🧪 Lesson Plan: Acids and Bases

Grade Level: 5
Subject: Physical Science
Duration: 45–60
NGSS 5-PS1-4: Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

🎯 Learning Objectives

By the end of this lesson, students will be able to:

- **Identify** acids and bases based on their properties and pH values.
- **Describe** the characteristics of acids and bases, including taste, feel, and chemical behavior.
- **Use** the pH scale to classify substances as acidic, basic, or neutral.

- **Litmus Paper:** Thin strips of special paper used to test whether a substance is an acid or a base. Blue litmus paper turns red in acid; red litmus paper turns blue in base.
- **Hydrogen Ion:** A positively charged ion (H+) that acids release when dissolved in water. The more hydrogen ions present, the stronger the acid.
- **Hydroxide Ion:** A negatively charged ion (OH-) that bases release when dissolved in water. The more hydroxide ions present, the stronger the base.

💼 Materials Needed: (all links are included in this PDF)

- Printed copies of the Study Guide (https://newpathworksheets.com/api/guide/study-guide-science-grade-5-acids-and-bases.pdf)
- Activity Lesson handout on Acids and Bases (https://newpathworksheets.com/api/activity-lesson/activity-lesson-science-grade-5-acids-and-bases-acids-and-bases-4.pdf)
- Vocabulary matching worksheet (https://newpathworksheets.com/api/vocabulary/vocabulary-science-grade-5-acids-and-bases-1.pdf)
- Practice Worksheet 0 (https://newpathworksheets.com/api/worksheet/worksheet-science-grade-5-acids-and-bases-0.pdf)
- Practice Worksheet 1 (https://newpathworksheets.com/api/worksheet/worksheet-science-grade-5-acids-and-bases-1.pdf)
- Small samples of lemon juice, vinegar, baking soda solution, and soapy water in labeled cups
- Red and blue litmus paper strips (or pH indicator paper)
- Chart paper or whiteboard

bases.pdf)

- Introduce the pH scale (0–14) and explain that pH 7 is neutral, below 7 is acidic, and above 7 is basic. (https://newpathworksheets.com/api/guide/study-guide-science-grade-5-acids-and-bases.pdf)
- Demonstrate testing a sample liquid with litmus paper: dip blue litmus into lemon juice and observe it turn red, confirming the liquid is an acid.
- Discuss safety: strong acids and bases can burn skin, so we never taste or touch unknown substances in science experiments.

Step 3: Guided Practice (15 minutes)

- Distribute the Activity Lesson handout and review the characteristics of acids and bases as a class. (https://newpathworksheets.com/api/activity-lesson/activity-lesson-science-grade-5-acids-and-bases-acids-and-bases-4.pdf)
- Work through the vocabulary matching worksheet together, reinforcing key terms like ion, pH scale, and litmus paper. (https://newpathworksheets.com/api/vocabulary/vocabulary-science-grade-5-acids-and-bases-1.pdf)
- Show the pH scale diagram from the Activity Lesson and have students identify where common substances (milk, water, soap, vinegar) fall on the scale. (https://newpathworksheets.com/api/activity-lesson/activity-lesson-science-grade-5-acids-and-bases-acids-and-bases-4.pdf)

Step 4: Independent Practice (15 minutes)

- Provide students with Practice Worksheet 0 to classify substances as acids, bases, or neutral and answer questions about pH and litmus paper. (https://newpathworksheets.com/api/worksheet/worksheet-science-grade-5-acids-and-bases-0.pdf)

Differentiation Strategies

For advanced learners:

- Challenge students to research and present on a strong acid or base used in industry, such as sulfuric acid or sodium hydroxide, and explain its uses and safety precautions.

- Have students design their own pH scale poster with additional household items and their approximate pH values.

For learners needing support:

- Provide a pre-labeled pH scale chart with color-coded ranges (red for acid, green for neutral, blue for base) for visual reference.
- Offer one-on-one assistance during the litmus paper demonstration and worksheet activities, and allow students to work in pairs for the independent practice.

