

Significant Figures

Chem20, Elementary Chemistry

Significant Figures are a way to express uncertainty in a measurement as well as create a system of rounding that is universally understood.

TO IDENTIFY SIGNIFICANT FIGURES

Non-zero integers are **ALWAYS** significant ($3741 = 4$ significant figures)

Zeroes are **SOMETIMES** significant ($0.1090 = 4$ sig. figs.)

Leading (to the left) zeroes are **NEVER** significant ($0.00133 = 3$ sig. figs.)

Interior (in the middle) zeroes are **ALWAYS** significant ($4808 = 4$ sig. figs.)

Trailing (to the right) zeroes are **SOMETIMES** significant.

*If a **decimal point** is written* → significant ($58.0 = 3$ sig. figs.)

*If there is **no decimal point** written* → not significant ($580 = 2$ sig. figs.)

TO USE SIGNIFICANT FIGURES IN CALCULATIONS

Multiplication & Division: Answer keeps the same **NUMBER** as the factor with the fewest.

$$0.62 \text{ (2 sig. figs.)} \times 3101 \text{ (4 sig. figs.)} = 1922 \rightarrow 1900 \text{ (2 sig. figs.)}$$

$$314 \text{ (3 sig. figs.)} \div 0.10384 \text{ (5 sig. figs.)} = 3023 \rightarrow 3020 \text{ (3 sig. figs.)}$$

Addition & Subtraction: Answer keeps the same **PLACE** as the factor with the smallest.

$$310 \text{ (tens position)} + 6.4 \text{ (tenths position)} = 316.4 \rightarrow 320 \text{ (tens position)}$$

$$6.487 \text{ (thousandths position)} - 10.4 \text{ (tenths position)} \\ = -3.913 \rightarrow -3.9 \text{ (tenths position)}$$

For **multistep** calculations, track significant figures for each step, but do not round until the very end.

$$6.43 \times 2.8 + 10.56 =$$

$$(1) 6.43 \text{ (3 sig. figs.)} \times 2.8 \text{ (2 sig. figs.)} = 18.004 \text{ (2 sig. figs.)}$$

$$(2) 18.004 \text{ (ones position)} + 10.56 \text{ (hundredths)} = 28.564 \text{ (ones position)} \rightarrow 29$$

$$3.56 - 1.85 \times 0.6 =$$

$$(1) 1.85 \text{ (3 sig. figs.)} \times 0.6 \text{ (1 sig. figs.)} = 1.11 \text{ (1 sig. fig.)}$$

$$(2) 3.56 \text{ (hundredths)} - 1.11 \text{ (ones position)} = 2.45 \text{ (ones position)} \rightarrow 2$$