

Red Cabbage pH Indicator

D:4
E:6



Red Cabbage Indicator

pH	2	4	6	8	10	12	14
Color	Red	Pink	Purple	Blue	Green	Yellow-green	Yellow

By: Amanda Schubert

Purpose:

How will boiling red cabbage produce a pH indicator?

Hypothesis:

If we boil red cabbage with a small amount of H₂O then we will have successfully produced a pH indicator. *blc - . .*

Variables:

Independent: amount of water ✓

Dependant: colour of filter ✓

Materials:

1. Beaker
2. Red cabbage
3. H₂O
4. Filter paper
5. Hot plate
6. Tongs
7. Liquid samples
8. Pipette
9. Spot plate
10. Aluminum plate

pH level	Color
6	Dark purple
6	Dark purple
4	Light purple/dark pink
3	Dark pink
2	Bright pink
7	Dark purple/blue
8	Slightly darker
10	Green

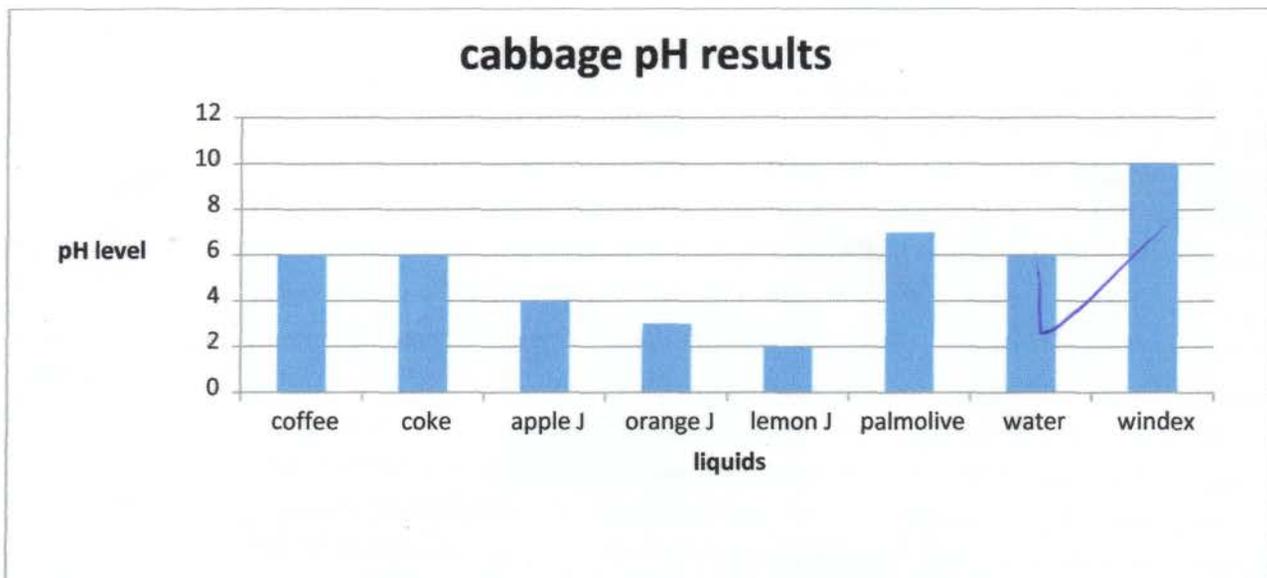
Procedure:

1. Place some red cabbage in the beaker
2. Add a bit of water into the beaker
3. Place the beaker on the hot plate and set to high
4. Take the beaker of the hot plate and pour the cabbage juice in an aluminum plate
5. Soak the filter paper in the cabbage juice
6. Make sure that you soaked both sides of the filter paper

7. Set the filter paper to dry
8. Repeat steps 4,5 and 6 several times
9. When dry cut the filter paper into little strips
10. Dip a piece of filter paper in each liquid
11. Record results

Results:

Liquid	pH level	Color
coffee	6	Dark purple
coke	6	Dark purple
Apple juice	4	Light purple/dark pink
Orange juice	3	Dark pink
lemon juice	2	Bright pink
Palmolive	7	Dark purple/blue
water	6	Slightly darker
Windex	10	Green



Conclusion:

My hypothesis stated if we boil red cabbage with a small amount of H₂O then we will have successfully produced a pH indicator. My hypothesis was correct because I was able to produce a pH indicator that worked but was not the easiest to use. My problem stated how boiling red cabbage will produce a pH indicator. Some possible sources of error are that maybe we didn't use enough cabbage juice or too little cabbage juice. Some ways I can fix my mistakes are by adding either more or less cabbage juice. My research can prove useful to people because they might not be able to find universal indicators and this way they can make their universal indicators with red cabbage. I wonder what would happen if we were to use the juice of a regular cabbage or if we were to add food coloring into the cabbage juice and then soak the filter paper in it.

Reliability of the method refers to whether the method gives the same result when repeated under the same conditions. It depends upon the reliability of the measuring instrument, the procedure and accuracy of the measurements, which also can be affected by the skill of the operator. The following techniques used in the method of measuring the pH of a solution are: 1. The use of a universal indicator paper for the collection of sufficient volume of solution to be tested. 2. The use of a standard solution when the standard is known. 3. The use of a standard solution of a known concentration.

