

# Spaghetti hydration lab report essay sample

[Environment](#), [Water](#)



Mass is defined as a body with a particular amount of matter contained within it. The mass of a particular object is always stationary, but due to the gravitational pull on different surfaces, the weight of an object may change. In this investigation, I will be discussing and observing the mass increase of raw spaghetti when spaghetti is hydrated in boiling water. In each trial, the mass of the spaghetti will be weighed initially and after being boiled. During each trial, the duration in which the spaghetti is cooked will change, and due to the change of time, we will be able to observe the changes of mass of the spaghetti. Aim

To determine the mass increase in percentage in which raw spaghetti is re-hydrated in boiling water for different intervals of time.

### Hypothesis

It is predicted that the mass of the spaghetti will increase when it is cooked for a longer period of time in the boiling water. This is because as the dehydrated spaghetti gets cooked, the spaghetti will absorb the boiling water making the spaghetti increasing in mass. It is believed that when the water is boiled and the spaghetti is being cooked, the mass of the spaghetti will increase because of the starch and gluten. When the spaghetti is boiled, it turns into a jelly form. The starches will dissolve the water when being cooked and the glutens/proteins becomes a soft semi-solid <sup>1</sup>. In relation to the evidence, I believe that the first interval will have a percentage increase of close to 100%, because as soon as the spaghetti gets cooked, the grains have to get used to the environment, involving rapid change. However, I feel that as the time increase progresses, the ending percentage compared to the initial mass will not be more than 200% because once the spaghetti has

adapted to the boiling water environment, it will probably take long for the spaghetti's grains to continue changing in state, meaning the mass won't rapidly increase like in the first interval. This concludes that the spaghetti will absorb more and more water if it is kept cooking for a longer period of time. Therefore, if the spaghetti is cooked for a longer period of time, the absorbing rate would work more efficiently. Variables

Independent Variable (IV): The time in which the spaghetti is heated in the boiling water (minutes). Dependent Variable (DV): The percentage mass increase of the spaghetti (Change in mass in different trials).

Fixed Variables (FV):

\* Ensuring that the amount of spaghetti used in each test remains constant. Doing this will ensure that the fixed equivalent of the spaghetti remains the same throughout, as it will be able to avoid any miscalculations with the results. This will be controlled through a balancing scale as initially in each test, the spaghetti will be weighed to a specific mass. \* Ensuring that the temperature of the boiling water remains constant, so if we keep the temperature of the boiling water the same throughout the experiment, the mass change will not be affected and the results will be able to be clear and reliable. We will know when the water temperature is measured up to 100°C with the thermometer. \* Ensuring that the specific type of spaghetti is used constantly, because if the type of spaghetti is changed in each experiment, the recorded mass may be different due to the starch levels of the particular type of spaghetti. To ensure this, the spaghetti in each trial will come from one particular source at all times. Procedure

## Apparatus

Material| Quantity and Features| What it is used for|

Sieve| 1 standard plastic sieve which is able to drain water| Draining the water off the spaghetti after being boiled| Flat cooking stove| 1 flat stove, with enough gas for all trials| To heat the boiling water in the pot for cooking the spaghetti | Metal boiling pot| 1 pot, big enough to contain around 1 litre of water| For boiling the water in, and for cooking the spaghetti| Stopwatch| 1 standard stopwatch| For timing the duration in which the spaghetti is in the water| Thermometer| 1 standard thermometer that can withstand 100°C| Measuring the temperature of the boiling water before the spaghetti gets boiled| Electronic Scale| 1 standard balancing scale| For weighing the spaghetti initially and after the particular trials| Oven mitt| 2 standard oven mitts| For pouring the boiling water/spaghetti into the sieve| Spaghetti| 1 packet, around 50-70 grams, thin spaghetti| Used for cooking and measuring the mass changes| Diagram

