LOGS: MATHEMATICAL RELATIONSHIPS AND SIGNIFICANT FIGURES

$$log (ab) = log (a) + log (b)$$
$$log(a/b) = log(a) - log(b)$$
$$log (ab) = b log (a)$$
$$log 1 = 0$$
antilog of x = 10^x

A log number has two parts: the characteristic and the mantissa.

- Characteristic is to the left of the decimal place and indicates the order of magnitude.
- Mantissa is to the right of the decimal place.

$$log (2.216 \times 10^{10}) = 10.3456$$
characteristic mantissa

$$\log (2.216 \times 10^{10}) = \log (2.216) + \log (10^{10}) = 0.3456 + (10) = 10.3456$$

When taking a log of a number, the mantissa should have the same number of digits as the number of significant digits in the original number.

Examples:

$$\log (5.12 \times 10^{-5}) = \log (5.12) + \log (10^{-5}) = 0.709 + (-5) = -4.291$$
$$\log (5.12 \times 10^{-6}) = \log (5.12) + \log (10^{-6}) = 0.709 + (-6) = -5.291$$
$$\log (5 \times 10^{-5}) = -4.3$$
$$\log (5.1 \times 10^{-5}) = -4.29$$

When taking an antilog, count the digits in the matissa – that's the number of significant figures your answer should have.

$$10^{-4.3} = 5 \times 10^{-5}$$
 $10^{-4.291} = 5.12 \times 10^{-5}$

SIGNIFICANT FIGURES & OPERATIONS

When making a measurement, always include all certain digits plus one uncertain digit. All of these digits are significant.

The least significant digit is the *only* one with uncertainty.

Addition and Subtraction

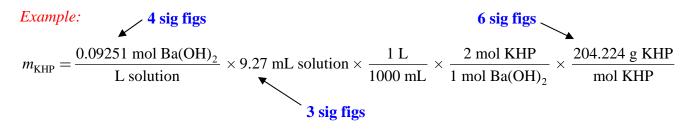
When adding and subtracting, look at the uncertain digits in the numbers you are combining and consider that your answer can only have one uncertain digit.

Example:

Can only have one uncertain digit in answer so rounded to the tenths place.

Multiplication and Division

When multiplying and dividing, your answer has the same number of significant figures as the number in the calculation with the fewest of significant figures.



 $m_{\rm KHP} = 0.350 \text{ g KHP}$

Scalars (like 2 mol KHP) and conversion factors (like 1 L / 1000 mL) are not considered when determining sig figs. They are considered to be *exact* and therefore have no uncertainty.

The answer should be reported with 3 sig figs (as shown).