Performance Level	Description
1	no real research standards developed by any of the disciplines below
1-2	With guidance, I can attempt to articulate a problem or research question to be investigated. With guidance I ask "What if..." questions, but they are not developed. With guidance, I attempt to identify variables in the investigation but if I'm not successful. With guidance, I can identify limited materials to be used to solve a problem. With guidance, I present a limited procedure which is limited or not in the order in which it should be done.
2-4	With guidance, I recognize and articulate the problem or research question to be investigated. With guidance, I identify a logical hypothesis using "If... then..." statements. I can identify most appropriate materials that will be used to solve the problem. I describe a simple and well-organized procedure. With guidance, I can identify variables that can be measured in the investigation including the method and units relevant. With guidance, I make suggestions of improvement and comments relevant.

D: SCIENTIFIC INQUIRY

Maximum: 5

You should be able to design and carry out scientific investigations independently.

By the end of Cycle 1 you should be able to:

- ✓ state a focused problem or research question to be tested by a scientific investigation;
- ✓ formulate a testable hypothesis and explain it using scientific reasoning;
- ✓ design and carry out scientific investigations that include variables and controls, material and/or equipment needed, a method to be followed, and the way in which the data is to be collected and processed;
- ✓ evaluate the validity and reliability of the method;
- ✓ judge the validity of the hypothesis based on the outcome of the investigation;
- ✓ suggest improvements to the method or further inquiry, when relevant.

Suitable assessment tasks for criterion D: Laboratory experiments, investigations and field studies among others.

Notes:

Reliability of the method: refers to whether the method allows for the collection of sufficient reliable data to answer the question. This depends upon the selection of the measuring instrument, the precision and accuracy of the measurements, errors associated with the measurement instrument, the size of the sample, the sampling techniques used and the number of readings.

Validity of the method: refers to whether the method allows for the collection of sufficient valid data to answer the question. This includes factors such as whether the measuring instrument measures what it is supposed to measure, the conditions of the experiment and the manipulation of variables (fair testing).

Achievement level	Level descriptor
0	I do not reach a standard described by any of the descriptors below
1-2	With guidance, I can attempt to articulate a problem or research question to be tested by a scientific investigation. With guidance I ask "What if..." questions, but they are not well developed. With guidance, I attempt to identify variables in the investigation but they are limited or incorrect. With guidance I can identify limited materials be used to solve the problem. With guidance, I present a limited procedure which is unclear or not in sequence. (may or may not be in point form)
3-4	With guidance, I recognize and articulate the problem or research question to be tested by a scientific investigation. With guidance, I identify a logical hypothesis using if ...then statements. I can identify most appropriate materials that will be used to solve the problem. Procedure is simple and well organized. With guidance, I can identify most of the variables that can be measured in the investigation including the control and constant where relevant. With guidance, I make suggestions of improvement and comments when relevant.

5-6	<p>I recognize and state the problem or research question to be tested by a scientific investigation. I identify a logical hypothesis with clearly identified variables and state a logical explanation for my hypothesis using scientific reasoning. (If...then...because...) I can identify all appropriate materials that will be used to solve the problem. Method is fully complete and concise. I can correctly identify ALL factors that can be measured in the investigation (Independent, Dependent, Constant, Control) where relevant. With guidance, I make suggestions for improvements and comment on the accuracy, method, quality and precision of my data. (selection of measuring instruments and possible errors, sample size, do the results support the research question...)</p>
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E: PROCESSING DATA

Maximum: 6

You should be able to organize, process, and interpret quantitative and qualitative data.

By the end of Cycle 1 you should be able to:

- ✓ collect and record data using units of measurement as and when appropriate;
- ✓ organize, transform and present data using numerical and visual forms;
- ✓ analyse and interpret the data;
- ✓ draw conclusions consistent with the data and supported by scientific reasoning.

Suitable assessment tasks for criterion E: Scientific investigations, laboratory reports and studies that provide students with sufficient raw data for processing and further analysis.

NOTES:

Numerical forms: may include mathematical calculations such as averaging, or determining values from a graph or table.

Qualitative data: refers to non-numerical data or information that it is difficult to measure in a numerical way.

Quantitative data: refers to numerical measurements of the variables associated with the investigation.

Transforming data: involves processing raw data into a form suitable for visual representation. This process may involve, for example, combining and manipulating raw data to determine the value of a physical quantity (such as adding, subtracting, squaring or dividing), and taking the average of several measurements. It might be that the data collected is already in a form suitable for visual representation, for example, distance travelled by a woodlouse. If the raw data is represented in this way and a best-fit line graph is drawn, the raw data has been processed.

Suitable format: may include tables with appropriate headings and units, large clearly labelled diagrams or concisely worded observations.

Visual forms: may include drawing graphs of various types appropriate to the kind of data being displayed (line graphs, bar graphs, histograms, pie charts, and so on).

Achievement level	Level descriptor
0	I do not reach a standard described by any of the descriptors below
1-2	With guidance, I organize some data by selecting an appropriate method of display. (table, a graph, chart, numerical, or other visual representation. With guidance, I organize some data using proper measurements. With guidance I identify limited trends, patterns or relationships in the data. My conclusion is very limited. (Barely or only scratches the surface of the content).

3-4	With guidance, I organize most data by selecting an appropriate method of display. (example: table, a graph, chart, numerical, or other visual representation). With guidance, I organize most of data using proper measurements. With guidance, I identify some trends, patterns or relationships in the data. With guidance, I draw a simple conclusion using scientific reasoning that is supported by the data.
5-6	I organize all data by selecting an appropriate method of display. (example: table, a graph, chart, numerical or other visual representation). I organize all data using proper measurements. I identify and analyse trends, patterns or relationships in the data. I draw a clear and detailed conclusion based on a reasonable interpretation of the data.