Extension Activities

- Conduct a hands-on experiment where students test the pH of various household liquids (lemon juice, milk, baking soda solution, vinegar, soapy water) using litmus paper or pH strips and record their findings.

- Practice Worksheet 1 (https://newpathworksheets.com/api/worksheet/worksheet-science-grade-5-acids-and-bases-1.pdf)
- Practice Worksheet 2 (https://newpathworksheets.com/api/worksheet/worksheet-science-grade-5-acids-and-bases-2.pdf)
- Practice Worksheet 3 (https://newpathworksheets.com/api/worksheet/worksheet-science-grade-5-acids-and-bases-3.pdf)
- Vocabulary Worksheet 1 (https://newpathworksheets.com/api/vocabulary/vocabulary-science-grade-5-acids-and-bases-1.pdf)
- Vocabulary Worksheet 2 (https://newpathworksheets.com/api/vocabulary/vocabulary-science-grade-5-acids-and-bases-2.pdf)

ACIDS AND BASES

Most every liquid has acidic or basic traits. Acids and bases are two important compounds.

Acids

An **Acid** is a type of sour substance. Examples of acids are lemon juice and vinegar.

Remember: DO NOT TASTE SUBSTANCES during science experiments.

Some Characteristics of ACIDS Important to Know:

- Acids taste sour
- Acids react strongly with metals (example: acid mixed with iron

Lesson Checkpoint: What is an ACID?
Give one example of an acid.

Bases

A base is a type of bitter substance. A base dissolved in water is called a basic solution. Examples of a base substance are soap and baking soda. A base releases hydroxide ions in water.

Some Characteristics of BASES Important to Know:

- Bases taste bitter
- Bases often have a slippery feel
- Strong bases are extremely dangerous and can burn your skin!!!
- Bases are also called alkalis

Lesson Checkpoint: What is an BASE?
Give one example of a base.

Identification of Acids and Bases

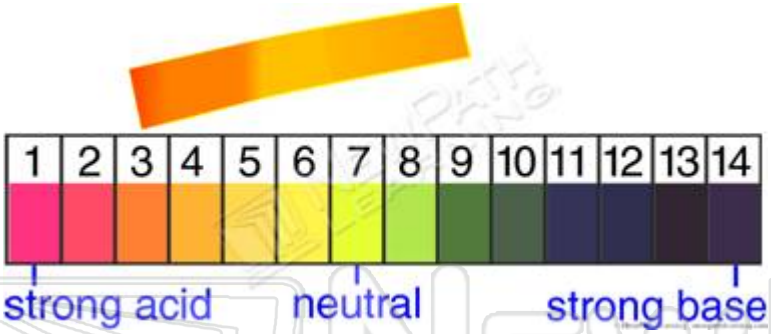
Scientists use a **pH scale** to measure how acidic or basic a substance

- The pH scale is numbered from 0 → 14.
- The lower the number = the more hydrogen ions = the more **acidic** the substance is
- The strength of an acid increases with distance from pH ranking of 7. ← ← ← ←
- Any substance listed **below pH 7 is acidic**.
- Example of an acid from the pH chart above is a tomato = pH of 4
- The higher the number = the less hydrogen ions = the more **basic** the substance is

The strength of a base increases with distance from pH ranking

There is special paper, called universal indicator paper, which acids and bases react with. The reactions are visible in the form of different colors on the paper.

The universal paper comes along with a pH scale to help determine if the substance you were testing is an acid, a base, or neutral.



