BEGINNING OF EXAM

1. A 5th period element is burned under a bunsen burner and a vibrant red-violet flame is produced. It is seen to also violently react with water. What is the element?

Rb: Rubidium

2. A student decides to titrate H₃PO₄, a triprotic acid, with a solution of NaOH. The experiment was completed with 100 mL of a 1.5 M H₃PO₄ solution and 2.0 M NaOH. Calculate the pH of the solution when 200 mL of NaOH is added. (Kₐ₁ = 7.5 x 10⁻³, Kₐ₂ = 6.2 x 10⁻⁵, Kₐ₃ = 4.8 x 10⁻₁⁰)

3. The titration of a weak acid with a strong base involves the direct transfer of protons from the weak acid to the hydroxide ion. The reaction of the weak acid, acetic acid, with a strong base, NaOH, can be seen below. In the reaction the acid and base react in a one to one ratio.

$$\text{C}_2\text{H}_3\text{O}_2\text{(aq)} + \text{OH}^-\text{(aq)} \rightarrow \text{C}_2\text{H}_5\text{O}_2^-\text{(aq)} + \text{H}_2\text{O} \text{(l)}$$
4. A student titrates a solution of HCl and NaOH in a lab. Label the axes of the given appropriately, with units, and draw a line of best fit. Add an appropriate title. Label the plot with approximate (half)-equivalence points. Then, sketch in the blank plot the complementary graphi “pH vs. Volume of NaOH” with the same corresponding features. Exact points are not needed.
5. Phenolphthalein, C_{20}H_{14}O_{4} or “phph” for shorthand, is a common acid-base indicator that turns colorless under acidic conditions and pink under basic conditions. A student uses phph as an indicator for a titration with an acetic acid solution and a solution of NaOH. If some acid is spilled during the transfer of solutions, how will the percent error change in respects to the percentage of acetic acid in vinegar? What will the resulting color be?

6. List the following acids from least to greatest according to strength.

   HCl, H_{2}SO_{4}, H_{2}O^{+}, HF, CH_{3}COOH, H_{2}, and H_{2}S

   More stable the conjugate base, stronger the acid.

   H_{2}, H_{2}S, CH_{3}COOH, HF, H_{2}O^{+}, H_{2}SO_{4}, HCl

   H_{2}S has a very strong base, organic, and has a strong g. change to react (B.).

7. An element is a solid at room temperature but soft enough to be cut with an ordinary knife. It reacts violently with water. What is the element?

   Na, Sodium
MULTIPLE CHOICE ANSWERS

1.) C
2.) D
3.) D
4.) B
5.) A
6.) C
7.) A
8.) C
9.) D
10.) C
11.) C
12.) A
13.) C
14.) A
15.) D
16.) 16a.) Colloid
   16b.) None
   16c.) Suspension
   16d.) Solution
   16e.) Solution
   16f.) Colloid
   16g.) Colloid
17.) B
18.) C
19.) B