## Method

1) Prepare all the materials as indicated in the apparatus table above. 2) Gather the ingredients and draw a table for the results. The table should have the IV on the left column, and the DV on the right column(s). 3) Gather the spaghetti, and weigh out 5 grams of spaghetti. Place the spaghetti after being weighed on a desk. 4) Pour around 1 litre of sink water into the metal boiling pot and place it on the flat cooking stove. 5) Turn on the stove, and set the heating flame on. Wait for the water in the boiling pot to start bubbling at a temperature of 100°C. 6) Once the boiling water reaches a temperature of around 100°C, place the 5 grams of spaghetti into the boiling

water for 2 exact minutes. 7) Once the spaghetti as been boiled for 2 minutes, let one person use the oven mitt to pour the boiling water and spaghetti into the sieve to drain the water. 8) Cool the spaghetti off using cold water. Place the spaghetti on the balancing electric scale on a napkin. 9) Record the mass number of the spaghetti on the results table. 10) Repeat steps 2-8 but instead of boiling the spaghetti for 2 minutes, boil it for 4, 6, 8 and 10 minutes. 11) Repeat steps 2-9 for a total of three trials. By the end of the experiment, there should be 5 different sets of data with 3 trials for each time recorded. Results

#### Raw Data

Table #1: Raw Quantitative Data Showing the Recorded Mass of the spaghetti after being cooked (0, 2, 4, 6, 8, 10 minutes) Time in which spaghetti is being cooked (minutes)| Mass of Spaghetti after cooked (grams)

0| 5. 0|

2| 9. 1|

4| 9. 7|

6| 10. 5|

8| 12. 4|

10| 14. 3|

From this graph, we can see that as the spaghetti is cooked for longer and longer periods of time, more starch dissolves into the water which indicates that the mass of the spaghetti increases gradually. From 0-2 minutes, we can see that the mass of the spaghetti almost doubles in percentage, however after that the mass increases by small amounts. This means that if

the spaghetti is cooked for a little amount of time, the mass will increase dramatically in comparison to the initial mass, but as the time increases in which the spaghetti is cooked for, the mass increases at a slow and steady pace. Table #2: Qualitative data indicating the Observations made throughout the experiment (0, 2, 4, 6, 8, 10 minutes)

Time in which spaghetti is cooked (minutes)	Observations and Errors
0	Spaghetti is very thin and hard. It is extremely brittle and weighs a very small amount. The colour is a dark yellow and it is very long in length, but short in width.
2	After being cooked for a short 2 minutes, the spaghetti is almost double the weight of the initial mass. The colour is a little lighter, but still pretty dark. The spaghetti has obtained moisture, and has become rubbery. No errors.
4	After being cooked for an extra 2 minutes, the spaghetti has appeared to have increased in mass by a small portion. The colour of the spaghetti is a pale yellow and the actual spaghetti has become thicker and moister. No errors.
6	After the spaghetti had been cooked for 6 minutes, it has appeared to be somewhat pale yellow in colour.

Now the spaghetti has absorbed even more water and stickier and has a larger width. No errors. | 8| The spaghetti is now even thicker and the colour has become lighter gradually. The sticky feeling is still there and the mass has increased by around 2 grams. When performing the experiment, a little bit of spaghetti fell down the sink when draining the water by mistake which may have caused a minor but inaccurate result. | 10| The spaghetti has now obtained a light-pale yellow colour and it has become thicker in width. The weight has increased by almost 3 times the initial mass of the spaghetti and the spaghetti is very moist in comparison to the initial features. No errors. |

After looking at this table, we can say that as the cooking time gradually increases, the spaghetti features develop more and more. The spaghetti colour becomes lighter through the process, the mass steadily increases and the spaghetti becomes gains moisture. As there were limited committed errors, I can say that my results gathered here follow a particular pattern that keeps on going on. Mass of Spaghetti After Cooked / Mass of Spaghetti Before Cooked  $\times 100 - 100 =$  % of mass increase from initial mass to final mass. e. g.  $\frac{182}{100} \times 100 - 100 = 82\%$  increase of mass.

