

Purpose How do chemists
measure exactly how
close their result was?

Warmup Copy any three
chewing gum results into
a table

<u>LAB RESULT</u>	<u>PERCENT ERROR</u>
68%	+25.9 +26%
74%	+37.0 +37%
38%	-29.6 -30%

#1 FORMULA For Percent error:

$$\% \text{ error} = \frac{\left(\begin{array}{l} \text{LAB} \\ \text{result} \end{array} - \begin{array}{l} \text{Accepted} \\ \text{result} \end{array} \right)}{\text{Accepted Result}} \times 100$$

Note: "Theoretical results" which
are calculated, may be
used as the "accepted result"
for calculating percent error

#2 WRITING CALCULATIONS ON A SINGLE LINE HELPS TO UNDERSTAND ERRORS. (like #1 in tonight's homework)

Part 1: Solving a concentration problem in a single line.

It will often be helpful to set up our story problems using a single line calculation.

1. A solution was mixed up that contained 344 grams of sodium chloride (table salt) per 1700 mL of aqueous solution. If a chemist took 6 squirts of this substance using a pipette that holds 1.3 mL and then she evaporated it in a crucible, how many grams of salt should she expect to obtain?

$$6 \text{ squirts} \times \left(\frac{1.3 \text{ mL}}{1 \text{ squirt}} \right) \left(\frac{344 \text{ grams}}{1700 \text{ mL}} \right) = 1.6 \text{ grams salt}$$

← theoretical value

#3 SOME POSSIBLE ERRORS

this error	causes this
too few squirts	theoretical value too small
BRINE SOLUTION EVAPORATED FOR DAYS	theoretical too large

this error	makes the result
① Partner said 4 squirts but did three.	too small!
② the brine was evaporating for days	too large!

a few hints for solving tonight's homework

CleMisFry: <http://genest.weebly.com>

Stop in for help every day at lunch and Tues. & Thurs after school!

Period _____

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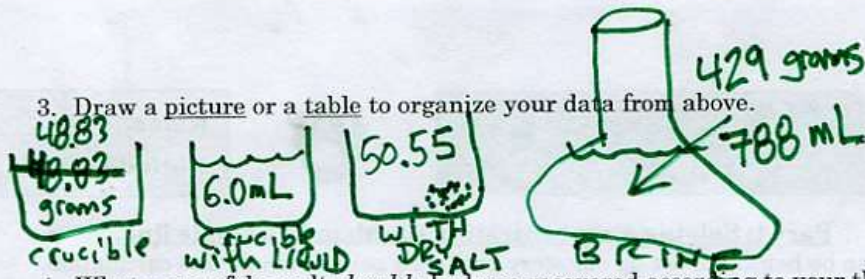
theoretical value

2. A solution was mixed up that contained 40.6 grams of sodium chloride (table salt) per 568 mL of aqueous solution. If a chemist took 5 squirts of this substance using a pipette that holds 2.1 mL and then she evaporated it in a crucible, how many grams of salt should she expect to obtain?

Part 2: Deciding what effect an error has



Dr. Roosevelt mixed up some brine by stirring 429 grams of sodium chloride into enough water to make 788 mL of solution. She then took a clean 48.83 gram crucible filled and filled it by completely emptying a pipette 5 times into the crucible (a pipette that holds 1.2 mL). Heating this until all of the water evaporated resulted in a dry crust of salt in her crucible. Her cooled crucible, with salt, weighed 50.55 grams.



4. What mass of dry salt *should* she have recovered according to your theoretical calculations? (Set up your calculation in a single line if possible, like we did in class--it will make the next part *much* easier to solve.)

SOLVE LIKE #1

[Faint handwritten notes and a diagram of a flask are visible in the background.]

5. Based on her scale readings, how many grams of salt did she actually recover?

SUBTRACT TWO CRUCIBLES

6. Did she recover more or less than was expected in a perfect experiment?

Look carefully at your answer for 5 and consider the following possibilities.

7. During heating, tipping occurred, causing some brine solution to spill out from the crucible!
This would make her result accidentally (too small / still accurate / too large)!
8. Heating stopped too soon. The stuff was still wet when it got weighed.
This would make her result accidentally (too small / still accurate / too large)!
9. During the first weighing of the empty crucible, the scale wasn't tared (zeroed). The scale read 0.2 g even with nothing on it.
This would make her result accidentally (too small / still accurate / too large)!
10. Popping and sputtering occurred and much liquid shot out during heating.
This would make her result accidentally (too small / still accurate / too large)!
11. Two grams of sand from 1998 was stuck in the old crucible. It remained there for the entire experiment
This would make her result accidentally (too small / still accurate / too large)!
12. The pipette, when you re-checked it, was *actually* a 0.9 mL pipette.
This would make her result accidentally (too small / still accurate / too large)!