

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

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

Seat#: \_\_\_\_\_

**Directions:** Any worksheet that is labeled with an \* means it is suggested extra practice. We do not always have time to assign every possible worksheet that would be good practice for you to do. You can do this worksheet when you have extra time, when you finish something early, or to help you study for a quiz or a test. If and when you choose to do this Extra Practice worksheet, please do the work on binder paper. You will include this paper stapled into your Rainbow Packet when you turn it in, even if you didn't do any of this. We want to make sure we keep it where it belongs so you can do it later if you want to (or need to). If you did the work on binder paper you can include that in your Rainbow Packet after this worksheet. If we end up with extra class time then portions of this may turn into required work. If that happens you will be told which problems are turned into required. Remember there is tons of other extra practice on the class website...and the entire internet! See me if you need help finding practice on a topic you are struggling with.

- 1) Write the name and formula for the conjugate bases of the following:
  - a.  $\text{HNO}_2$
  - b.  $\text{H}_2\text{SO}_4$
  - c.  $\text{H}_2\text{PO}_4^-$
  - d.  $\text{HF}$
  - e.  $\text{CH}_3\text{CO}_2\text{H}$
- 2) Is the monohydrogenphosphated ion  $\text{HPO}_4^{2-}$  amphiprotic? If so, write the formulas of its conjugate acid and its conjugate base.
- 3) Write the net ionic acid-base reactions for:
  - a. Acetic acid with aqueous ammonia solution.
  - b. Hydrofluoric acid with sodium hydroxide.
  - c. Ammonium chloride with potassium hydroxide
  - d. Sodium bicarbonate with sulfuric acid.
  - e. Chlorous acid with aqueous ammonia solution.
  - f. Disodium hydrogen phosphate with acetic acid.
- 4) List the following substances in order of increasing acid strength. Look up and/or determine the  $K_a$  values for each one to help you with this.

$\text{H}_2\text{O}$	$\text{H}_2\text{SO}_3$	$\text{HCN}$	$\text{H}_2\text{PO}_4^-$	$\text{NH}_4^+$
$[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$	$\text{NH}_3$	$\text{H}_3\text{O}^+$	$\text{HCO}_2\text{H}$	$\text{HCl}$
- 5) What is the pH of a solution that contains 2.60 g of NaOH in 250 mL of aqueous solution? 13.4
- 6) A 0.12 M solution of an unknown weak acid has a pH of 4.26 at 25°C. What is the hydronium ion concentration in the solution and what is the value of its  $K_a$ ?  $K_a = 2.52 \times 10^{-9}$
- 7) Suppose you dissolved benzoic acid in water to make a 0.15 M solution.  $K_a$  benzoic acid =  $6.3 \times 10^{-5}$  at 25°C. Determine the following:
  - a. The concentration of benzoic acid 0.147 M
  - b. The concentration of hydronium ion 0.0031 M
  - c. The concentration of benzoate anion 0.0031 M
  - d. The pH of the solution 2.51
- 8) For each of the following salts, predict whether an aqueous solution would be acidic, basic, or neutral
  - a. Sodium Nitrate  $\text{NaNO}_3$
  - b. Ammonium iodide  $\text{NH}_4\text{I}$
  - c. Sodium bicarbonate  $\text{NaHCO}_3$
  - d. Ammonium cyanide  $\text{NH}_4\text{CN}$
  - e. Sodium hypochlorite  $\text{NaOCl}$
- 9) Consider a solution of 0.80 M solution of sulfurous acid. Determine the following:
  - a. The pH 0.933
  - b. The concentration of sulfite ion  $6.4 \times 10^{-8} \text{ M}$
  - c. What happens to the concentration of sulfite ion  $\text{SO}_3^{2-}$  if the concentration of sulfurous acid is halved?
- 10) Calculate the pH of a 0.35 M solution of potassium cyanide.  $K_a$  for  $\text{HCN} = 4.0 \times 10^{-10}$  11.47
- 11) Consider a solution of 0.20 M solution of formic acid  $\text{HCO}_2\text{H}$ . Determine the following:
  - a. The pH 2.22
  - b. Now suppose sufficient sodium formate is added to make the solution 0.10 M in formate ion (without changing the total volume). Would you expect the pH to increase or decrease?
  - c. Calculate the pH of this new solution 3.44
  - d. What would the pH be if the concentration of formate ion was increased to 0.20 M? 3.74
  - e. What do you notice about the pH of this solution?