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 ppm 10^7 ppb

0.0035% $\frac{0.0035}{100} = \frac{x}{10^6}$ $x = \frac{3.5\times10^{-3}\times10^6}{100} = \frac{3.5\times10^3}{10^2} =$ 35 ppm 35×10^3 ppb 3.5×10^4 ppb

8.5×10^{-3}% $\frac{8.5\times10^{-3}}{100} = \frac{x}{10^6}$ $x = \frac{8.5\times10^3}{10^2} =$ 85 ppm or 8.5×10^4 ppb

0.000054% $\frac{5.4\times10^{-5}}{100} = \frac{x}{10^6}$ $x = 0.54$ ppm

Same ↕

5.4×10^{-5}% $x = 0.54$ ppm

ppb?

$\frac{0.54}{10^6} = \frac{x}{10^9}$

$x = 0.54\times10^3$ 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.

Conversion into ppm

1 ppb $\frac{1}{10^9} = \frac{x}{10^2}$ $x = 10^{-7}$ % $\frac{1}{10^9} = \frac{x}{10^6}$ $x = 10^{-3}$ ppm

53 ppb $\frac{53}{10^9} = \frac{x}{10^2}$ $x = 53\times10^{-7}$ % $= 5.3\times10^{-6}$ % $\frac{53}{10^9} = \frac{x}{10^6}$ $x = 53\times10^{-3}$ $x = 0.053$ ppm

100.3 ppb $\frac{100.3}{10^9} = \frac{x}{10^2}$ $x = 100.3\times10^{-7} = 1.003\times10^{-5}$ $\frac{100.3}{10^9} = \frac{x}{10^6}$ $x = 100.3\times10^{-3}$ $x = 0.1003$ ppm