

## Student Learning Map

**Topic:** Chapter 8 - Bases

Days: (25)

**Subject(s):**

**Grade(s):** ()

**Key Learning(s):**

Bases

**Optional  
Instructional Tools:**

Labs 8.1, 8.2, 8.3, 8.4,  
8.5, 8.6  
WS 8-A 8-B, 8-C, 8-D

**Unit Essential Questions(s):**

What are the properties and reactions of bases?

<b>Concept:</b> Properties of bases	<b>Concept:</b> Reactions with bases	<b>Concept:</b> Common Applications of Bases
<b>Lesson Essential Questions:</b>  What properties describe bases? ()  What indicators are used to identify bases? ()  How is the concentration of a base measured? ()  What is the pH value of a base? ()	<b>Lesson Essential Questions:</b>  What is a neutralization reaction? ()  How can a salt be synthesized? ()	<b>Lesson Essential Questions:</b>  What are some common household bases? ()  What is an antacid? How does it work? ()
<b>Vocabulary:</b> <u>phenolphthalein</u> , <u>methyl orange</u> , <u>litmus paper</u>	<b>Vocabulary:</b> <u>pH paper</u>	<b>Vocabulary:</b>

**Additional Info:**



Name:	Partner's Name:
Date of lab:	If absent, data obtained from:

## Lab 8.1 - Properties of Bases

\*Make complete and accurate observations during the lab. Observations include such things as...what is happening; for any chemicals, the color, appearance, phase (solid, liquid, gas), and odor (but **NEVER** taste) ; temperature if requested; etc.\*

Procedure	Observations
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### Part A - Sodium Hydroxide, NaOH

\_\_\_\_1. Rinse 2 same size, test tubes well.

\_\_\_\_2. Obtain about 20 mL of dilute sodium hydroxide, NaOH, solution in a 50 mL beaker.

\_\_\_\_3. Fill one test tube about 1/2 full with dilute sodium hydroxide, NaOH, solution.

Appearance: \_\_\_\_\_

\_\_\_\_4. Note the odor of the sodium hydroxide, NaOH, solution. Remember to waft the vapors; do not inhale directly. Note your observations in the Data Table below.

\_\_\_\_5. Place one or 2 drops of the sodium hydroxide, NaOH, solution on a watch glass.

\_\_\_\_6. Add about 9 drops of water to the same watch glass.

\_\_\_\_7. Rub this solution from the watch glass between your fingers. Note your observations in the Data Table below. **Rinse off your fingers !**

\_\_\_\_8. Test the sodium hydroxide, NaOH, solution in the test tube with a piece of red litmus paper, a piece of blue litmus paper, and pH paper. Note all your observation in the Data Table below.

\_\_\_\_9. Pour half of the sodium hydroxide, NaOH, solution into the other test tube.

\_\_\_\_10. In one of the test tubes add 2 drops of phenolphthalein indicator. Note your observations in the Data Table below.

\_\_\_\_11. In the other test tube add 2 drops of methyl orange indicator. Note your observations in the Data Table below.

\_\_\_\_12. Pour the solutions in the test tubes and the watch glass down the drain; rinse the glassware well.

\_\_\_\_\_

## Part B - Potassium Hydroxide, KOH

**\*\* This is the same procedure as above, except you are using potassium hydroxide this time\*\***

\_\_\_\_ 13. Rinse 2 same size, test tubes well.

\_\_\_\_ 14. Obtain about 20 mL of dilute potassium hydroxide, KOH, solution in a 50 mL beaker.

\_\_\_\_ 15. Fill one test tube about 1/2 full with dilute potassium hydroxide, KOH, solution.

Appearance: \_\_\_\_\_

\_\_\_\_ 16. Note the odor of the potassium hydroxide, KOH, solution. Remember to waft the vapors; do not inhale directly. Note your observations in the Data Table below.

\_\_\_\_ 17. Place one or 2 drops of the potassium hydroxide, KOH, solution on a watch glass.

\_\_\_\_ 18. Add about 9 drops of water to the same watch glass.

\_\_\_\_ 19. Rub this solution from the watch glass between your fingers. Note your observations in the Data Table below. **Rinse off your fingers !**

\_\_\_\_ 20. Test the potassium hydroxide, KOH, solution in the test tube with a piece of red litmus paper, a piece of blue litmus paper, and pH paper. Note all your observation in the Data Table below.

\_\_\_\_ 21. Pour half of the potassium hydroxide, KOH, solution into the other test tube.

\_\_\_\_ 22. In one of the test tubes add 2 drops of phenolphthalein indicator. Note your observations in the Data Table below.

\_\_\_\_ 23. In the other test tube add 2 drops of methyl orange indicator. Note your observations in the Data Table below.

\_\_\_\_ 24. Pour the solutions in the test tubes and the watch glass down the drain; rinse the glassware well.

## Part C - Ammonia

**\*\* This is the same procedure as above, except you are using potassium hydroxide this time\*\***

\_\_\_\_ 25. Rinse 2 same size, test tubes well.