A strong acid will turn the universal indicator paper **red**. A strong base will turn universal indicator paper **purple.**

Scientists also use a similar type of indicator paper called **litmus paper**, which is special paper used to detect the presence of an acid or a base. Litmus paper will tell you the pH of a particular substance by

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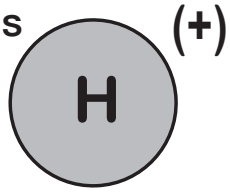
Acids & Bases

Sci E

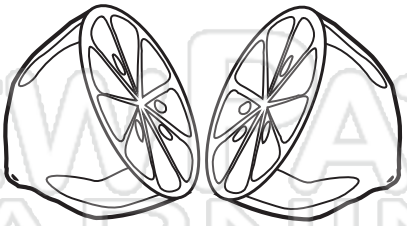
Name _____ Class _____ Date _____

An **acid** is a type of sour substance. When placed in water, acids release **hydrogen (H+) ions** into the water. The **more hydrogen ions** formed, the **stronger the acid**.



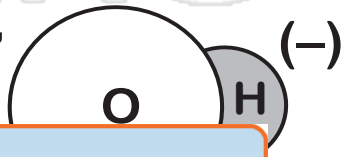
Some Characteristics of ACIDS:

- Acids **taste sour**
- Acids react strongly with metals
- Change blue **litmus paper** to **red**



Many of the foods we eat, such as lemons, contain weak acids.

A **base** is a type of bitter substance. When placed in water, bases release **hydroxide (OH-) ions** into the water. Examples include soap and baking soda.



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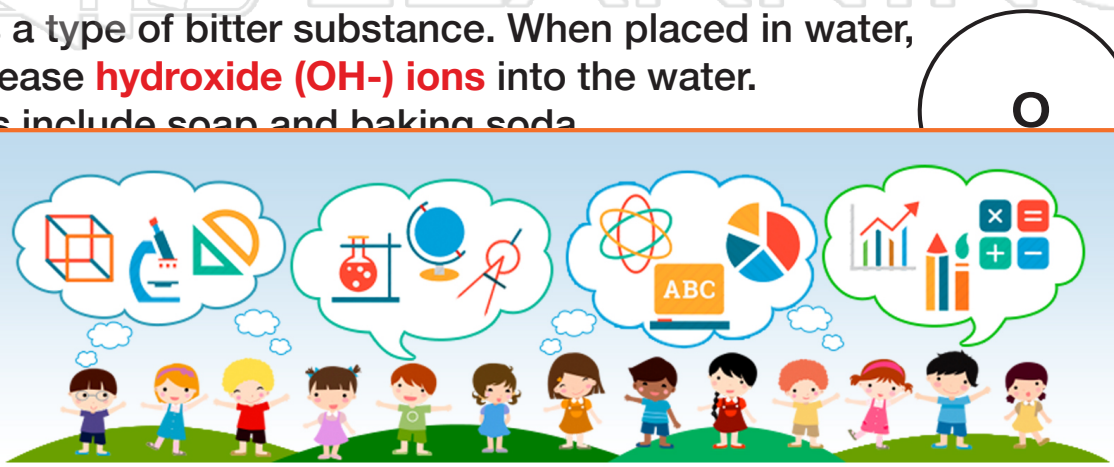

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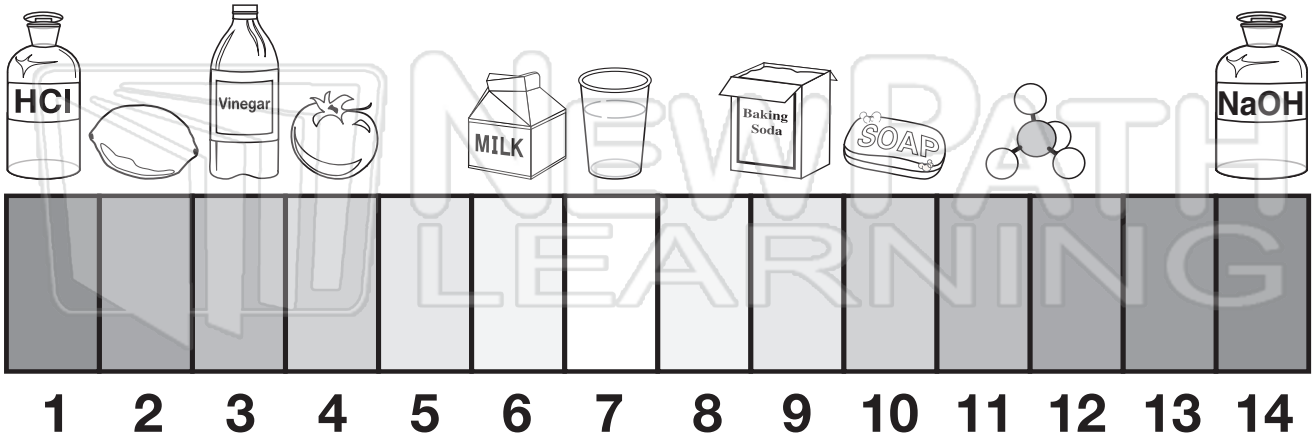