### Calculations

Formula used to calculate mass increase of the spaghetti:

Time Interval 2 - Time Interval 1 = % of mass increase between intervals of time. e. g.  $82 - 0 = 82\%$  mass difference between interval 1 and interval 2.

Formula Used to calculate mass increase between each time interval:

Table #3: Final table showing the percentage mass increase from before the spaghetti was cooked to after and percentage increase of mass between time intervals (2, 4, 6, 8, 10 minutes) Time in which spaghetti is being cooked (minutes) | Percentage mass increase of the spaghetti from before to after being cooked (%) | Percentage mass increase of the spaghetti between time intervals (%)

2 | 82 | 82 |

4 | 94 | 12 |

6 | 110 | 16 |

8| 148| 38|

10| 186| 38|

From the graph above, we can observe and indicate the percentage increases and the time intervals. Firstly, we can observe that the percentage increase from the initial mass to the final mass for each time increases higher and higher. By the end of the 10 minute test, we can see that the spaghetti percentage mass increase is almost 200% higher than the initial mass. In addition, we can observe that the time intervals percentages increase gradually as the spaghetti is cooked for longer periods of time.

Graph #1: Percentage mass increase of the spaghetti from before to after being cooked (2, 4, 6, 8, 10 minutes) 2 4 6 8 10

Graph #2: Percentage mass increase of the spaghetti between time intervals (2, 4, 6, 8, 10 minutes) 2 4 6 8 10

Discussion

Conclusion

In conclusion, firstly I can observe from my results that as spaghetti is cooked in boiling water for long periods of time, the mass will increase gradually. From my results, the biggest percentage increase in which when the mass increased the highest was in the interval between 0 and 2 minutes. This is because as the spaghetti is cooked for even a little amount of time, the mass will increase because the starches and proteins would have to get used to a different environment, which in this case, causes a rapid change which causes the spaghetti to go through a change of state, as it converts to



a jelly form. In addition, I could see from my results that as the time was added in terms of cooking, the mass increased in small amounts. This concludes that the process of an increase of mass doesn't instantly occur, and it takes time for the spaghetti to actually gain develop its mass once it has started to cook. We can finalize that as spaghetti is cooked in boiling water for longer periods of time, the percentage mass will increase.

This means that as the starches of the spaghetti are gelatinized for a longer period of time, they convert from a solid, crystalline form to a liquid, soluble form<sup>2</sup>. It can be declared that as the starches gelatinize, the liquid basically thickens. The starch grains absorb the liquids and the spaghetti gains its mass in result to this because the grains swell up to 30 times their original sizes<sup>3</sup>. This indicates that the spaghetti mass increase as it is cooked for longer periods of time. Furthermore, as spaghetti is a carbohydrate it also contains proteins. As the spaghetti is cooked in the boiling water, the proteins coagulated which means that the proteins convert to a thickened semi solid state which is heavier than the initial liquid state. All of these components contribute to why the results occurred and why the mass kept on steadily increasing.

In relation between the independent variable, and the dependent variable I can see very clear relationship regarding the 2 variable after performing this test. I am able to presume that as the time in which the spaghetti is being cooked increases, so does the mass of the spaghetti after being cooked. This means that as the independent variable increases, the dependent variable will always increase in response. I can additionally state that the results

support my hypothesis and the reasons given were effectively shown during the experiment. Firstly, I can claim that my hypothesis is supported by my results as the mass was always increasing as the spaghetti was being cooked for different periods of time. Also, I can see that as I described why I thought my prediction would be correct with a reason involving starches and proteins, I can observe and finalize that the mass of spaghetti will regularly increase if the cooking duration is longer. Finally, in connection with my percentage, I believe that my percentage predictions were nearly spot on, and again the results given were pretty much the same as the outcome which presented itself. Evaluation

