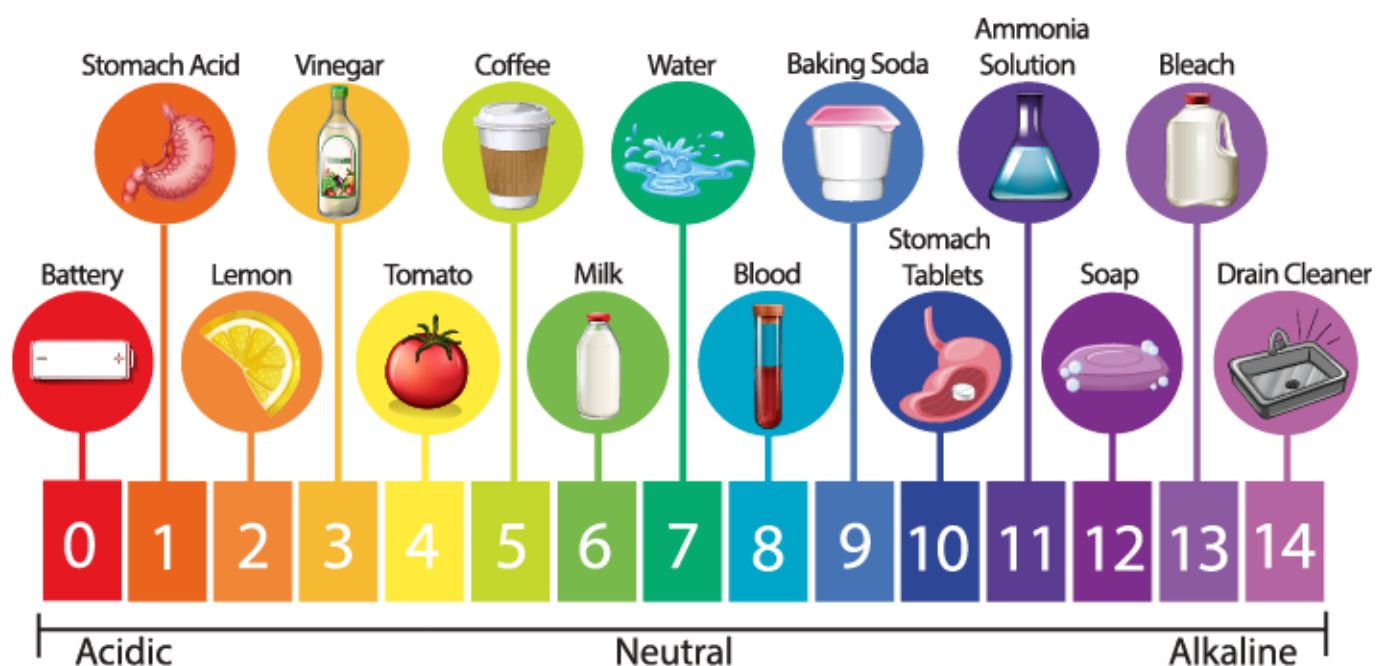


Analyzing the Strength of Acids and Bases Using the pH Scale

The pH Scale



Target Group

Grades 8–10

Duration

- **Main Activity:** 45–60 minutes
- **Discussion & Assessment:** 15–20 minutes

Module Type

Simulation-Based Experiment + Concept Discovery + Inquiry-Based Learning

Learning Objectives

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

- Understand the **pH scale (0–14)**
 - Differentiate between **acids, bases, and neutral substances**
 - Compare the **strength** of acids and bases
 - Observe colour changes associated with pH values
 - Interpret numerical pH data from a simulation
 - Relate pH concepts to real-life applications
 - Apply scientific thinking: : **prediction → observation → conclusion**
-

Key Concepts

Primary Concepts

- Acids and bases
- pH scale
- Strength of acids and bases

Secondary Concept

- Indicators
 - Neutralization
 - Numerical data interpretation
-

Think First (Prediction Activity – 5–7 minutes)

Pre-Activity Discussion

Ask students to think and write predictions:

- Which is more acidic – lemon juice or vinegar?
- Is soap acidic or basic?
- Why is drinking water considered neutral?
- Can two substances with similar taste have different pH values?