Acids & Bases

Sci E

Name _____ Class _____ Date _____

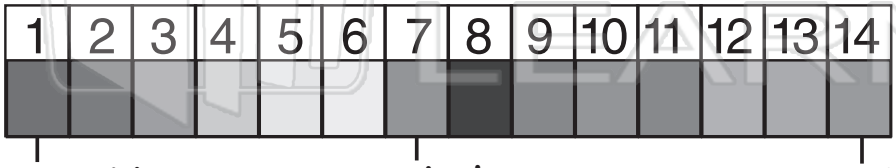
pH Indicators

pH indicators are chemicals that **change color** in the presence of an acid or base. They are used to determine if a substance is acidic or basic.

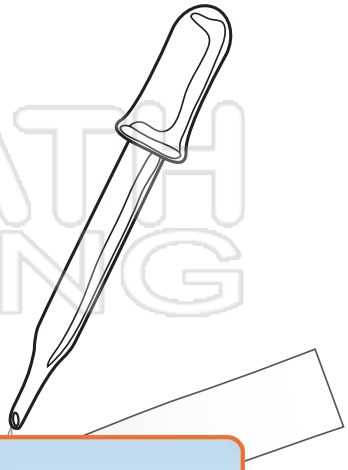
Universal pH Indicator Paper:

A strong **acid** will turn the universal pH indicator paper **red**.

A strong **base** will turn the universal indicator paper **purple**.



strong acid (r… neutral strong base



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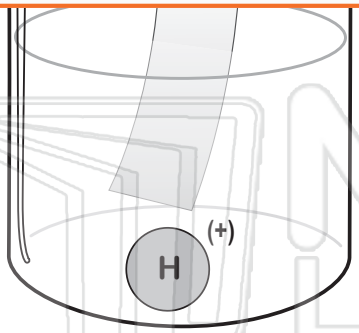
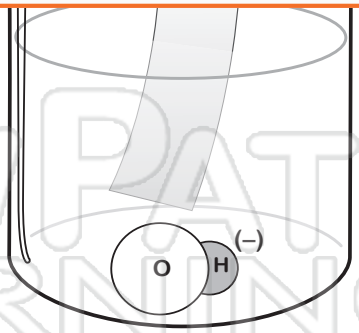


acidic - blue litmus turns red



basic - red litmus turns blue

Acids & Bases

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Name _____ Class _____ Date _____

Fill in the blanks.

When placed in water, **acids** release _____ **ions** into the water.

Acids taste _____.

When placed in water, **bases** release _____ **ions** into the water.

Bases taste _____ and feel _____.

