

CHEM 100

EXTRA Problems : scientific notation, pph (%), ppm, ppb

1. Express the following numbers in scientific notation:

- 1 10^0
- 10 10^1
- 100 10^2
- 1000 10^3

2. Convert the following concentrations that are expressed as a percent into parts per million (ppm):

1% $\frac{1}{100} = \frac{x}{10^6}$

$x = 10^4$

$10,000 \text{ ppm}$

10^7 ppb

0.0035% $\frac{0.0035}{100} = \frac{x}{10^6}$

$x = \frac{3.5 \times 10^{-3} \times 10^6}{100} = \frac{3.5 \times 10^3}{10^2} = 35 \text{ ppm}$

35 ppm

$35 \times 10^3 \text{ ppb}$

$3.5 \times 10^4 \text{ ppb}$

$8.5 \times 10^{-3}\%$ $\frac{8.5 \times 10^{-3}}{100} = \frac{x}{10^6}$

$x = \frac{8.5 \times 10^3}{10^2} = 85 \text{ ppm}$

85 ppm

or $8.5 \times 10^4 \text{ ppb}$

0.000054% $\frac{5.4 \times 10^{-5}}{100} = \frac{x}{10^6}$

$x = 0.54 \text{ ppm}$

↑ same

$5.4 \times 10^{-5}\%$ $x = 0.54 \text{ ppm}$

$\frac{0.54}{10^6} = \frac{x}{10^9}$
 $x = 0.54 \times 10^3 \text{ ppb}$
 or
 540 ppb

Would it be preferable to express any of the values that you just calculated as parts per billion instead of parts per million?

3. Convert the following concentrations that are expressed as ppb into a percent.

1 ppb $\frac{1}{10^9} = \frac{x}{10^2}$

$x = 10^{-7} \%$

53 ppb $\frac{53}{10^9} = \frac{x}{10^2}$

$x = 53 \times 10^{-7} \%$
 $= 5.3 \times 10^{-6} \%$

100.3 ppb $\frac{100.3}{10^9} = \frac{x}{10^2}$

$x = 100.3 \times 10^{-7}$
 $= 1.003 \times 10^{-5}$

Conversion into

$\frac{1}{10^9} = \frac{x}{10^6}$ $x = 10^{-3} \text{ ppm}$

$\frac{53}{10^9} = \frac{x}{10^6}$ $x = 53 \times 10^{-3}$
 $x = 0.053 \text{ ppm}$

$\frac{100.3}{10^9} = \frac{x}{10^6}$

$x = 100.3 \times 10^{-3}$

$x = 0.1003 \text{ ppm}$