Student Investigation Sheet

Acid-Base Titrations

Titration is a procedure used to determine the acid or base concentration or the pH of a solution. It involves careful measurement of solutions, and relies on detailed observations of the indicators used. Titration is an important tool used by chemists to determine the composition of unknown solutions in many different applications.

Safety Precautions:

- Wear goggles, gloves, and lab aprons.
- Do not wear open-toed shoes.
- Do not eat or drink anything in the lab.
- Report any broken glass or spills to the teacher. Do not try to clean them up yourself.

Objective(s):

In this activity, you will determine the concentration and pH of base using as acid, an indicator, and the titration procedure.

Materials:

Per pair or group:

- baking soda (4 g)
- balance
- buret (2)
- buret stand (1)
- Erlenmeyer flask, 250 mL (3)
- methyl orange
- phenolphthalein
- scoopula
- squirt bottle
- sodium hydroxide, NaOH, solution of unknown concentration (75 mL)
- 0.1 M sulfuric acid, H_2SO_4 (200 mL)
- water, deionized or distilled (250 mL)
- weigh boats

Key Question

What is the question you want to answer?	
	Directions: Write the question for the investigation. The question should be specific and investigable.
	Key Components • Specific (one general thought, does not combine two or more questions) • Is able to be investigated

Hypothesis

What do you predict will be the result of the investigation?	
	Directions: Develop a claim about what you think is going to happen.
	Key Components • Expresses a cause-and-effect relationship • Is testable • Incorporates prior knowledge

Plan

How will you investigate the question?	
	Directions: Describe the plan that you will use to study your question and analyze your hypothesis.
	Key Components • Plan is easily repeatable by others • Plan describes the use of materials • Plan is in a logical order

Data

What evidence was gathered during the investigation?	
	Directions: Record all of the evidence that has been collected. Use graphic organizers, tables, and graphs when appropriate.
	Key Components • Data (from an investigation and/or other sources, such as observations, reading material, archived date, etc.) • Appropriate (data applies directly to the question) • Sufficient (uses enough data to completely answer the question and determine a finding on the hypothesis)

Conclusion

What did you learn from this investigation?	
	Directions: Develop a conclusion for your investigation. The conclusion should contain clear thoughts and proper vocabulary. This section focuses on the answer to your question. It should prove or refute the hypothesis by using logical reasoning to link the hypothesis to the data.
	Key Components • Use precise and accurate language • Use scientific vocabulary • Provide clear logical thoughts • Use evidence and reasoning to support or refute the hypothesis

Analysis and Conclusions

1. What is the concentration of the sodium hydroxide solution? How did you determine this value?

2. What were the equivalence points in your titrations?

3. What is the purpose of a titration?

4. Draw the graph depicting each titration. What are the reactions and what are the products formed for each titration?

5. What are three possible sources of error in this titration activity?