_____ indicators are chemicals that **change**

in the presence of an acid or base. They are used to determine if a s

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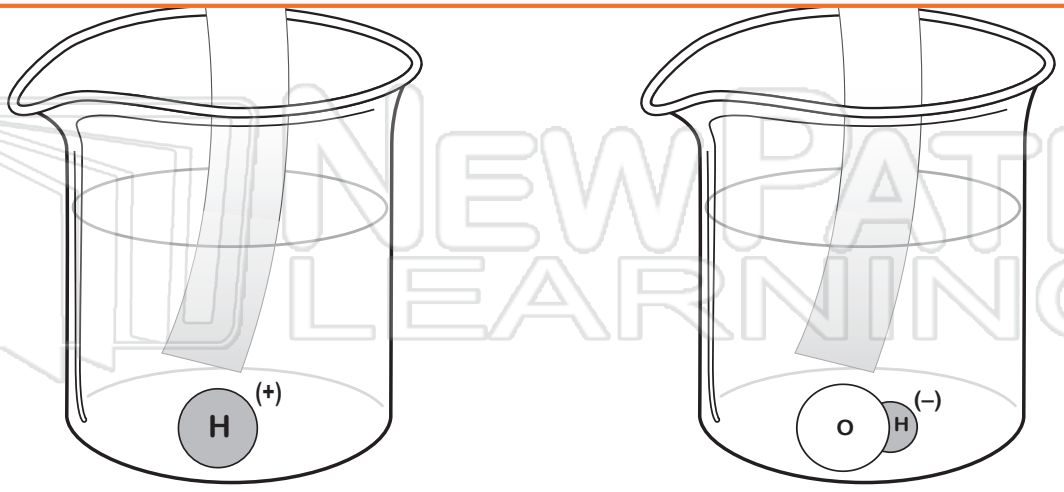

Acids & Bases

Sci E

Name _____ Class _____ Date _____

Cut out and color the objects. Make a large **pH scale**. Use references, if needed, to help you place items along the pH scale. Find more items to add to the scale.

Acids & Bases

Sci E

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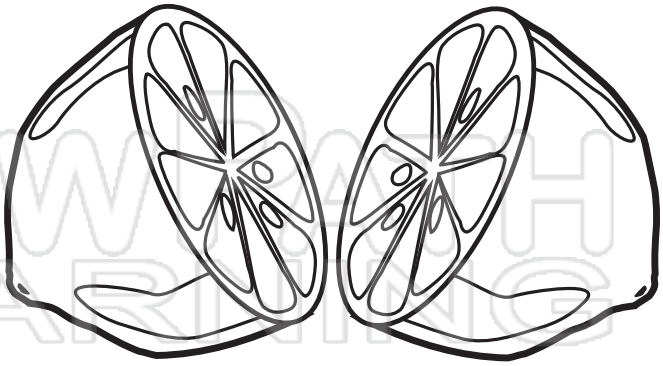

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Acids & Bases

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Answer Key

Fill in the blanks.

When placed in water, acids release hydrogen ions into the water.

Acids taste sour.

When placed in water, bases release hydroxide ions into the water.

Bases taste bitter and feel slippery.

pH indicators are chemicals that change in the presence of an acid or base. They are used to determine if a s

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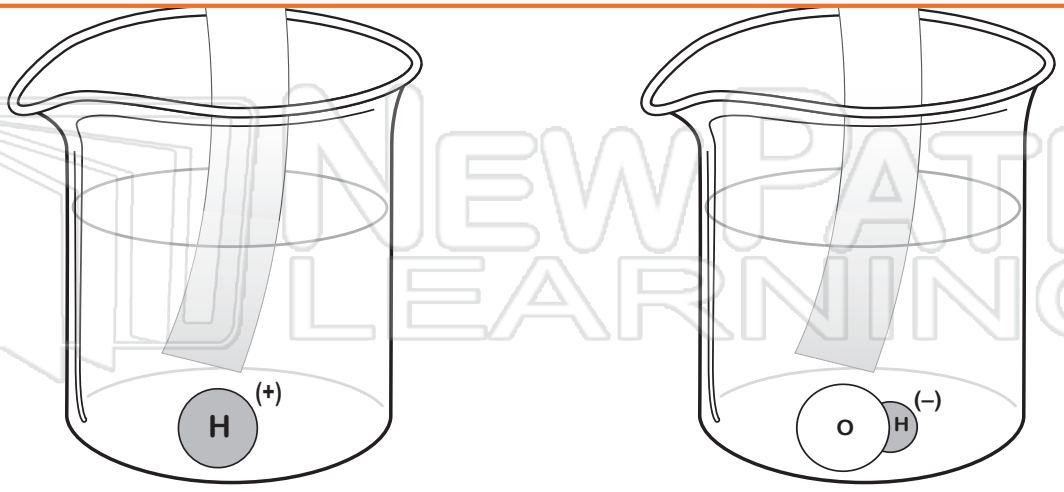

