

Name: \_\_\_\_\_

Period: \_\_\_\_\_

### Unit 12 Acids and Bases- Funsheets

**Part A:** Name and write the formula for the following acids and bases.

- 1) Carbonic acid \_\_\_\_\_
- 2) Chlorous acid \_\_\_\_\_
- 3) Hydroiodic acid \_\_\_\_\_
- 4) Hydrofluoric acid \_\_\_\_\_
- 5) Hydroselenic acid \_\_\_\_\_
- 6) Hypochlorous acid \_\_\_\_\_
- 7) Acetic acid \_\_\_\_\_
- 8) Phosphorous acid \_\_\_\_\_
- 9) Perchloric acid \_\_\_\_\_
- 10)  $H_2SO_4$  \_\_\_\_\_
- 11)  $HClO_2$  \_\_\_\_\_
- 12)  $H_2S$  \_\_\_\_\_
- 13)  $H_2SO_3$  \_\_\_\_\_
- 14)  $HNO_2$  \_\_\_\_\_
- 15)  $H_3PO_4$  \_\_\_\_\_
- 16)  $HClO_3$  \_\_\_\_\_
- 17)  $HCN$  \_\_\_\_\_
- 18) Calcium Hydroxide \_\_\_\_\_
- 19) Ammonia \_\_\_\_\_
- 20) Iron (II) Hydroxide \_\_\_\_\_
- 21) Lithium Hydroxide \_\_\_\_\_
- 22) Aluminum Hydroxide \_\_\_\_\_
- 23) Magnesium Hydroxide \_\_\_\_\_
- 24) Tin (IV) Hydroxide \_\_\_\_\_
- 25)  $Sr(OH)_2$  \_\_\_\_\_
- 26)  $Pb(OH)_2$  \_\_\_\_\_
- 27)  $KOH$  \_\_\_\_\_
- 28)  $Cr(OH)_3$  \_\_\_\_\_
- 29)  $Zn(OH)_2$  \_\_\_\_\_
- 30)  $Fe(OH)_3$  \_\_\_\_\_
- 31)  $Ba(OH)_2$  \_\_\_\_\_

**Part B:** Using Arrhenius definition, classify the following examples as acids, bases, or salts.

- |                                   |       |   |       |
|-----------------------------------|-------|---|-------|
| 1) HBr                            | _____ | 7) HClO   | _____ |
| 2) Mg(OH) <sub>2</sub>            | _____ | 8) KCl  | _____ |
| 3) HCl                            | _____ | 9) Al(OH) <sub>3</sub>                            | _____ |
| 4) KNO <sub>2</sub>               | _____ | 10) KC <sub>2</sub> H <sub>3</sub> O <sub>2</sub> | _____ |
| 5) Ba(OH) <sub>2</sub>            | _____ | 11) NaCl  | _____ |
| 6) H <sub>3</sub> PO <sub>4</sub> | _____ | 12) NH <sub>3</sub>                               | _____ |
- 13) Explain why NH<sub>3</sub> is considered a Bronsted-Lowry base, but not an Arrhenius base.

- 14) What happens to the charge of a substance if it gains a proton (H<sup>+</sup>)? \_\_\_\_\_
- 15) What happens to the charge of a substance if it loses a proton (H<sup>+</sup>)? \_\_\_\_\_
- 16) When an acid (gains/loses) a proton, it becomes the conjugate (acid/base). (circle the correct answers)
- 17) When a base (gains/loses) a proton, it become the conjugate (acid/base). (circle the correct answers)

For the following, write in the missing information for each conjugate pair.

Acid	Conjugate Base
H <sub>3</sub> O <sup>+1</sup>	
	OH <sup>-1</sup>
HCl	
	H <sub>2</sub> PO <sub>3</sub> <sup>-1</sup>

Base	Conjugate Acid
NH <sub>3</sub>	
	H <sub>2</sub> O
H <sub>2</sub> O	
	HBr

For the following equations, label the Bronsted-Lowry acid/base AND label the conjugate acid and conjugate base.

