

Test Course

pH of Common Materials

Final Report - Answer Guide

Institution	SI Curriculum Development University
Session	Test Course
Course	Test Course
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Test Your Knowledge

Match each term with the best description.

Terms to match:

- Acid
- Anthocyanin
- Base
- Neutralization
- pH scale

Descriptions to match:

1. A chemical present in numerous plants that can be used as a pH indicator
2. Used to measure the acidity of a solution
3. The chemical reaction between an acid and a base
4. A substance that tastes sour and forms hydrogen ions when dissolved in water
5. A substance that tastes bitter and feels slippery

Correct answers:

1 Anthocyanin 2 pH scale 3 Neutralization 4 Acid 5 Base

Order the items from the least acidic to the most acidic.

≡ Orange juice	1	Correct answer: Concentrated sodium hydroxide solution
≡ Concentrated sodium hydroxide solution	2	Correct answer: Soap
≡ pH = 1	3	Correct answer: pH = 7
≡ pH = 7	4	Correct answer: Orange juice
≡ Soap	5	Correct answer: pH = 1

Exploration

Characteristics of bases include being slippery and having a bitter taste.

☒ True	✓
☐ False	

Weak bases often feel slippery to the skin because they ____.

☐ coat the skin with their chemical configuration	
☐ react with natural substances in the skin to form a protective coating	
☒ degrade the fatty acids and oils on the skin	✓
☐ are made from the same substance as mucus	

Substances are classified as acids or bases depending on ____.

- ☐ their color and thickness
- ☒ how they react with other chemicals
- ☐ the type of container used to hold them
- ☐ All of the above

✓

On the pH scale, 7 represents a neutral substance. As the number of H^+ increases in solution, the pH number decreases; as the number of OH^- ions increases in solution, the pH number increases.

- ☒ True
- ☐ False

✓

Anthocyanins serve as natural pH indicators, because they change color at different pH values.

- ☒ True
- ☐ False

✓

Exercise 2

Compare and contrast the results between the commercial and homemade pH test strips. Which test strips were more accurate? Explain your answer.

The commercial pH strips were specific enough (when matched with the pH range color guide) to not only describe a solution as acidic, neutral, or basic, but to allow a quantitative number to be assigned to the solution. The homemade pH strips allowed a solution to be defined within a pH range, but did not allow for specific numerical differentiation between solutions. Both strips were generally accurate as they provided the same range of results. However, as the commercial strips allowed a quantitative number on the pH scale to be defined, the commercial strips were more specific.

Why is the pH scale important in science? Give several examples of scientific applications.

The pH reading of substances is used in many different fields on a daily basis. For example, blood should have a pH reading of 7.4. If a patient was not feeling well and their blood pH showed a reading above or below the normal value, medical personnel would know to step in and treat the patient. If you had an upset stomach or acid-reflux and chose to take an antacid to settle your stomach, you are ingesting a basic substance to help neutralize an acid build-up in your stomach.

What information about a chemical solution can be inferred from knowing its pH value?

Knowing a pH value for a solution, one can calculate the hydrogen ion and hydroxide ion concentrations for the solution. One can also use pH information to determine an equilibrium constant for an acid.

If a chemical has a pH of 3, how could you alter its pH value to be more basic?

If a chemical has a pH of 3, adding an amount of a base, such as NaOH, would change the pH value to be more basic.

Data Table 1: pH Observations
(SAMPLE ANSWER BELOW)

Well plate	Item Tested	Commercial pH Strip		Homemade pH Strip	
		Color	pH	Color	pH
1	2 M HCL (hydrochloric acid)	Magenta	2.0	Pink	1-3
2	0.5 M NaOH (sodium hydroxide)	Dark Blue	12.0	Green	9-12
3	Distilled water	Yellowish-green	6.0-7.0	Purple: no change	4-8

4	The answers for the last 9 rows of Data Tables 1 and 2 will vary depending on the items chosen for testing by the student.	No sample answer	No sample answer	No sample answer	No sample answer
5	No sample answer	No sample answer	No sample answer	No sample answer	No sample answer
6	No sample answer	No sample answer	No sample answer	No sample answer	No sample answer
7	No sample answer	No sample answer	No sample answer	No sample answer	No sample answer
8	No sample answer	No sample answer	No sample answer	No sample answer	No sample answer
9	No sample answer	No sample answer	No sample answer	No sample answer	No sample answer
10	No sample answer	No sample answer	No sample answer	No sample answer	No sample answer
11	No sample answer	No sample answer	No sample answer	No sample answer	No sample answer
12	No sample answer	No sample answer	No sample answer	No sample answer	No sample answer

Data Table 2: Analysis of Results
(SAMPLE ANSWER BELOW)

Well Plate	Item Tested	Acid/Base/Neutral?	Explanation
1	2 M HCl (hydrochloric acid)	Acid	Both the homemade and commercial pH strips showed a color in the acidic range.
2	0.5 M NaOH (sodium hydroxide)	Base	Both the homemade and commercial pH strips showed a color in the acidic range.
3	Distilled water	Neutral	Both the homemade and commercial pH strips showed a color in the acidic range.
4	The answers for the last 9 rows of Data Tables 1 and 2 will vary depending on the items chosen for testing by the student.	No sample answer	No sample answer
5	No sample answer	No sample answer	No sample answer
6	No sample answer	No sample answer	No sample answer

7	No sample answer	No sample answer	No sample answer
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Competency Review

A cleaning product with a pH of 8 is considered ____, whereas a product with a pH of 6 is considered ____.

- ☒ basic; acidic ✓
- ☐ basic; neutral
- ☐ neutral; acidic
- ☐ acidic; basic

Bases are found in everyday food items such as lemons, limes, and oranges.

- ☐ True
- ☒ False ✓

An example of a base is ____.

- ☐ citrus
- ☒ soap ✓
- ☐ HCl
- ☐ All of the above

A solution with a pH of 1 is less acidic than a solution with a pH of 6.

- ☐ True
- ☒ False ✓

A pH indicator allows scientists to ____ measure the pH of a substance.

- ☒ qualitatively ✓
- ☐ quantitatively
- ☐ electrically
- ☐ ethically

Red onions are red in the presence of an acid and green in the presence of a base. ____ is an example of a substance that would cause a red onion to turn green.

- ☐ HCl
- ☒ NaOH ✓
- ☐ Distilled water
- ☐ All of the above

Results of a pH test with commercial test strips are dependent upon the volume of the substance tested.

- ☐ True
- ☒ False ✓

The pH of soap is nearest to the pH of ____ because both are ____.

- ☒ NaOH; basic ✓
- ☐ NaOH; acidic
- ☐ HCl; basic
- ☐ HCl; acidic

Extension Questions

Swimming pools are recommended to be at a pH of 7.2 - 7.8. If the pool is too acidic, it will corrode metal equipment and cause skin irritation. If it is too basic, it will cause scaling and make the water cloudy.

You measure the pH of your pool and it reads a pH of 6.8. What can you do to raise the pH to the proper range?

(SAMPLE ANSWER BELOW)

Add a weak base to the pool water. A strong base could raise the pH too much.