Acids & Bases

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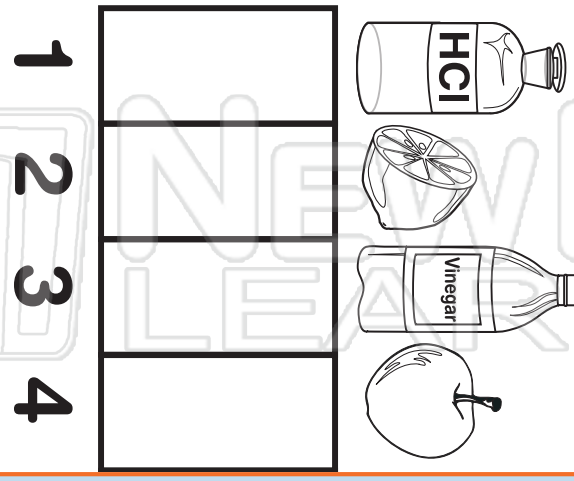
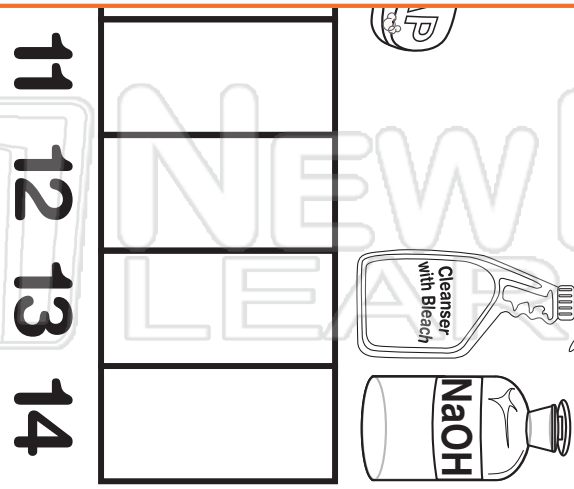
Answer Key - Example

Cut out and color the objects. Make a large **pH scale**. Use references, if needed, to help you place items along the pH scale. Find more items to add to the scale.





Science Worksheets: Acids and bases

Sci E

Name_____ Class_____ Date_____

1 A(n) _____ is a type of **sour** substance.

A acid
B base
C neutral liquid
D positive ion

2 Which of the following is an example of an **acid**?

A soap
B baking soda
C lemon juice
D ammonia

3 A **strong acid**, such as sulfuric acid, **mixed with iron** gives off **hydrogen gas**. Which of the following statements is supported by this example?

A Bases react strongly with metals.

4 Which of the following is a true fact about **acids**?

A Strong acids will not harm your skin.
B Strong acids can

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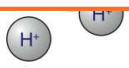
5

charged atoms
D a form of light energy

7

C the weaker the acid
D the stronger the acid



9 A(n) _____ is a type of **bitter** substance.

A ion
B base
C acid
D neutral substance

10 What is a **base** dissolved in water called?

A a compound solution
B an acidic solution
C a neutral solution
D a basic solution

Science Worksheets: Acids and bases

Sci E

Name_____ Class_____ Date_____

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C neutral liquid
D positive ion

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5

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PREVIEW

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D a basic solution

D

Science Worksheets: Acids and bases

Sci E

Name_____ Class_____ Date_____

1 Which of the following is an example of a **base**?

A baking soda
B lemon
C tomato
D pure water

2 When a **base** is mixed in water, the **positive hydrogen ions** **separate** from the _____ ions.

A positive hydrochloride
B positive hydrogen peroxide
C negative hydroxide
D hydrogen

3 **Bases** often have a _____ feel.

