Accuracy & Precision: Scenario A

A group of students each took turns measuring the temperature of a beaker of boiling water. Given a thermometer has an uncertainty of ±0.2 degrees, the actual accepted boiling point of pure water is 100 ±0.2 °C.

Student 1 recorded: **97.5 °C**

Student 2 recorded: **97.1 °C**

Student 3 recorded: **97.2 °C**

Make a Claim

- Look at the data points and the actual value.
- Notice the upper and lower limit of the uncertainty. **(±0.2 degrees)**
- Make a hypothesis (your best guess) as to whether the data points are close to each other.
- Ask yourself if the data is close to the actual true answer.

Data Points

97.5 °C
97.1 °C
97.2 °C

Actual Boiling Point

100 °C ±0.2 degrees

Option 1: The data is both PRECISE and ACCURATE.

Option 2: The data is PRECISE but not ACCURATE.

Option 3: The data is not PRECISE, but it is ACCURATE.

Option 2: The data is neither PRECISE or ACCURATE.

Check for Precision: Show Evidence

- To find precision first calculate the mean " average" value.

Student 1 recorded 97.5 °C
Student 2 recorded 97.1 °C
Student 3 recorded + 97.2 °C
291.8 °C ÷ 3 = 97.2*666*

- Next apply the uncertainty to the mean "average" value.

97.3 ± 0.2 means … 97.3 + 0.2 = 97.5 is the upper limit
97.3 – 0.2 = 97.1 is the lower limit

- Finally, ask are the data points within the limit of uncertainty? Explain your reasoning…

Explain Your Reasoning

- The range for the lower and upper limit of uncertainty in the precision measurements was **97.1 to 97.5**. Since all the data points exist within this range, the data is **PRECISE**.

Student 1 recorded: **97.5 °C**

Student 2 recorded: **97.1 °C**

Student 3 recorded: **97.2 °C**

Check for Accuracy

- To determine accuracy of data, compare the mean "average" value to the accepted "true" value.

The mean "average" value is **97.3 °C**

The accepted "true" value is **100 °C**

- Next apply the uncertainty to the accepted "true value" to determine upper and lower limit.

100 ± 0.2 means … **100 + 0.2 = 100.2 is the upper limit**

100 – 0.2 = 99.8 is the lower limit

- Is the mean "average" value within the limit of uncertainty? Explain your reasoning…

Explain Your Reasoning

- The range for the lower and upper limit of uncertainty in the accuracy measurement was **99.8 to 100.2**. Since the mean "average" value is NOT inside this range, the data is **NOT ACCURATE**.

97.5 °C
97.1 °C
+ 97.2 °C
291.8 °C ÷ 3 = *97.2666*

The mean "average" value is too low.