Teaching Strategy

- Think–Pair–Share
- Record predictions on the board
- Encourage reasoning rather than correct answers
- Revisit predictions after the activity

Materials Required (Digital)

- Computer / Laptop
 - Internet connection
 - **PhET Simulation: pH Scale**
 - Notebook / Worksheet for observations
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Activity: Exploring pH of Common Substances Using Simulation

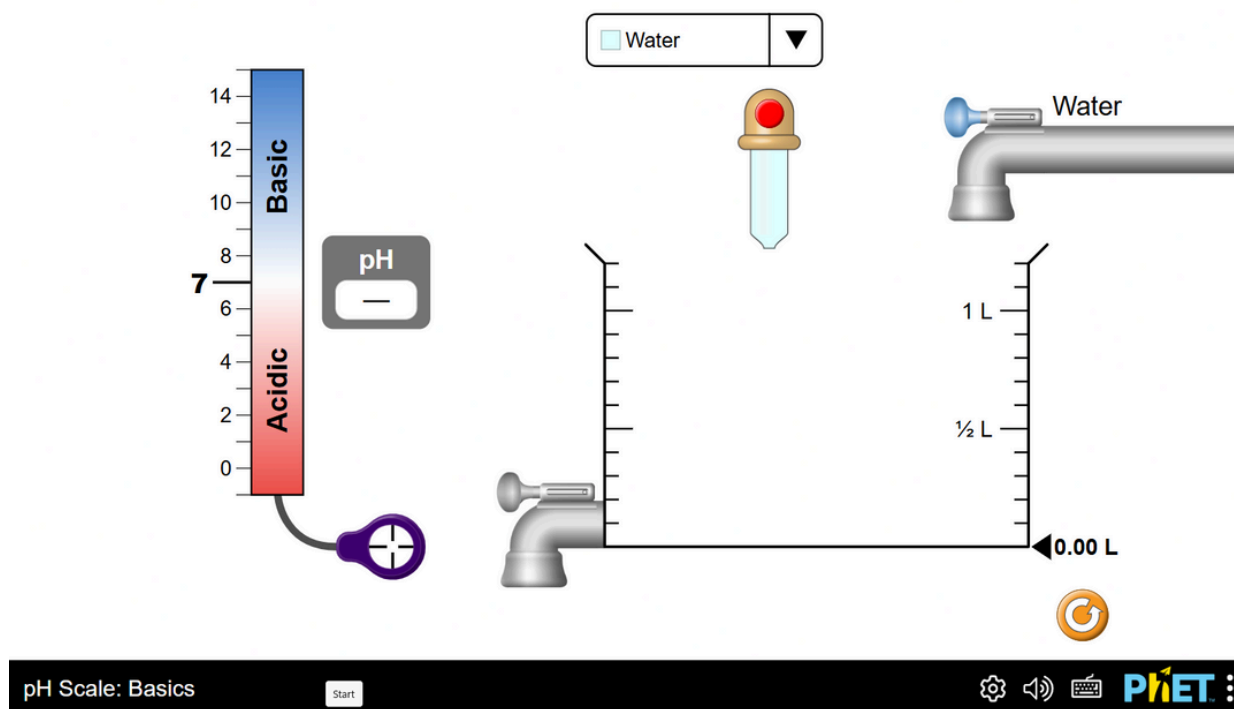
Activity 1: Understanding the pH Scale

Procedure

1. Open PhET – pH Scale simulation
2. Observe the pH scale displayed (0–14)
3. Identify acidic, neutral, and basic regions

Observation

1. $\text{pH} < 7 \rightarrow$ Acidic
2. $\text{pH} = 7 \rightarrow$ Neutral
3. $\text{pH} > 7 \rightarrow$ Basic



Conclusion

The pH scale is used to measure the acidity or basicity of a substance.