\_\_\_\_ 26. Obtain about 20 mL of household ammonia in a 50 mL beaker.

\_\_\_\_ 27. Fill one test tube about 1/2 full with household ammonia.

Appearance: \_\_\_\_\_

\_\_\_\_ 28. Note the odor of the household ammonia. Remember to waft the vapors; do not inhale directly. Note your observations in the Data Table below.

\_\_\_\_ 29. Place one or 2 drops of the household ammonia on a watch glass.

\_\_\_\_ 30. Add about 9 drops of water to the same watch glass.

\_\_\_\_31. Rub this solution from the watch glass between your fingers. Note your observations in the Data Table below. **Rinse off your fingers !**

\_\_\_\_32. Test the household ammonia in the test tube with a piece of red litmus paper, a piece of blue litmus paper, and pH paper. Note all your observation in the Data Table below.

\_\_\_\_33. Pour half of the household ammonia into the other test tube.

\_\_\_\_34. In one of the test tubes add 2 drops of phenolphthalein indicator. Note your observations in the Data Table below.

\_\_\_\_35. In the other test tube add 2 drops of methyl orange indicator. Note your observations in the Data Table below.

\_\_\_\_36. Pour the solutions in the test tubes and the watch glass down the drain; rinse the glassware well.

\_\_\_\_37. Obtain 2 clean watch glasses.

\_\_\_\_38. On one watch glass, put a few drops of dilute sodium hydroxide, NaOH, solution.

\_\_\_\_39. On the other watch glass, put the same number of drops of household ammonia.

\_\_\_\_40. Set both watch glasses under the fume hood to evaporate over night.

\_\_\_\_41. Wipe down your counter area, wash your hands, then take off your goggles and have a seat.

## Day 2

\_\_\_\_42. Obtain both of your watch glasses from yesterday.

\_\_\_\_43. Observe what was left in the sodium hydroxide watch glass: \_\_\_\_\_

\_\_\_\_44. Observe what was left in the household ammonia watch glass: \_\_\_\_\_

\_\_\_\_45. Rinse the watch glasses well, wash your hands, take off your goggles and have a seat.

**Data Table**

Indicator	Sodium hydroxide, NaOH	Potassium hydroxide, KOH	Household Ammonia
Odor			
Feel of solution			
Red litmus			
Blue litmus			
pH paper color			
pH paper #			
Phenolphthalein			
Methyl orange			

## Questions

1. Sodium hydroxide and potassium hydroxide are bases. Below, list the **properties of bases** which you determined in this lab:

Feel of solution: \_\_\_\_\_

Litmus paper: \_\_\_\_\_

pH # range: \_\_\_\_\_

Phenolphthalein: \_\_\_\_\_

2. Would you classify household ammonia as a base ? \_\_\_\_\_

Why, or why not ? \_\_\_\_\_

3. What word do bases have in their names which indicates that they are bases ? \_\_\_\_\_

4. Summarize the reactions for acids and bases:

	Acids	Bases
Litmus paper		
pH # range		
Methyl orange		

5. Using one complete sentence (with correct spelling and punctuation), explain why is household ammonia used instead of sodium hydroxide in some window cleaners ? \_\_\_\_\_

\_\_\_\_\_

Name:	Partner's Name:
Date of lab:	If absent, data obtained from:

## Lab 8.2 - Different Concentrations of Bases

\*Make complete and accurate observations during the lab. Observations include such things as...what is happening; for any chemicals, the color, appearance, phase (solid, liquid, gas), and odor (but **NEVER** taste) ; temperature if requested; etc.\*

Procedure	Observations
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### Part A - Making the Solutions

\_\_\_\_\_1. Obtain about 10 mL of 0.1 M sodium hydroxide, NaOH, solution in a small, clean beaker.

Appearance: \_\_\_\_\_

\_\_\_\_\_2. Obtain 4 clean, same size test tubes.

\_\_\_\_\_3. Put exactly 10.0 mL of the 0.1 M sodium hydroxide, NaOH, solution in the first test tube.

\_\_\_\_\_4. Place exactly 9.0 mL of distilled water in each of the other 3 test tubes.

\_\_\_\_\_5. Using a graduated pipet, transfer 1.0 mL of the 0.1 M sodium hydroxide, NaOH, solution from the first test tube to the second test tube (which has 9.0 mL of distilled water in it).

\_\_\_\_\_6. The second test tube is now 0.01 M.

\_\_\_\_\_7. Using a graduated pipet, transfer 1.0 mL of the 0.01 M sodium hydroxide, NaOH, solution from the second test tube to the third test tube (which has 9.0 mL of distilled water in it).

\_\_\_\_\_8. The third test tube is now 0.001 M.

\_\_\_\_\_9. Using a graduated pipet, transfer 1.0 mL of the 0.001 M sodium hydroxide, NaOH, solution from the third test tube to the fourth test tube (which has 9.0 mL of distilled water in it).

\_\_\_\_\_10. The fourth test tube is now 0.0001 M.

### Part B - Testing the Solutions

\_\_\_\_\_11. Test each of the 4 solutions with pH paper. Compare the color immediately with the color chart on the pH wheel. Indicate your observations in the **Data Table** below.