A rough
B slippery
C hard
D spongy

4 Which is true of **strong bases**?

A They are not dangerous in any way.
B They are very dangerous and can burn your skin.

5

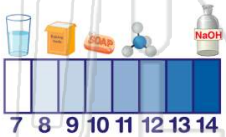
7

B presence of helium
C potential of hydrogen
D hydrogen pieces

C moderate pH, 5-6 on the pH scale
D very high pH, 10-14 on the pH scale

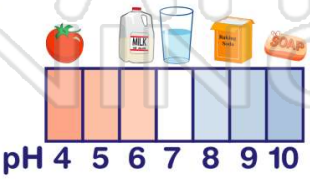
9 A **strong base** has a _____.

A neutral pH, 7 on the pH scale
B very low pH, 0-4 on the pH scale
C moderate pH, 8-9 on the pH scale
D very high pH, 10-14 on the pH scale



10 A **neutral solution** is one that has a pH of _____. It is not an acid or a base.

A 7
B 6
C 8
D 0



Science Worksheets: Acids and bases

Sci E

Name_____ Class_____ Date_____

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7

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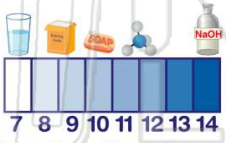

D

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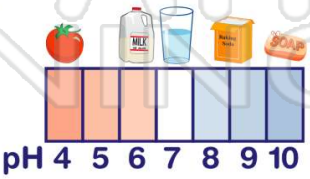
B 6
C 8
D 0



A

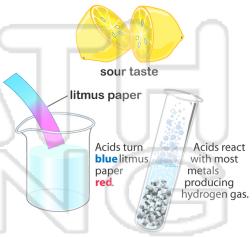
Science Worksheets: Acids and bases

Name_____ Class_____ Date_____

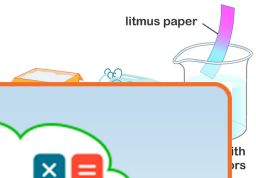
Match each of the following terms to its definition:

Litmus paper	PH scale	Acid
Ion	Neutral solution	Base

1. - a sour substance that can react with metals and turns blue litmus paper red; when placed in water, acids release hydrogen ions into the water



2. - a type of bitter substance that releases hydroxide ions in water and turns red litmus paper blue; bases often have a slippery feel and strong bases can burn your skin



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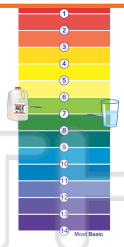
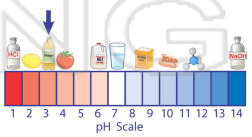
5. - a solution that has a pH of 7; it is not an acid or a base



6. - a numerical scale used to measure the amount of hydrogen ions there are in a solution; a scale which measures the acidity and alkalinity of a substance



Science Worksheets: Acids and bases

Name_____ Class_____ Date_____

Match each of the following terms to its definition:

Litmus paper	PH scale	Acid
Ion	Neutral solution	Base

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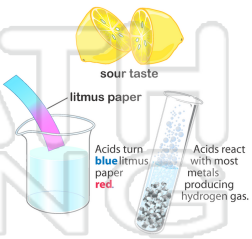
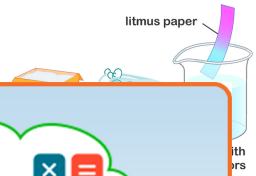


2. base - a type of bitter substance that releases hydroxide ions in water and turns red litmus paper blue; bases often have a slippery feel and strong bases can burn your skin



3. ion

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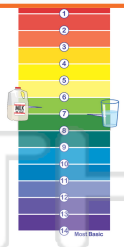
5. neutral solution - a solution that has a pH of 7; it is not an acid or a base



6. pH scale - a numerical scale used to measure the amount of hydrogen ions there are in a solution; a scale which measures the acidity and alkalinity of a substance