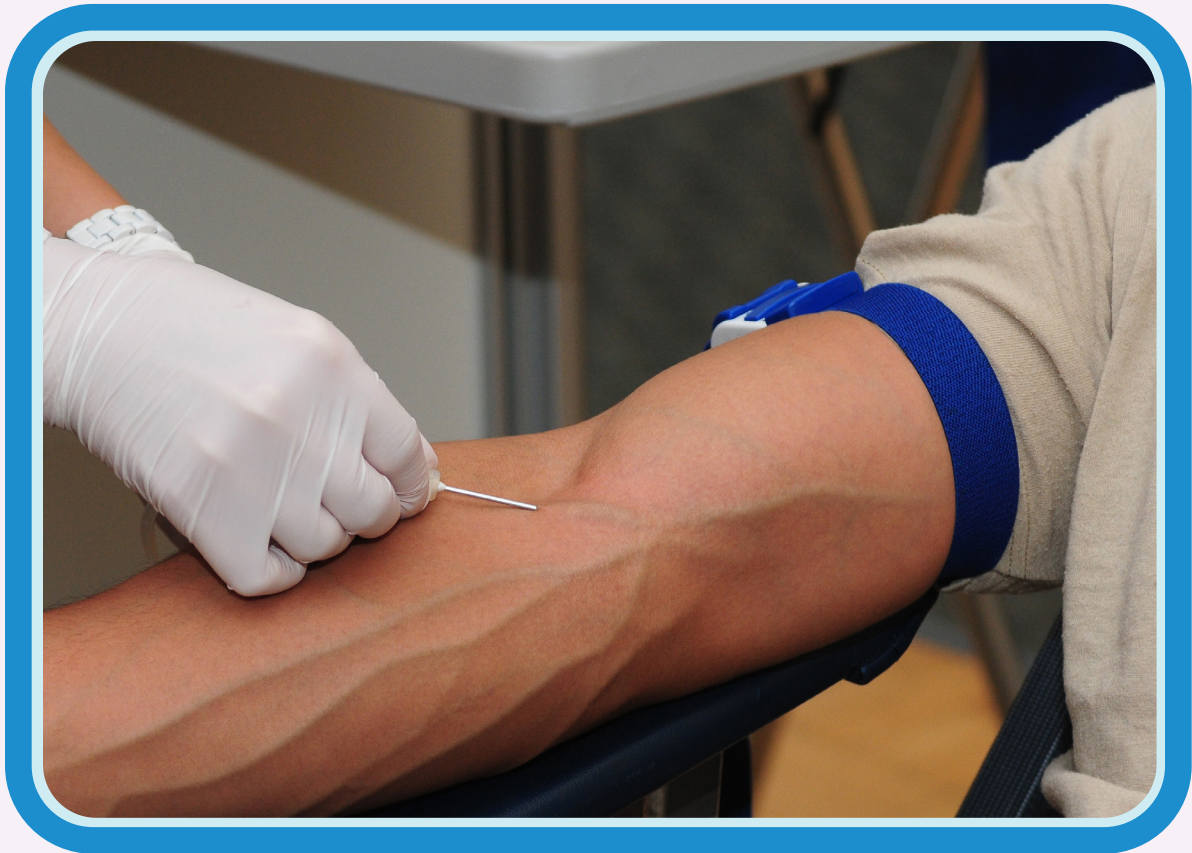


# Acid-Base Results



# Acid-Base Results

**Do you need an idea for a scientific study?  
Try out one of our ideas or make one of your own.**

**Start learning right now about how your body maintains its pH. Take the following brief quiz to see how much you already know about how buffers in your body work. See the bottom of page 4 to check your answers.**

1. What is the normal pH of the blood in your body?
  - a. 6.88
  - b. 7.00
  - c. 7.40
  - d. 7.90
2. What is the normal pH of your stomach cavity?
  - a. 2.00
  - b. 6.00
  - c. 7.00
  - d. 8.00
3. Death may occur if your blood pH changes by how many points?
  - a. 2
  - b. 4
  - c. 6
  - d. 8
4. Breathing problems can cause the blood pH level to change from normal conditions.
  - a. true
  - b. false
5. Severe dehydration can cause which condition in the human body?
  - a. alkalosis
  - b. acidosis
  - c. both acidosis and alkalosis
  - d. neither acidosis nor alkalosis



# Cabbage Head

Indicators are substances that change color based on the pH of a solution. The acidity or basicity of a solution is measured by pH. A pH of 7 is considered neutral, while a pH less than 7 is acidic and a pH greater than 7 is basic. Red cabbage extract can be used as an indicator to determine the pH of unknown solutions.

## Materials

3 to 4 large leaves from a red cabbage	saucepan
water	stove
safety glasses	household products
plastic cups	eyedropper

## Directions

1. Make sure to get proper permission before you do this experiment. It can get messy.
2. Put on your safety glasses.
3. Place the 3 – 4 large red cabbage leaves in the saucepan.
4. Place enough water in the pan to just cover the leaves.
5. Boil the leaves and water for 5 minutes and then let the leaves steep for about an hour.
6. Carefully pour the cool liquid extract from the saucepan into the plastic cup. Do not allow any leaf material to enter the cup. Dispose the excess leaves into the trash or your compost pile.
7. Pour a small amount of the test liquids (tap water, distilled water, milk, lemon juice, soapy water, etc.) into separate cups.
8. Add a few drops of the cabbage extract to each of the liquids.
9. Carefully observe what happens. Record your observations in Table 1.

Liquid Tested	Your Observations

## Questions

1. Why do you think the cabbage extract changed colors in the various liquids you tested?
2. Create a color scale you could use with your cabbage extract to determine the pH of various substances.

# Acid-Base Results

## Your Blood's pH

The human body is very sensitive to small changes in the pH of the blood. While normal blood pH levels range between 7.35 to 7.45, a change in pH of a few points can result in a person entering a coma or even having fatal results. Blood pH can deviate from normal in four distinct ways: metabolic acidosis, respiratory acidosis, metabolic alkalosis, and respiratory alkalosis. The following describes each of the four possible conditions:

- Metabolic acidosis – Results from a high concentration of the  $H^+$  that causes the pH to decrease. Ketoacidosis, some kidney diseases, and gastrointestinal issues have been associated with this condition.
- Respiratory acidosis – Results from a reduced respiration rate and an increase in the  $H^+$  that causes the pH to decrease. Breathing problems, such as asthma and emphysema have been associated with this condition.
- Metabolic alkalosis – Results from a low  $H^+$  concentration and an increase in the pH level. Ingestion of certain medicines, vomiting, and irregular heart rhythms have been associated with this condition.
- Respiratory alkalosis – Results from an increased respiration rate and a decrease in the  $H^+$  concentration that causes the pH to increase. Hyperventilation, body trauma, and low oxygen levels have been associated with this condition.



While eating and drinking certain foods is not responsible for significantly changing your blood's pH, other parts of your body can be affected by ingesting substances which are too acidic or basic. For instance, drinking acidic beverages (like sodas) can attack the enamel on your teeth, leading to tooth decay, other dental issues, and stomach problems.

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[STEMsims.com](http://STEMsims.com)

Answers: Page 2 Answers: (1) c, (2) a, (3) a, (4) b, (5) b. Page 3 Cabbage extract is a weak acid, so an acid/base reaction occurred with the extract and the test solutions. (2)

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