Name: KEY Off. Class: _____ Per: _____ Date: _____

Teacher: _____ **Acid/Base Short Response Practice** **Chemistry**

Base your answers to questions **1** and **2** on the information below and on your knowledge of chemistry.

Vinegar is a commercial form of acetic acid, $HC_2H_3O_2(aq)$. One sample vinegar has a pH value of 2.4.

1. Explain, in terms of particles, why $HC_2H_3O_2(aq)$ can conduct an electric current.

$HC_2H_3O_2$ has free floating ions

- $HC_2H_3O_2$ is an acid
- aq = aqueous dissolved in water
- in water acids & bases dissociate into their ions

2. State the color of bromthymol blue indicator in a sample of the commercial vinegar.

pH = 2.4

Yellow

Bromothymol blue is yellow when the pH is 6 or lower

Base your answers to questions **3** and **4** on the information below.

In a titration, 20.0 milliliters of 0.15 M HCl(aq) is exactly neutralized by 18.0 milliliters of KOH(aq).

3. Compare the number of moles of $H^+(aq)$ ions to the number of moles of $OH^-(aq)$ ions in the titration mixture when the HCl(aq) is exactly neutralized by the KOH(aq).

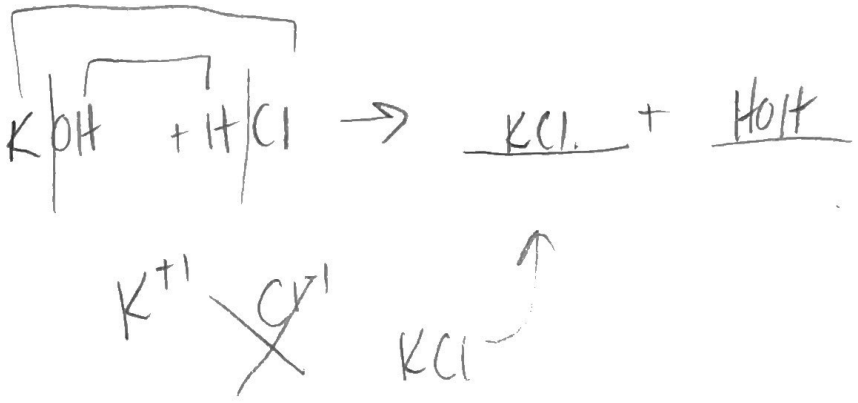
→ = pH 7

When something is completely neutralized the pH is 7

$H^+ = OH^-$

4. Complete the equation below for the neutralization reaction by writing the formula of *each* product.

$KOH(aq) + HCl(aq) \rightarrow$ KCl + HOH



KEY

Base your answers to questions **5** through **7** on the information below.

Some carbonated beverages are made by forcing carbon dioxide gas into a beverage solution. When a bottle of one kind of carbonated beverage is first opened, the beverage has a pH value of 3.

5. After the beverage bottle is left open for several hours, the hydronium ion (H_3O^+) concentration in the beverage solution decreases to $\frac{1}{1000}$ of the original concentration. Determine the new pH of the beverage solution.

- when H_3O^+ ↓ the pH ↑

→ 3 pH units

3 + 3 = **6**

- remember pH is on the log scale so each value is changed 10 fold.

