Measuring pH[1]

Learning objectives:

- Measure the pH of different substances.
- Distinguish between an acidic substance and a basic or alkaline one.
- Classify and compare substances according to their pH.

Key questions:

- What are acids and bases?
- How do you measure the acidity and basicity of a substance?

Materials:

- Electronic device: computer, smartphone, or tablet.
- PhET *pH Scale: Basics* simulation: https://phet.colorado.edu/sims/html/ph-scale-basics/latest/ph-scale-basics_en.html

Open Exploration:

1. Play with the simulation pH Scale: Basics for 5 minutes to find out what this sim is about and describe your observations.

Collect and analyze evidence:

Continue exploring the simulation and answer the following questions:

2. Which substance is most acidic within the simulation? What is its pH value?

[1]This activity was adapted and translated from the *Exploring pH* guide (2021) published by Institución Universitaria Digital de Antioquia, Colombia. Make a copy of this sheet as a Google Doc.

3. Which substance is most basic within the simulation? What is its pH value?

4. Which substance has a pH value closest to water (pH = 7)?

5. Which substances have the same pH values? What is the implication of this?

6. Vomit has a pH value of 2. Based on this information, what do you think the substances in the human stomach are, acidic or basic? Why do you think this is the case?

7. Is it possible to change the pH value of a substance? Explore this question using the simulation and explain:
    a. What happens to an acidic substance when water is added?

b. What happens to a basic substance when water is added?

c. In general, when we dilute an acid or a base the pH changes. Which pH value does it change towards when diluted?

d. Can an acid be converted into a base and vice versa? What do you think?

Conclusions

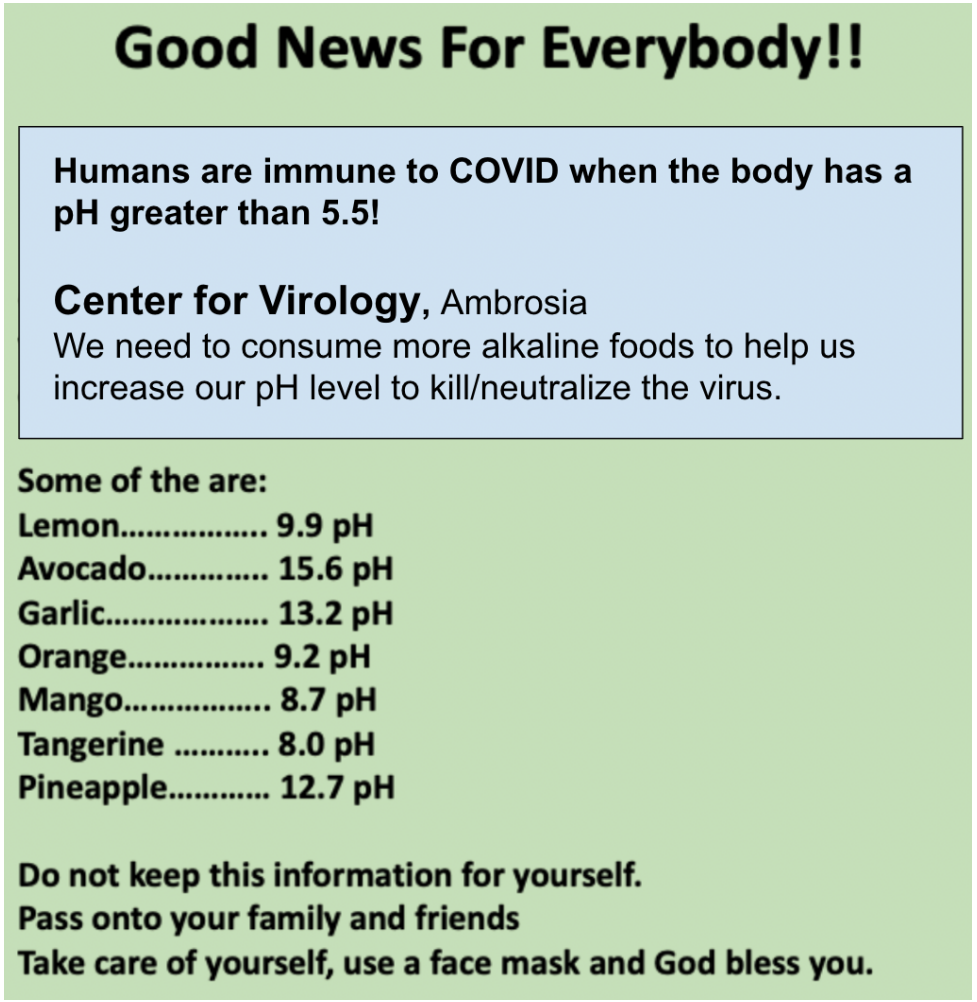
Answer the next questions individually.

8. How can we know if a substance is acidic or basic?

9. How can we change the pH of a substance?

10. The following image is an example of **misinformation** (incorrect information) widely spread through social media during the COVID-19 pandemic. Imagine that this image was sent to your family or friends during the pandemic and there are people considering doing what was suggested by the image. Write an

argument[2] that you would share with your family and friends to convince them that this information is false.



Note: Alkaline and Basic mean the same

Argument that you will share with your family/friends:

After answering, please share your ideas with your group.

[2]An argument is a reason or set of reasons given with the aim of persuading others that an action or idea is right or wrong**.** An argument is made up of 1) a **Thesis or personal opinion** regarding the situation. In this activity, the thesis is: The information shown in this image is false. 2)**Logical reasoning:** the reasons behind your opinion. 3) **Evidence to support your opinion.** In this case, you should use the evidence collected from the simulation.