\_\_\_\_\_12. Obtain 4 more clean, same size test tubes.

\_\_\_\_\_13. Be careful and do not mix up your test tubes: Pour approximately 1/2 of each solution into another test tube. You should now have 8 test tubes (2 sets of the 4 different solutions).

\_\_\_\_14. In the first set of the solutions put 2 drops of phenolphthalein indicator. Indicate your observations in the Data Table below.

\_\_\_\_15. In the second set of solutions, put 2 drops of methyl orange indicator. Indicate your observations in the Data Table below.

\_\_\_\_16. Rinse all your test tubes well, wipe down your lab area, wash your hands, then take off your goggles and have a seat.

**Data Table**

Test Tubes	pH Paper Color	pH #	Phenolphthalein	Methyl Orange
0.1 M				
0.01 M				
0.001 M				
0.0001 M				

## Questions

1. What does "M" stand for in the different solutions ? \_\_\_\_\_

2. Which is the most concentrated, the 0.1 M, 0.01 M, 0.001 M, or 0.0001 M solution ? \_\_\_\_\_

3. What is the range of the common pH scale ? \_\_\_\_\_

4. Which pH numbers represent bases ? \_\_\_\_\_

5. What pH number represents a neutral solution ? \_\_\_\_\_

6. Which pH numbers represent strong bases ? \_\_\_\_\_

7. Which pH numbers represent weak bases ? \_\_\_\_\_

8. What color does methyl orange indicator turn in a base solution ? \_\_\_\_\_

8.a. Is it easy to tell the difference between a neutral and a basic solution with

methyl orange indicator ? \_\_\_\_\_ Why ? \_\_\_\_\_

\_\_\_\_\_

9. What color does phenolphthalein indicator turn in a base solution ? \_\_\_\_\_

9.a. Is it easy to tell the difference between a neutral and a basic solution with

phenolphthalein indicator ? \_\_\_\_\_ Why ? \_\_\_\_\_

\_\_\_\_\_



10. Which appears to be more accurate when trying to determine the pH of solutions, phenolphthalein, methyl orange indicator, or pH paper ? \_\_\_\_\_
11. What should you do if you want to make an base solution weaker ? \_\_\_\_\_

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### **Review Questions**

12. \_\_\_\_\_ litmus turns \_\_\_\_\_ color in the presence of a base.
13. What is the pH range of bases ? \_\_\_\_\_
14. What do bases feel like ? \_\_\_\_\_
15. What **word** appears in the name of most bases ? \_\_\_\_\_



Name:	Partner's Name:
Date of lab:	If absent, data obtained from:

## Lab 8.3 - Household Acids and Bases

\*Make complete and accurate observations during the lab. Observations include such things as...what is happening; for any chemicals, the color, appearance, phase (solid, liquid, gas), and odor (but **NEVER** taste) ; temperature if requested; etc.\*

Procedure	Observations
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- \_\_\_\_ 1. You will test household items with red litmus paper, blue litmus paper, and pH paper.
- \_\_\_\_ 2. If the item is a liquid, simply pour a **small** amount into an evaporating dish; bring it back to your lab area and test it with each indicator paper.
- \_\_\_\_ 3. If the item is a solid, place a **small** scoop into an evaporating dish, add a small amount of distilled water, mix it up with a stirring rod, and test it with the indicator papers.
- \_\_\_\_ 4. Complete the Data Table below for all the substances tested.

**Data Table**

1	Substance	Red Litmus Paper	Blue Litmus Paper	pH paper color	pH paper #
2	Clear soda				
3	Cola soda				
4	Juice - Clear				
5	Tea				
6	Milk				
7	Coffee				
8	Liquid soap				
9	Drain cleaner				
10	Shampoo - Clear				
11	Ammonia				
12	Vinegar				
13	Sugar				
14	Milk of magnesia				
15	Salt				
16	Tea				

Substance	Red Litmus Paper	Blue Litmus Paper	pH paper color	pH paper #

## Questions

1. What will acids do to:

red litmus paper - \_\_\_\_\_

blue litmus paper - \_\_\_\_\_

2. What common pH numbers represent acids ? \_\_\_\_\_

3. In order of the items listed, indicate the numbers which you would consider to be acidic (you must have gotten a pH below 7, and blue litmus turning red) ? \_\_\_\_\_

4. What will bases do to:

red litmus paper - \_\_\_\_\_

blue litmus paper - \_\_\_\_\_

5. What common pH numbers represent bases ? \_\_\_\_\_

6. In order of the items listed, indicate the numbers which you would consider to be basic (you must have gotten a pH above 7, and red litmus turning blue) ? \_\_\_\_\_

7. In order of the items listed, indicate the numbers which you would consider to be

neutral ? \_\_\_\_\_

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## Review Questions

8. Circle the correct answer. Phenolphthalein will turn pink in .....(an acid, or a base).

9. What word represents most bases ? \_\_\_\_\_

10. Which is more concentrated; 1.0 M solution, or 2.0 M solution ?