

Name: Key

Period: _____ Funsheets Part 1

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) H₂SO₄
- 11) HClO₂
- 12) H₂S
- 13) H₂SO₃
- 14) HNO₂
- 15) H₃PO₄
- 16) HClO₃
- 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

H₂CO₃
HClO₂
HI
HF
H₂Se
HClO
HC₂H₃O₂
H₃PO₃
HClO₄
sulfuric acid
chlorous acid
hydrosulfuric acid
sulfurous acid
nitrous acid
phosphoric acid
chloric acid
hydrocyanic acid
Ca(OH)₂
NH₃
Fe(OH)₂
LiOH
Al(OH)₃
Mg(OH)₂
Sn(OH)₄
strontium hydroxide
lead (II) hydroxide
potassium hydroxide
chromium(III) hydroxide
zinc hydroxide
iron (III) hydroxide
barium hydroxide

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

- | | | | |
|-----------------------------------|----------|---|----------|
| 1) HBr | <u>A</u> | 7) HClO | <u>A</u> |
| 2) Mg(OH) ₂ | <u>B</u> | 8) KCl | <u>S</u> |
| 3) HCl | <u>A</u> | 9) Al(OH) ₃ | <u>B</u> |
| 4) KNO ₃ | <u>S</u> | 10) KC ₂ H ₃ O ₂ | <u>S</u> |
| 5) Ba(OH) ₂ | <u>B</u> | 11) NH ₄ Cl | <u>S</u> |
| 6) H ₃ PO ₄ | <u>A</u> | 12) NH ₃ | <u>S</u> |

- 13) Explain why NH₃ is considered a Bronsted-Lowry base, but not an Arrhenius base.
Can accept a proton, but has no OH⁻
- 14) What happens to the charge of a substance if it gains a proton (H⁺)? +1
- 15) What happens to the charge of a substance if it loses a proton (H⁺)? -1
- 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 becomes the conjugate (acid/base). (circle the correct answers)

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

Acid	Conjugate Base	Base	Conjugate Acid
H ₃ O ⁺	H ₂ O	NH ₃	NH ₄ ⁺
H ₂ O	OH ⁻	OH ⁻	H ₂ O
HCl	Cl ⁻	H ₂ O	H ₃ O ⁺
H ₃ PO ₃	H ₂ PO ₃ ⁻	Br ⁻	HBr

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

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

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

$pH = -\log[H_3O^+]$ $[H_3O^+] = 10^{-pH}$	Formulas $pH + pOH = 14$	$pOH = -\log[OH^-]$ $[OH^-] = 10^{-pOH}$
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1) What is the pH of a 0.0235 M HCl solution?

$$pH = -\log(0.0235) = 1.63$$

2) What is the pOH of a 0.0235 M HCl solution?

$$pH = 1.63 \quad 14 - 1.63 = 12.37$$

3) What is the pH of a 6.50×10^{-3} M KOH solution? (Hint: this is a basic solution)

$$pOH = -\log(6.50 \times 10^{-3}) = 2.19 \quad 14 - 2.19 = 11.81$$

4) What is the pH of a 6.2×10^{-5} M NaOH solution? (Hint: this is a basic solution)

$$pOH = -\log(6.2 \times 10^{-5}) = 4.2 \quad 14 - 4.2 = 9.8$$

5) A solution with an H_3O^+ concentration of 1.00×10^{-7} M is said to be neutral. Why?

$$pH = -\log(1.00 \times 10^{-7}) = 7.00 \quad \text{pH of 7 is neutral}$$

6) Dr. Pepper has a $[H^+] = 1.4 \times 10^{-5}$ M. What is its pH?

$$pH = -\log(1.4 \times 10^{-5}) = 4.9$$

7) Fill in chart:

	$[H^+]$	$[OH^-]$	pH	pOH	ACID BASE NEUTRAL
a.	1×10^{-2} M	1×10^{-11}	3	11	acid
b.	1×10^{-8}	1×10^{-6} M	8	6	base
c.	1×10^{-9}	1×10^{-5}	9	5	base
d.	1×10^{-2}	1×10^{-12}	2	12	acid
e.	1×10^{-7}	1×10^{-7}	7	7	NEUTRAL
f.	3.2×10^{-5}	3.2×10^{-10}	4.5	9.5	acid
g.	2.0×10^{-5}	5.0×10^{-10}	4.7	9.3	acid
h.	5.0×10^{-12}	2.0×10^{-3} M	11.3	2.7	base
i.	5.0×10^{-11} M	2.0×10^{-4}	10.3	3.7	base
j.	4.47×10^{-5}	2.24×10^{-10}	4.35	9.65	acid