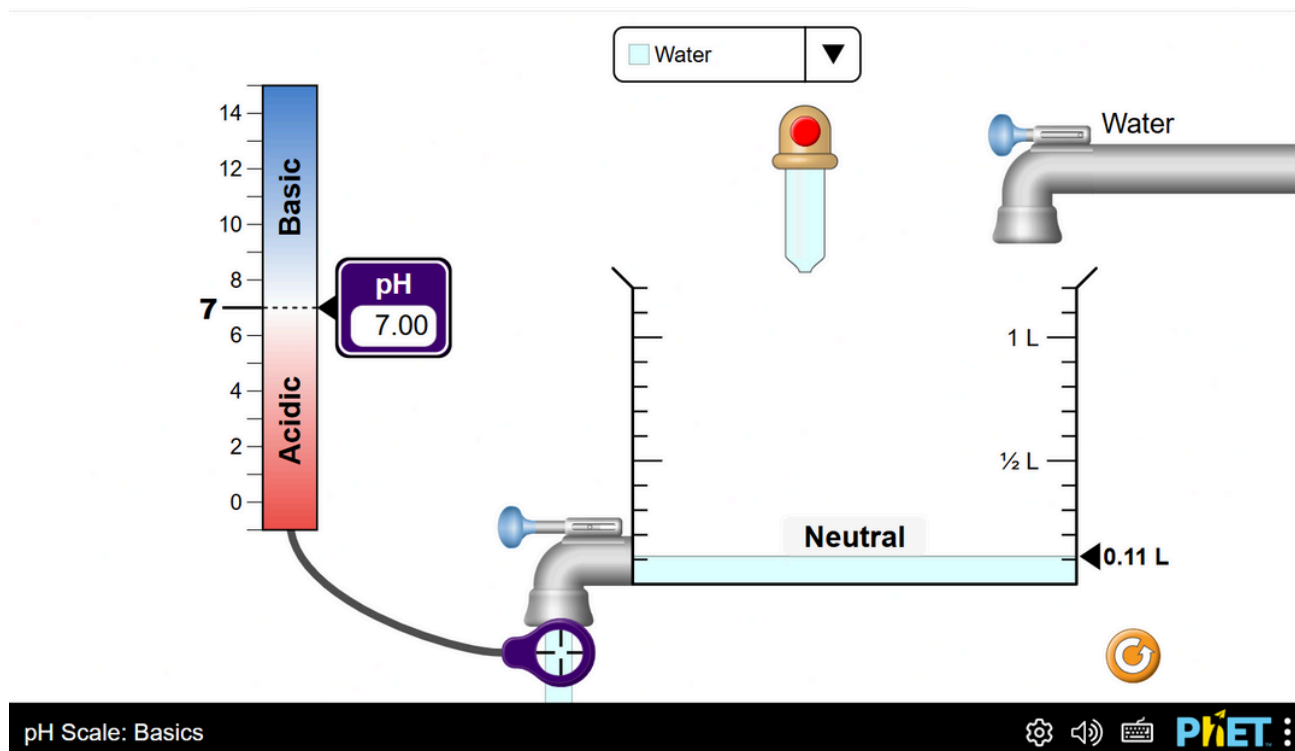
Activity 2: Testing a Neutral Substance

Procedure

1. Select pure water in the simulation
2. Observe the pH value and colour

Observation

1. pH value is around 7
2. Colour corresponds to neutral region



Conclusion

Pure water is neutral in nature.

