$\qquad$ Date: $\qquad$

Class: Anions
or
Cations


Fill in the blanks in the table below.

|  | Acid, Base, or <br> Neutral? | Possible |
| :--- | :--- | :--- |
| a. |  | 4 |
| b. | Neutral |  |
| c. |  | 8 |
| d. | Base |  |

## Remember:

The more $\mathrm{H}^{+}$ions there are (higher the concentration of $\mathrm{H}^{+}$),
the more $\qquad$ it will be $\rightarrow$ the $\qquad$ the pH value
The more $\mathrm{OH}^{-}$ions there are (higher the concentration of $\mathrm{OH}^{-}$),
the more $\qquad$ it will be $\rightarrow$ the $\qquad$ the pH value

For each of the questions below, circle the option that will have the higher pH.
a. Solution with $\mathrm{H}^{+}$concentrations of
b. Solution with $\mathrm{OH}^{-}$concentrations of
c. Solution with $\mathrm{H}^{+}$concentrations of

| $\mathbf{0 . 4 3 M}$ | or | $\mathbf{0 . 5 7} \mathbf{M}$ |
| :--- | :--- | :--- |
| $\mathbf{2 . 4 M}$ | or | $\mathbf{1 . 9 M}$ |
| $\mathbf{1 . 2 M}$ | or | $\mathbf{3 . 2 M}$ |
| $\mathbf{4 . 3} \mathbf{M}$ | or | $\mathbf{4 . 4} \mathbf{4}$ |

6. For each of the questions below, circle the option that will have the lower pH.
a. Solution with $\mathrm{H}^{+}$concentrations of
0.19M or
0.23M
b. Solution with $\mathrm{OH}^{-}$concentrations of
c. Solution with $\mathrm{H}^{+}$concentrations of
5.6M or
5.25M
d. Solution with $\mathrm{H}^{+}$concentration of
9.9M or
8.6M
1.2M or $\mathbf{3 . 2 M}$
*Each change of a single pH unit signifies a tenfold change in the concentration of the hydrogen ion or the hydroxide ion.

- The $\left[\mathrm{H}^{+}\right]$(concentration of $\mathrm{H}^{+}$ions) is ten times greater in a solution with a pH of 5 as in a solution with a pH of 6 .
- The $\left[\mathrm{OH}^{-}\right]$(concentration of $\mathrm{OH}^{-}$ions) is ten times greater in a solution with a pH of 11 as in a solution with a pH of 10 .

Practice: (State which solution at the given pH value has the greatest amount of hydrogen or hydroxide ions and by how much)

## 1. $\mathbf{p H}$ of 1 versus $\mathbf{p H}$ of 2

## 2. $\mathbf{p H}$ of 8 versus pH of 9

## 3. $\mathbf{p H}$ of 10 versus $\mathbf{p H}$ of 12

## 4. $\mathbf{p H}$ of 3 versus $\mathbf{p H}$ of 6

## Classwork

1. Which substance is an Arrhenius base?

Explain why in the lines provided below.
(1) $\mathrm{CH}_{3} \mathrm{OH}$
(2) $\mathrm{CH}_{3} \mathrm{Cl}$
(3) LiOH
(4) LiCl
2. The compound NaOH (s) dissolves in water to yield
(1) hydroxide ions as the only negative ions
(2) hydroxide ions as the only positive ions
(3) hydronium ions as the only negative ions
(4) hydronium ions as the only positive ions
3. An Arrhenius acid has
(1) only hydroxide ions in solution
(2) only hydrogen ions in solution
(3) hydrogen ions as the only positive ions in solution
(4) hydrogen ions as the only negative ions in solution
4. Which Lewis electron-dot diagram correctly represents a hydroxide ion?

5. Which ion is the only negative ion produced by an Arrhenius base in water?
(1) $\mathrm{NO}_{3}{ }^{-}$
(2) $\mathrm{Cl}^{-}$
(3) $\mathrm{OH}^{-}$
(4) $\mathrm{H}^{-}$
6. Which statement describes an alternate theory of acids and bases?
(1) Acids and bases are both $\mathrm{H}^{+}$acceptors
(2) Acids and bases are both $\mathrm{H}^{+}$donors.
(3) Acids are $\mathrm{H}^{+}$acceptors, and bases are $\mathrm{H}^{+}$donors.
(4) Acids are $\mathrm{H}^{+}$donors, and bases are $\mathrm{H}^{+}$ acceptors.
7. The only positive ion found in $\mathrm{H}_{2} \mathrm{SO}_{4}(\mathrm{aq})$ is the
(1) ammonium ion
(2) hydronium ion
(3) hydroxide ion
(4) sulfate ion
8. Which two formulas represent Arrhenius acids?
(1) $\mathrm{CH}_{3} \mathrm{COOH}$ and $\mathrm{CH}_{3} \mathrm{CH}_{2} \mathrm{OH}$
(2) $\mathrm{HC}_{2} \mathrm{H}_{3} \mathrm{O}_{2}$ and $\mathrm{H}_{3} \mathrm{PO}_{4}$
(3) $\mathrm{KHCO}_{3}$ and $\mathrm{KHSO}_{4}$
(4) NaSCN and $\mathrm{Na}_{2} \mathrm{~S}_{2} \mathrm{O}_{3}$
9. Which compound releases hydroxide ions in an aqueous solution?
(1) $\mathrm{CH}_{3} \mathrm{COOH}$
(2) HCl
(3) $\mathrm{CH}_{3} \mathrm{OH}$
(4) KOH

