

## A Warning about Calculators

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Let's enter this number:

$$2.45 \times 10^{-9}$$

into the calculator.

Here is the RIGHT way:

- 1) Press "2," the decimal button, then "4" and then "5"
- 2) Press a key marked either "EXP" or "EE"
- 3) Press "9," then the sign change key (usually marked "+/-").

Here is the typical wrong way:

- 1) Press "2," the decimal button, then "4" and then "5"
- \*\*\*2) Press the times button ("x") and then enter "10" (by pressing "1" then "0")\*\*\*
- 3) Press a key marked either "EXP" or "EE"
- 4) Press "9," then the sign change key (usually marked "+/-").

\*\*\*That step #2 is WRONG!!\*\*\* Don't do it. Pressing "EXP" means "times ten to the power of." The step #2 (where you enter "times 10") means you entered  $2.45 \times 10^{-8}$ . Try entering it the wrong way and then pressing the "equals" button. See?

The ChemTeam has had this happen in the classroom:

"Mr. Park, you did that problem wrong. See, when I do it, I get <some answer> and yours is too small by a factor of ten."

You can imagine the ChemTeam's unmitigated glee when this happens!!

Let's use  $2.45 \times 10^{-8}$  to highlight another problem.

The calculator puts the number into shorthand on the screen.

$2.45 \times 10^{-8}$  is written in scientific notation. Here is how it is displayed on the calculator screen:

$$2.45^{-8}$$

However, do not, DO NOT write it that way on paper. DON'T DO IT.  $2.45 \times 10^{-8}$  and  $2.45^{-8}$  are different numbers!!

$2.45^{-8}$  is calculator shorthand for  $2.45 \times 10^{-8}$ .

Make sure you include the "x 10" when you make the transfer from screen to paper.