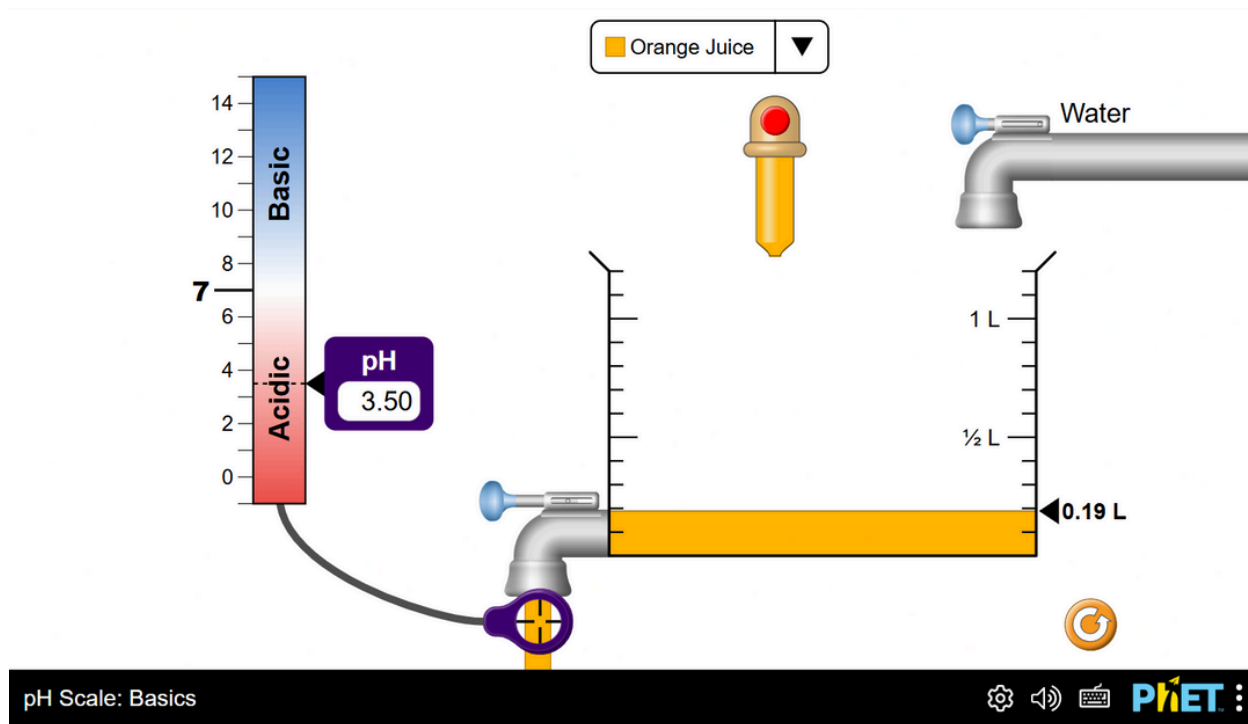
Activity 3: Testing Acidic Substances

Procedure

1. Select orange juice
2. Observe pH value and colour change
3. Compare with water

Observation

1. pH value less than 7
2. Stronger acids show lower pH values



Conclusion

Lower pH value indicates a stronger acid.

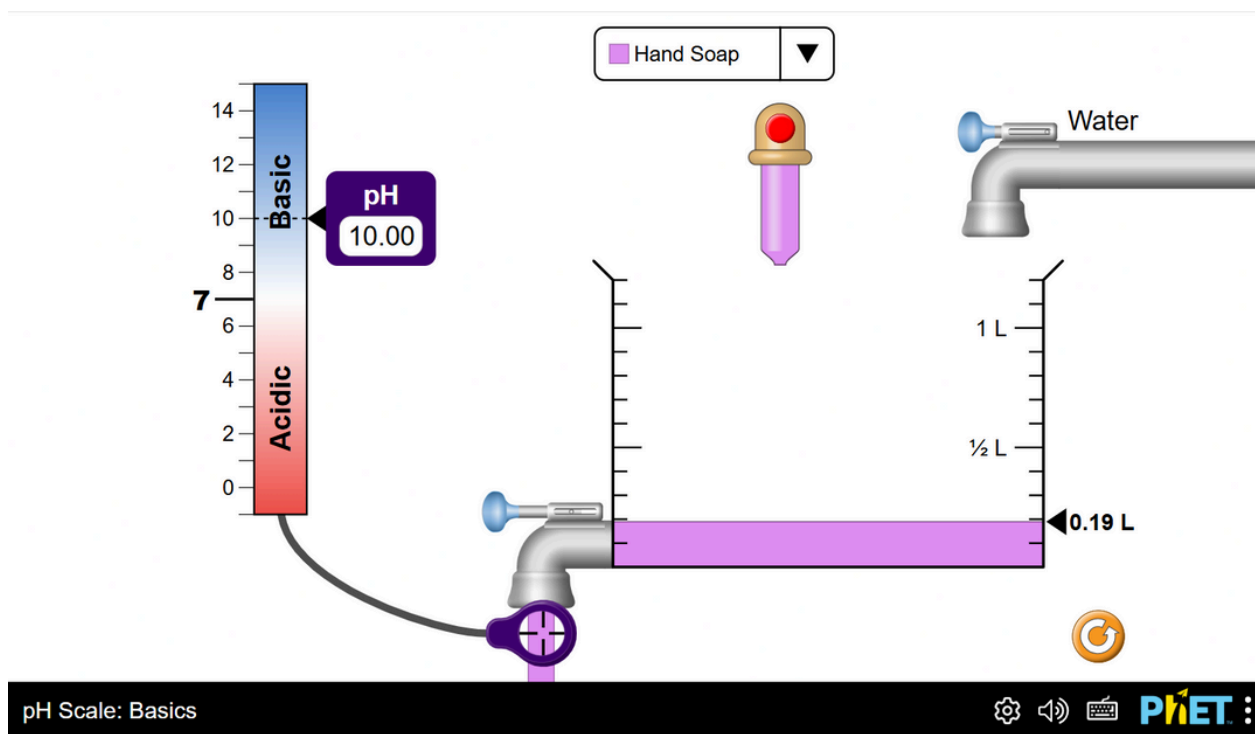
Activity 4: Testing Basic Substances

Procedure

1. Select soap solution or bleach
2. Observe pH value and colour

Observation

1. pH value greater than 7
2. Strong bases show higher pH values



Conclusion

Higher pH value indicates a stronger base.