- |     |   |   |   |   |  |   |  |
|-----|---|---|---|---|--|---|--|
| 18) | HC <sub>2</sub> H <sub>3</sub> O <sub>2</sub> | + | H <sub>2</sub> O                              | ↔ | H <sub>3</sub> O <sup>+1</sup>                             | + | C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> <sup>-1</sup> |
|     |   | + |   | ↔ |  | + |  |
| 19) | HCO <sub>3</sub> <sup>-1</sup>                | + | H <sub>2</sub> O                              | ↔ | H <sub>2</sub> CO <sub>3</sub>                             | + | OH <sup>-1</sup>   |
|     |   | + |   | ↔ |  | + |  |
| 20) | HNO <sub>3</sub>                              | + | SO <sub>4</sub> <sup>-2</sup>                 | ↔ | HSO <sub>4</sub> <sup>-1</sup>                             | + | NO <sub>3</sub> <sup>-1</sup>                              |
|     |   | + |   | ↔ |  | + |  |
| 21) | HF  | + | H <sub>2</sub> O                              | ↔ | F <sup>-1</sup>  | + | H <sub>3</sub> O <sup>+1</sup>                             |
|     |   | + |   | ↔ |  | + |  |
| 22) | HNO <sub>2</sub>                              | + | H <sub>2</sub> O                              | ↔ | H <sub>3</sub> O <sup>+1</sup>                             | + | NO <sub>2</sub> <sup>-1</sup>                              |
|     |   | + |   | ↔ |  | + |  |
| 23) | H <sub>2</sub> O                              | + | S <sup>-2</sup>                               | ↔ | HS <sup>-1</sup>   | + | OH <sup>-1</sup>   |
|     |   | + |   | ↔ |  | + |  |
| 24) | CN <sup>-1</sup>                              | + | HC <sub>2</sub> H <sub>3</sub> O <sub>2</sub> | ↔ | C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> <sup>-1</sup> | + | HCN  |
|     |   | + |   | ↔ |  | + |  |
| 25) | NH <sub>3</sub>                               | + | H <sub>2</sub> O                              | ↔ | NH <sub>4</sub> <sup>+1</sup>                              | + | OH <sup>-1</sup>   |
|     |   | + |   | ↔ |  | + |  |
| 26) | OH <sup>-1</sup>                              | + | NH <sub>4</sub> <sup>+1</sup>                 | ↔ | H <sub>2</sub> O   | + | NH <sub>3</sub>  |
|     |   | + |   | ↔ |  | + |  |

**Part C:** Using your knowledge of pH and pOH and the equations below answer the following questions. Show all work!

$pH = -\log[H_3O^{+1}]$	<b>Formulas</b>	$pOH = -\log[OH^{-1}]$
$[H_3O^{+1}] = 10^{-pH}$	$pH + pOH = 14$	$[OH^{-1}] = 10^{-pOH}$

- 1) What is the pH of a 0.0235 M HCl solution?
- 2) What is the pOH of a 0.0235 M HCl solution?
- 3) What is the pH of a  $6.50 \times 10^{-3}$  M KOH solution? (Hint: this is a basic solution)
- 4) What is the pH of a  $6.2 \times 10^{-5}$  M NaOH solution? (Hint: this is a basic solution)
- 5) A solution with an  $H_3O^+$  concentration of  $1.00 \times 10^{-7}$  M is said to be neutral. Why?
- 6) Dr. Pepper has a  $[H^+] = 1.4 \times 10^{-5}$  M. What is its pH?

7) Fill in chart:

$[H^+]$	$[OH^-]$	pH	pOH	ACID BASE NEUTRAL
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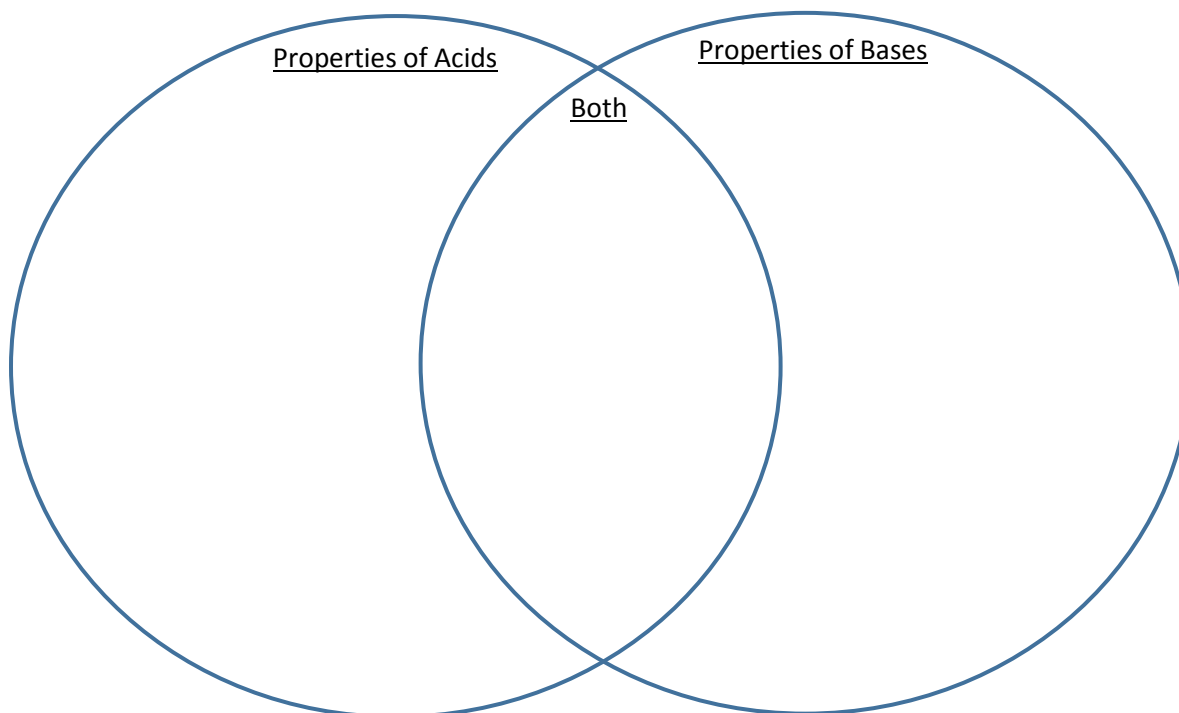
a.	$1 \times 10^{-3}$ M			
b.		$1 \times 10^{-6}$ M		
c.			9	
d.				12
e.				NEUTRAL
f.				9.5
g.			4.7	
h.		$2.0 \times 10^{-3}$ M		
i.	$5.0 \times 10^{-11}$ M			
j.			4.35	

