with a pH l	ess than 7
47)	Which 0.1 M solution h	nas a pH <i>closest</i> to 7?	•		
	A) NaOH(aq)		C)	Na2CO3(aq)	
	B) NaCl(aq)		D)	NaC2H3O2(aq)	

- ____ 48) In the laboratory, a student neutralized 1.5 M HNO3 with 0.50 M KOH.
 - (a) Write the balanced equation for the reaction between HNO3 and KOH.
 - (b) How many milliliters of 0.50 M KOH are needed to exactly neutralize 10. milliliters of 1.5 M HNO3? [Write the correct formula. Show all work. Indicate the correct answer with an appropriate unit.]
- 49) In the laboratory, a student titrated HNO3 with 0.50 M LiOH until the indicator changed from colorless to pink.
 - (a) Write the balanced equation for the reaction between HNO3 and LiOH.
 - (b) If 50. milliliters of 0.50 M LiOH is required to exactly neutralize 100. milliliters of an HNO3 solution, what is the molarity of the HNO3 solution? [Write the correct formula. Show all work. Indicate the correct answer with an appropriate unit.]
 - (c) What indicator was used in the titration?

____ 50) In the laboratory, a student performed an acid-base titration. The diagram below shows NaOH(aq) being added to HCl(aq).



The following data was collected:

Volume of the acid, HCl = 20.0 mL Molarity of the acid = 0.50 M Volume of the base, NaOH = 40.0 mL

- (a) Write the balanced equation for the reaction between HCl and NaOH.
- (b) Based on the data above, calculate the molarity of the NaOH. [Write the correct formula. Show all work. Indicate the correct answer with an appropriate unit.]
- (c) What color does the indicator appear at the endpoint of the titration?
- (d) What name is given to the reaction between equivalent quantities of an acid and a base?

- 1) B
- 2) C
- 3) B
- 4) A
- 5) A
- 6) A
- 7) A
- 8) A
- 9) B
- 10) A
- 11) D
- 12) D
- 13) D
- 14) B
- 15) C
- 16) A
- 17) B
- 18) D
- 19) A
- 20) *C*

- 21) B
- 22) C
- 23) A
- 24) B
- 25) A
- 26) B
- 27) C
- 28) B
- 29) C
- 30) A
- 31) C
- 32) A
- 33) A
- 34) B
- 35) B
- 36) B
- 37) B
- 38) *C*
- 39) A
- 40) A

- 41) C
- 42) B
- 43) D
- 44) A
- 45) D
- 46) B
- 47) B
- 48) (a) HNO3 + KOH → KNO3 + H2O;
 - (b) 30. mL WORK SHOWN: $M_A V_A = M_B V_B$, (1.5 M)(10. mL) = (0.50 M)(V_B), $V_B = 30$. mL
- 49) (a) $HNO_3 + LiOH \longrightarrow LiNO_3 + H_2O$;
 - (b) 0.25 M WORK SHOWN: $M_A V_A = M_B V_B$, $(M_A)(100. \text{ mL}) = (0.50 \text{ M})(50. \text{ mL})$, $M_A = 0.25 \text{ M}$;
 - (c) phenolphthalein
- 50) (a) $HCl + NaOH \longrightarrow NaCl + H2O$;
 - (b) 0.25 M WORK SHOWN: $M_A V_A = M_B V_B$, (0.50 M)(20.0 mL) = (M_B) (40.0 mL), M_B = 0.25 M;
 - (c) pink;
 - (d) neutralization