

MEASUREMENTS AND CALCULATIONS

ANSWERS:

HOMEWORK QUESTIONS:

4a. Which student's data is more PRECISE? Explain your answer.

Student 1: 72.25 grams, 73.34 grams, 73.02 grams, 73.25 grams

Student 2: 72.01 grams, 71.99 grams, 72.00 grams, 71.98 grams

Answer: *Student 2's data is more precise. The values for the four masses are within 0.03 grams. Precision deals with "how close" the measurements are to each another. Student 1's data is over one gram different (1.09 gram).*

4b. Using a balance that always reads 0.50 grams too low, a student obtained the mass of a beaker to be 50.62 grams. The student then added some sugar to the beaker and, using the same balance, obtained a total mass of 69.88 grams. The student recorded the mass of the sugar as 19.26 grams. Is the mass of the sugar inaccurate by 0.50 grams? Why or why not?

Answer: *The mass of the sugar IS correct (19.26 grams). Although the balance reads all measurements a half a gram too low, the error is corrected when the beaker is weighed (first). Once the balance reads the mass of the beaker, all additional mass adjustments have been corrected. The balance will not read "each" item as a half a gram too low – only the total mass.*

Example, go home tonight and "adjust" your home scale to read 10 pounds too low. Obtain a heavy object that you know the weight (a ten pound dumbbell for example). Step on the scale and weigh yourself – take note of the weight (your body only) read on the scale. Now add the additional weight (dumbbell) to your own weight (pick up the item and hold it). Question, does the object's weight get added to your own weight? Or did the scale subtract an additional ten pounds to the object you added?

4c. Calculate the percent error for the data.

Sample A: "measured value" = 35.75 grams, "true value" = 36.88 grams.

Answer:

$$\% \text{ Error} = \frac{| \text{measured value} - \text{true value} |}{\text{true value}} \times 100$$

$$\% \text{ Error} = \frac{| 35.75 \text{ g} - 36.88 \text{ g} |}{36.88 \text{ g}} \times 100 = 3.06 \%$$