**Part D:** Determine if the following acids and bases are strong or weak. Then what kind of salt (acidic, basic, neutral, or unable to determine) will be produced in a neutralization reaction between the following:

Acid		Base		Type of salt produced + Water
HCl	(strong/weak)	NaOH	(strong/weak)	
HC <sub>2</sub> H <sub>3</sub> O <sub>2</sub>	(strong/weak)	Ba(OH) <sub>2</sub>	(strong/weak)	
HF	(strong/weak)	AgOH	(strong/weak)	
HClO <sub>3</sub>	(strong/weak)	LiOH	(strong/weak)	
H <sub>2</sub> SO <sub>4</sub>	(strong/weak)	Ca(OH) <sub>2</sub>	(strong/weak)	
HI	(strong/weak)	Fe(OH) <sub>3</sub>	(strong/weak)	
HClO <sub>4</sub>	(strong/weak)	RbOH	(strong/weak)	
HNO <sub>3</sub>	(strong/weak)	Sr(OH) <sub>2</sub>	(strong/weak)	
HBr	(strong/weak)	KOH	(strong/weak)	
H <sub>2</sub> S	(strong/weak)	CsOH	(strong/weak)	

**Part E:** Using your knowledge of acids and bases, answer the following questions.

- 1) Fill in the following Venn diagram about properties of acids and bases. You must fill in at least 4 facts in each.



- 2) Give an example of each of the following:

a. Monoprotic acid: \_\_\_\_\_

b. Diprotic acid: \_\_\_\_\_

c. Triprotic acid: \_\_\_\_\_

d. Monobasic: \_\_\_\_\_

e. Dibasic: \_\_\_\_\_

f. Tribasic: \_\_\_\_\_

- 3) Fill in the chart below:

List 3 Weak Acids	List 7 Strong Acids	List 3 Weak Bases	List 8 Strong Bases:

- 4) When describing an acid or a base, what do the terms strong and weak mean?
- 5) In your own words, what is the difference between Arrhenius's definition and Bronsted-Lowry's definition of acids and bases?
- 6) What is an amphoteric substance? Given an example of one.
- 7) What is the formula for hydronium and how can be it abbreviated?
- 8) What is a conjugate acid/base pair?
- 9) Explain how you would determine the acid, base, conjugate acid, and conjugate base when given a reaction. Be detailed.
- 10) If a substance has a high pH... (circle your answers)
  - a. The substance is (ACIDIC/BASIC/NEUTRAL)
  - b. The substance has a (HIGH/LOW/NEUTRAL) hydronium ion concentration.
  - c. The substance has a (HIGH/LOW/NEUTRAL) pOH
  - d. The substance has a (HIGH/LOW/NEUTRAL) hydroxide ion concentration.
- 11) If a substance has a high hydronium ion concentration... (circle your answer)
  - a. The substance is (ACIDIC/BASIC/NEUTRAL)
  - b. The substance has a (HIGH/LOW/NEUTRAL) pH
  - c. The substance has a (HIGH/LOW/NEUTRAL) pOH
  - d. The substance has a (HIGH/LOW/NEUTRAL) hydroxide ion concentration.
- 12) What is a neutralization reaction?
- 13) What is a buffer?
- 14) What is a buffer made of?
- 15) Give an example of a buffer and explain what it is used for.
- 16) List 3 ways to test a solution's pH.
- 17) What is a titration?
- 18) In a titration, what is an end point?
- 19) In a titration, what is an equivalence point?
- 20) Draw and label a setup of a titration.