Activity 5: Comparison and Classification

Observation Table

Substance	pH Value	Nature
Water	7	Neutral
Orange juice	3.50	Acidic
Soap	10	Basic

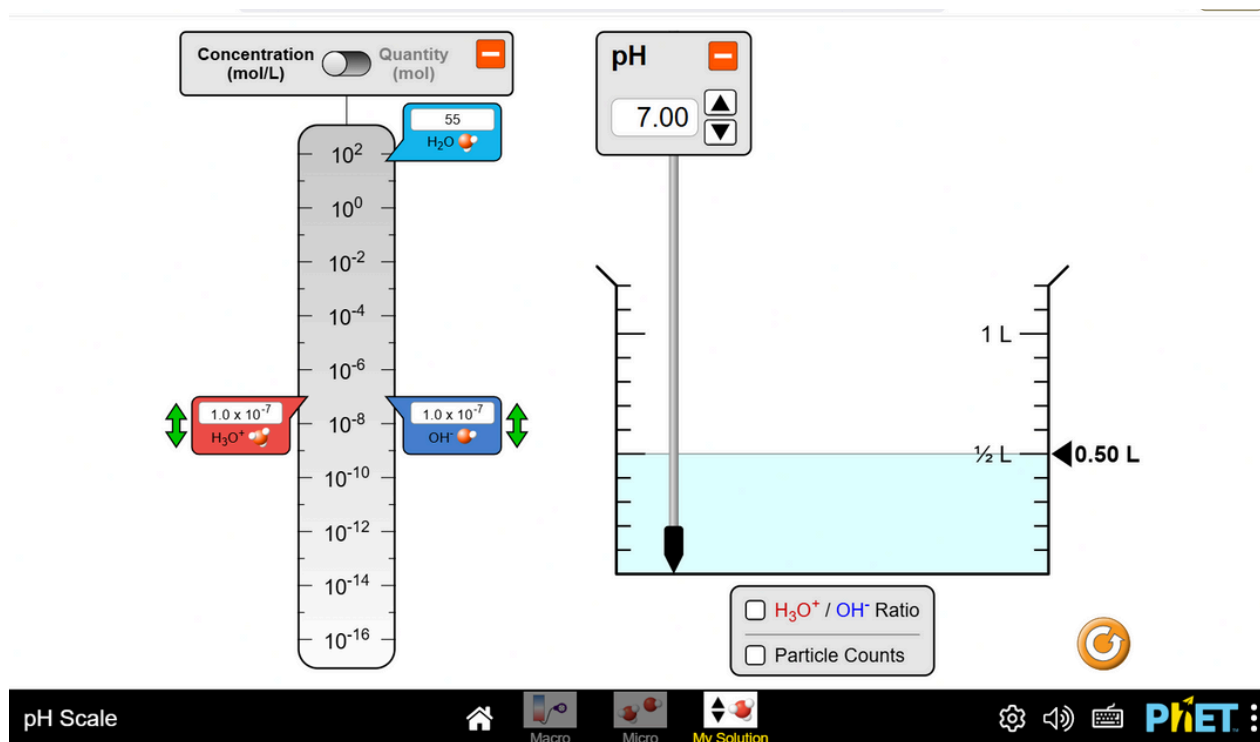
Conclusion

Substances can be classified as acidic, basic, or neutral based on their pH value.

What's Happening? (Concept Explanation)

- Acids release hydrogen ions (H^+) in solution

- Bases release hydroxide ions (OH^-)
- pH value indicates the concentration of these ions
- Lower pH \rightarrow more H^+ ions
- Higher pH \rightarrow more OH^- ions



Real-Life Connections & Applications

1. **Human Body** – stomach acid aids digestion
2. **Agriculture** – soil pH affects crop growth
3. **Environment** – acid rain damages ecosystems
4. **Household Products** – soaps and cleaners are basic
5. **Water Treatment** – maintaining neutral pH

Think & Answer (Assessment)

Basic (Grade 8)

- What does pH measure?
- Name one acidic and one basic substance.

Intermediate (Grade 9)

- Why is water neutral?
- How does pH indicate strength of acids and bases?

Advanced (Grade 10)

- What happens during neutralization?

- Why should strong acids and bases be handled carefully?
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Final Conclusion

The pH scale provides a systematic way to measure and compare the strength of acids and bases. Simulation-based learning helps visualize numerical pH values and strengthens conceptual understanding.