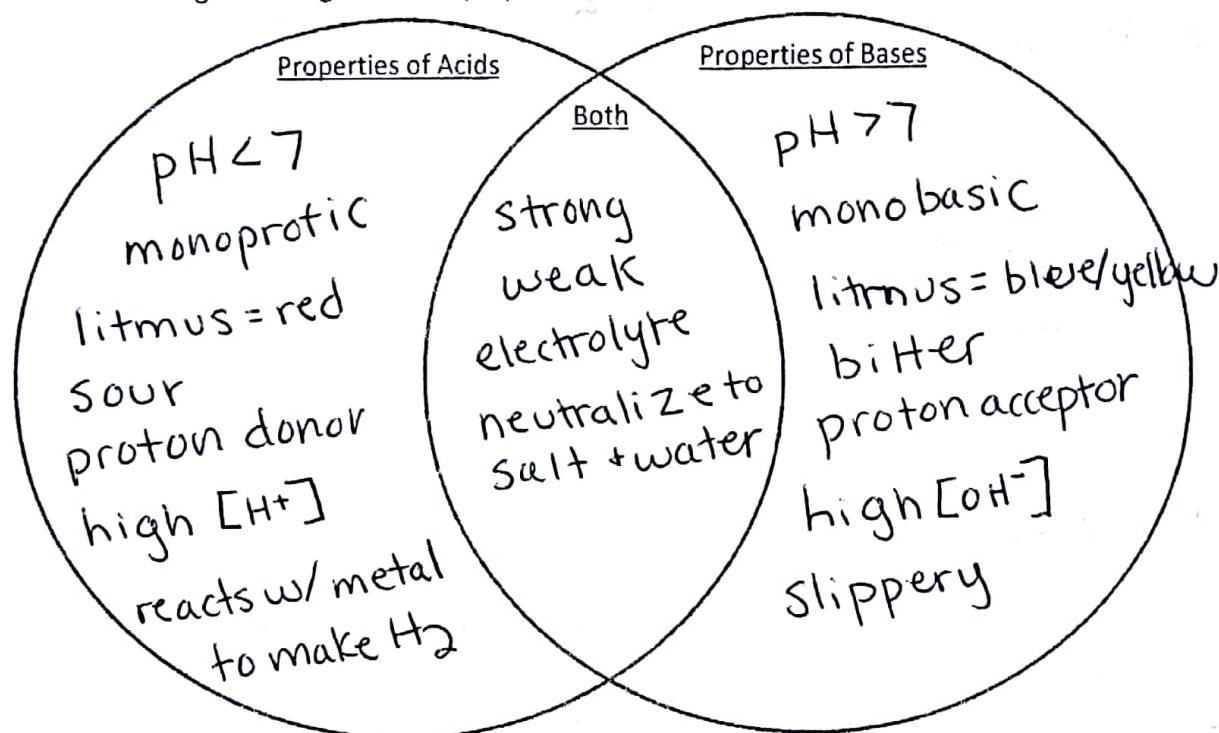
Part 2

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)	neutral
HC ₂ H ₃ O ₂	(strong/weak)	Ba(OH) ₂	(strong/weak)	basic
HF	(strong/weak)	AgOH	(strong/weak)	not enough info
HClO ₃	(strong/weak)	LiOH	(strong/weak)	neutral
H ₂ SO ₄	(strong/weak)	Ca(OH) ₂	(strong/weak)	neutral
HI	(strong/weak)	Fe(OH) ₃	(strong/weak)	acidic
HClO ₄	(strong/weak)	RbOH	(strong/weak)	neutral
HNO ₃	(strong/weak)	Sr(OH) ₂	(strong/weak)	neutral
HBr	(strong/weak)	KOH	(strong/weak)	neutral
H ₂ S	(strong/weak)	CsOH	(strong/weak)	basic

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: HF, HI, HBr, etc
 b. Diprotic acid: H₂S
 c. Triprotic acid: H₃P

- d. Monobasic: LiOH, AgOH, etc
 e. Dibasic: Ca(OH)₂, Sr(OH)₂, etc
 f. Tribasic: Fe(OH)₃, Al(OH)₃, etc

3) Fill in the chart below:

List 3 Weak Acids	List 7 Strong Acids	List 3 Weak Bases	List 8 Strong Bases:
HF H ₂ S H ₃ P	HCl HNO ₃ HBr HClO ₃ H ₂ SO ₄ HClO ₄ HI	Al(OH) ₃ Fe(OH) ₃ AgOH	LiOH CsOH NaOH Ca(OH) ₂ KOH Sr(OH) ₂ RbOH Ba(OH) ₂

PART E CONTINUES ON 4
THE NEXT PAGE!!

4) When describing an acid or a base, what do the terms strong and weak mean?

Strong 100% ionizes, weak only partially ionizes

5) In your own words, what is the difference between Arrhenius's definition and Bronsted-Lowry's definition of acids and bases?

Arrhenius said acids have H^+ and base have OH^-

Bronsted-Lowry said acids donate protons, base accept protons

6) What is an amphoteric substance? Given an example of one.

Substance that acts as an acid and base; water

7) What is the formula for hydronium and how can be it abbreviated?

H_3O^+ , H^+

8) What is a conjugate acid/base pair?

a pair of substances related by one H^+

9) Explain how you would determine the acid, base, conjugate acid, and conjugate base when given a reaction. Be detailed.

Acid loses an H^+

CB is the acid w/o H^+

Base gains H^+

CA is the base w/ extra H^+

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?

acid + base \rightarrow salt + H_2O

13) What is a buffer?

a solution that resists a change in pH

14) What is a buffer made of?

a weak acid and its conjugate base

15) Give an example of a buffer and explain what it is used for.

blood, maintains body's pH

16) List 3 ways to test a solution's pH.

pH paper/meter/probe, litmus paper, liquid indicator

17) What is a titration?

an experimental way to determine the concentration of an

18) In a titration, what is an end point?

unknown acid or base

when the indicator changes color + titration is done

19) In a titration, what is an equivalence point?

point when moles of H^+ equal moles of H^-

20) Draw and label a setup of a titration.