#### Reliability of the Procedure

In terms of the reliability of my procedure, I feel that the measuring instruments made the procedure quite reliable but it still cannot be fully trusted and used on a regular basis. I believe that the instruments and apparatus we were using in the procedure were used well in the description and the method was easy to follow. Also, the method could be reliable because the number of readings that I wanted to use in the method was fair to get consistent results. Validity of the Procedure

For the validity of the procedure and method, I believe that my procedure that I wrote up for the experiment was valid. I believe that it was valid because the method was successful as what I wrote up clearly showed what was wished to be measured and it was easily follow able. Also, it was valid as it showed the instruments I wanted to use to gather my results and the conditions of my procedure for my experiment involved fair testing, and

keeping the fixed variables controlled at a constant amount. Reliability of results

In terms of my results, I can observe that my results are not fully reliable and are obviously not very precise. I believe that my results can be reliable to a very small extent, as my results followed a distinct pattern and were proven correct by sources such as the internet. However, I feel that they are not very reliable because as we only had 80 minutes, I felt that the time intervals were too long, which resulted in only one set of results. This means that my results could have been inconsistent, and if I had performed 3 full trials, I believe that I could've obtained a clear average result that could be fully reliable. Validity of results

Although my results were not reliable because not enough results were presented, however I feel that my results presented can be considered as valid. This is because the instruments and apparatus I decided to use were appropriate for measuring my final results that were presented. Also, I made sure everything that I labeled as a fixed variable was kept unchanged. For example, I kept the spaghetti mass initially constant by measuring the mass to 5 grams at all times with the balancing scale. This made sure that my results were valid. Precision involving the data

I believe that my results were quite precise. Although my results only involved time for 1 trial, I can still say that my results were precise as they followed a distinct pattern and as I also asked my peers for their results for comparison, and I can clearly state that my results were almost the identical to my peers results thus proving the fact that my results were precise in

comparison and all the results presented were very similar. Accuracy involving the data

In addition, in terms of accuracy from the data that was presented, I again feel that my results were accurate. This was because I my results followed a straight trend. Also, after research about the growth of mass when spaghetti is cooked and how the starches and proteins combine in the mass gain, I can state that my results were not perfectly correct because there are no correct results, but I can say that the results are similar to my peers results and my results support information produced from the internet. Weaknesses and how they affected my results

Although I can state that my results that were presented were successful and my observations followed a particular pattern, I can definitely say that there was at least 1 or 2 weaknesses or errors that were committed during the process of the experiment. Firstly, I believe in the process of the experiment, my partner and I dropped a little spaghetti which may have affected the results somehow in the test for 8 minutes of duration. Also, when I performed my experiment, I feel that the preparation for the cooking was not prepared very well and maybe 5-10 minutes were wasted as we did not prepare our plan of action very well and it was considered a weakness.

Improvements

As there were some weaknesses and errors that occurred in the process of the investigation, I believe that there are some features and objectives that I can perform in a future lab report to make the process error-free, therefore resulting in accurate and reliable results. Firstly, I believe that when we

handle our materials and when we are to end a particular trial, we should always be prepared before the time would end so we will not be in a rush, and therefore not spilling any ingredients in similarity to what occurred in this particular experiment. In addition, I also believe that another improvement could be planning the action being taken and writing the method and task of plan before the experiment in a future investigation, so no time would be lost and there will be time for the maximum amount of trials possible to gather a range of results. Further Investigation

When I speak about further investigation, I am giving out my ideas that could be linked for future experiments linked to this particular one. For example: 1. Instead of adjusting the time, we could adjust the temperature and we could observe the mass change of the spaghetti and the link between the results. 2. We could also not observe the mass, but can observe the time in which the spaghetti takes to fully cook, and observe the cooking times with temperature of boiling water change. For further investigation, I believe that experiment extensions such as the ideas given above can be alternates for the investigation we prepared, and if any of these ideas are to be investigated, the different results could be compared.

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