

# Boiling Point of Water

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**Question:**

What is the boiling point of water?

**Hypothesis:**

The kinetic theory that states that all molecules are in a constant state of motion and that adding heat will cause them to move faster. When the intermolecular forces are overcome, water will change from a liquid to a gas. Based on this knowledge, it is expected that the boiling point of water will be 100.0 degrees Celsius.

**Comment [Vs1]:** Hypothesis based on background research and prior knowledge. Description of science is more basic than a level 4

**Materials:**

- Tripod
- Bunsen burner
- 400 mL Beaker
- Thermometer
- Tongs

**Comment [Vs2]:** Missing retort stand

**Procedure:**

1. Pour 250 mL of distilled water into a beaker.
2. Place thermometer in beaker and record initial temperature.
3. Place beaker onto tripod. Light Bunsen burner
4. Record water temperature every 2 minutes until water boils and the same temperature is recorded for 2 observations.
5. Turn Bunsen burner off and use tongs to carefully remove beaker.
6. Repeat steps 1 – 5 twice.

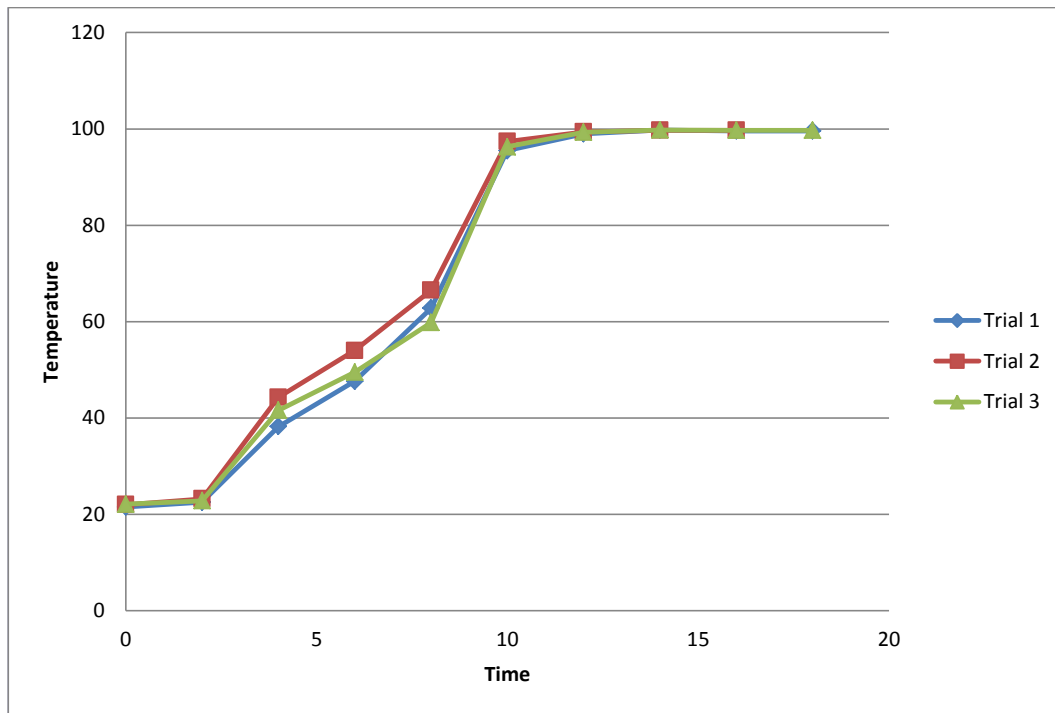
**Comment [Vs3]:** Procedure is written in a step-wise fashion; includes details like units of measurement, type of water to be used, when to end timing, and safety measures for transfer of beaker; missing beaker size.

**Results:**

Time (min)	Temperature (°C)		
	Trial 1	Trial 2	Trial 3
0	21.5	22.0	22.1
2	22.5	23.2	22.8
4	38.2	44.3	41.6
6	47.6	54.0	49.5
8	62.8	66.5	59.8
10	95.5	97.4	96.3
12	99.0	99.4	99.3
14	99.8	99.7	99.8
16	99.6	99.7	99.7
18	99.6		99.7

**Comment [Vs4]:** Table is missing title; includes units of measure; measurements are in correct significant digits; table formatting needs to be considered

**Graph:**



**Comment [Vs5]:** Graph is missing main title; includes legend; axes titles missing units of measure

**Observations:**

Small bubbles could be seen at the bottom of the beaker prior to boiling.

**Comment [Vs6]:** Observation is related to experimental results; less detail than a level 4

**Discussion:**

Water can be found in three states; solid, liquid, or gas. Intermolecular forces hold water molecules together. When water reaches its boiling point, it changes from a liquid to a gas. For this to happen, the intermolecular forces between water molecules must be broken. According to the kinetic theory, molecules are in constant motion. Increasing the temperature of the water will increase the movement of water molecules. This will weaken the bonds between water molecules and they break apart. Water then changes from a liquid to steam. This phase change can be measured by taking the temperature of the water as heat is added.

**Comment [Vs7]:** Provides a good description of the basic science involved in the experiment. Includes how the measurement of temperature is used to determine phase change of water.

The average temperature at which water boiled was found to be 99.7 degrees Celsius. The hypothesis that the water would boil at 100 degrees Celsius can be accepted based on the results of this experiment. The graph of results shows that in the first few minutes, the temperature increase was minimal but there was an increase in temperature early in the experiment. There was a gradual increase in temperatures over the next few minutes. Another increase in temperature can be seen 10 minutes into the experiment. The temperature increase slows down and becomes constant. The water underwent a phase change in to a gas (i.e. steam) at that time.

**Comment [Vs8]:** Provides a good summary of results; hypothesis is accepted based on results; discussion refers to graph and refers patterns/ trends in data; discussion does NOT relate results to basic science involved in experiment. Discussion section written in 3<sup>rd</sup> person/ past tense.

The test results can be improved by using distilled water. This would reduce the amount of impurities in the water that can affect boiling point.

**Conclusion:**

The results support the idea that water will come to a boil at 100 degrees Celsius. It would be interesting to find out in future tests what heating methods would bring water to a boil the fastest.

**Comment [Vs9]:** Satisfactory summary of overall results; includes idea for further testing but lacks some detail. Conclusion written in 3<sup>rd</sup> person/ past tense.