6. Using Table *M*, identify *one* indicator that is yellow in a solution that has the same pH value as this beverage.

- bromothymol blue
- bromoresol green
- thymol blue

7. State, in terms of the pH scale, why this beverage is classified as acidic.

the beverage is an acid b/c the pH < 7

pH > 7 = basic

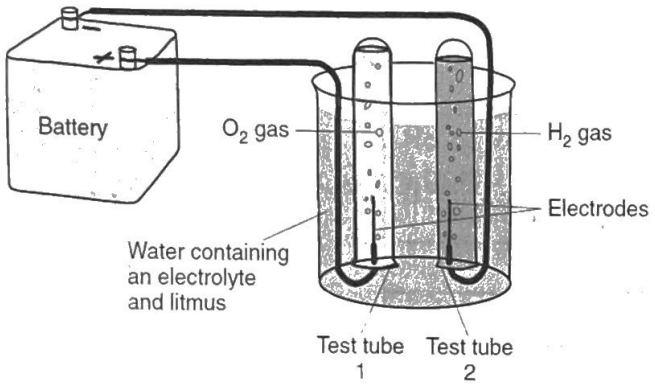
pH = 7 = neutral

pH < 7 = acidic

KEY

8. Base your answer to the following question on the information below.

The diagram below shows a system in which water is being decomposed into oxygen gas and hydrogen gas. Litmus is used as an indicator in the water. The litmus turns red in test tube 1 and blue in test tube 2.



The oxidation and reduction occurring in the test tubes are represented by the balanced equations below.

acids release this

Test tube 1: $2H_2O(\ell) \rightarrow O_2(g) + 4H^+(aq) + 4e^-$

Test tube 2: $4H_2O(\ell) + 4e^- \rightarrow 2H_2(g) + 4OH^-(aq)$ bases release this

Explain, in terms of the products formed in test tube 2, why litmus turns blue in test tube 2.

Litmus turns blue in a base

KEY

Base your answers to questions **9** through **11** on the information below.

A student used blue litmus paper and phenolphthalein paper as indicators to test the pH of distilled water and five aqueous household solutions. Then the student used a pH meter to measure the pH of the distilled water and each solution. The results of the student's work are recorded in the table below.

Testing Results

Liquid Tested	Color of Blue Litmus Paper	Color of Phenolphthalein Paper	Measured pH Value Using a pH Meter
2% milk	blue	colorless	6.4
distilled water	blue	colorless	7.0
household ammonia	blue	pink	11.5
lemon juice	red	colorless	2.3
tomato juice	red	colorless	4.3
vinegar	red	colorless	3.3

9. Based on the measured pH values, identify the liquid tested that is 10 times more acidic than vinegar.

2.3 – lemon juice

↳ lower pH

↳ 1 # lower than 3.3

10. Explain, using the reference table, in terms of the pH range for color change why litmus is *not* appropriate to differentiate the acidity levels of tomato juice and vinegar.

Litmus paper just says if something is less than 4.5 or greater than 8.3

it can't distinguish pH's less than 4.5 and both substances have pH's below 4.5

11. Identify the liquid tested that has the *lowest* hydronium ion concentration.

↳ least amount of H_3O^+ = most basic = Highest pH

pH = 11.5

household ammonia

KEY

Base your answers to questions **12** through **14** on the information below.

Soil pH can affect the development of plants. For example, a hydrangea plant produces blue flowers when grown in acidic soil but pink flowers when grown in basic soil. Evergreen plants can show a yellowing of foliage, called chlorosis, when grown in soil that is too basic.

Acidic soil can be neutralized by treating it with calcium hydroxide, $Ca(OH)_2$, commonly called slaked lime. Slaked lime is slightly soluble in water.

actually react this!

12. Write an equation, using symbols *or* words, for the neutralization of the ions in acidic soil by the ions released by slaked lime in water.

acids release H^+

bases release OH^-

$H^+ + OH^- \rightarrow$ water

13. An evergreen plant has yellowing foliage. The soil surrounding the plant is tested with methyl orange and bromthymol blue. Both indicators turn yellow in the soil tests. State, in terms of pH value, why the yellowing of the plant is *not* due to chlorosis.

M.O = yellow 4.4 or higher
BB = yellow 6.0 or lower

The indicators show that the pH is between 4.4 and 6.0. Chlorosis is when the soil is too basic - pH > 7.

14. Compare the hydrogen ion concentration to the hydroxide ion concentration in soil when a hydrangea plant produces ~~pink~~ flowers.

H^+ (acidic)

OH^- (basic)

plant is pink in basic soil

$H_3O^+ > OH^-$ = acidic

$H_3O^+ = OH^-$ = neutral

$H_3O^+ < OH^-$ = basic

$H_3O^+ < OH^-$

more OH^- than H_3O^+