Doing Metric Conversions (more examples)

I assume you already know the following:

1 GHz = 1×10^{9} Hz	1 Mg = 1×10^{6} g	1 km = 1×10^{3} m	
1 cm = 1×10^{-2} m	1 mA = 1×10^{-3} A	1 μC = 1×10^{-6} C	1 nm = 1×10^{-9} m

Example 1: convert $4.98\times10^{3}\,\text{cHz}$ to MHz

Convert to base units. $\dfrac{4.98\times10^{3}\times10^{-2}\,\text{Hz}}{1}$

Prepare for the second conversion. $\left(\dfrac{4.98\times10^{3}\times10^{-2}\,\text{Hz}}{1}\right)\left(\dfrac{1\ \text{MHz}}{1\ \text{MHz}}\right)$ If this method confuses you, see below.

Change the bottom to Hz, so they cancel. $\left(\dfrac{4.98\times10\,\text{Hz}}{1}\right)\left(\dfrac{1\ \text{MHz}}{1\times10^{6}\,\text{Hz}}\right)$

Exponents change signs when they move up or down in a fraction. $\left(\dfrac{4.98\times10^{3}\times10^{-2}\,\text{Hz}}{1}\right)\left(\dfrac{1\times10^{-6}\ \text{MHz}}{1}\right)$

Add exponents. $4.98\times10^{1-6}\ \text{MHz}$

Answer. $4.98\times10^{-5}\ \text{MHz}$

The other option for the second conversion is to memorize the following:
1 Giga = 1×10^{9} Base Units (or 1 billion)
1 Mega = 1×10^{6} Base Units (or 1 million)
1 Kilo = 1×10^{3} Base Units (or 1 thousand)
1 Base Unit = 1×10^{2} Centi (or 100)
1 Base Unit = 1×10^{3} Milli (or 1000)
1 Base Unit = 1×10^{6} micro (μ) (or 1 million)
1 Base Unit = 1×10^{9} nano (or 1 billion)

Example 2: convert $8.2\times10^{-4}\,\text{km}$ to μm

Convert to base units. $\dfrac{8.2\times10^{-4}\times10^{3}\,\text{m}}{1}$

Add exponents and prepare the second conversion. $\left(\dfrac{8.2\times10^{-1}\,\text{m}}{1}\right)\left(\dfrac{10^{6}\ \mu\text{m}}{1\ \text{m}}\right)$

Add exponents $\left(\dfrac{8.2\times10^{-1+6}\,\mu\text{m}}{1}\right)$

Answer. $8.2\times10^{5}\,\mu\text{m}$

Either way is fine by me as long as you can do it. Personally, I think the second way is easier. - Murray

Do these examples: (answers on the back)

1. 4.08×10^{8} μC to kC

2. 0.56 mg to kg

3. 6.08 nm to cm

4. 2.27×10^{-12} kC to μC

5. 0.0875 cm to km

6. 1.94×10^{-8} MHz to mHz

7. 0.35 μg to kg

8. 3.81×10^{15} nm to Gm

1. 4.08×10^{8} μC to kC

$$\left(\frac{4.08\times10^{8}\times10^{-6}\,C}{1}\right)\left(\frac{1\ kC}{10^{3}\ C}\right) = 4.08\times10^{2}\times10^{-3}\,C = 4.08\times10^{-1}\,C$$

2. 0.56 mg to kg

$$\left(\frac{.56\times10^{-3}\,g}{1}\right)\left(\frac{kg}{10^{3}\,g}\right) = .56\times10^{-3}\times10^{-3}\,kg = .56\times10^{-6}\,kg$$

you can stop here

or $5.6\times10^{-1}\times10^{-6} = 5.6\times10^{-7}$ kg ← in correct sci. Not.

3. 6.08 nm to cm

$$\frac{6.08\times10^{-9}\,m}{1}\left(\frac{10^{2}\,cm}{1\ m}\right) = 6.08\times10^{-7}\,cm$$

4. 2.27×10^{-12} kC to μC

$$\left(\frac{2.27\times10^{-12}\times10^{3}\,C}{1}\right)\left(\frac{10^{6}\,mC}{1\ C}\right) = 2.27\times10^{-3}\,mC$$

5. 0.0875 cm to km

$$\left(\frac{.0875\times10^{-2}\,m}{1}\right)\left(\frac{km}{10^{3}\ m}\right) = .0875\times10^{-2}\times10^{-3}\,km = .0875\times10^{-5}\,km$$

OR you can stop here

$8.75\times10^{-2}\times10^{-5}\,km = 8.75\times10^{-7}\,km$ ← sci. not.

6. 1.94×10^{-8} MHz to mHz

$$\left(\frac{1.94\times10^{-8}\times10^{6}\,Hz}{1}\right)\left(\frac{10^{3}\ mHz}{1\ Hz}\right) = 1.94\times10^{-2+3}$$

$= 1.94\times10\ mHz$ or $19.4\ Hz$

7. 0.35 μg to kg

$$\left(\frac{.35\times10^{-6}\,g}{1}\right)\left(\frac{kg}{10^{3}\,g}\right) = .35\times10^{-6-3}\,kg = .35\times10^{-9}\,kg$$ ☆

(or $3.5\times10^{-1}\times10^{-9} = 3.5\times10^{-10}$ kg)

8. 3.81×10^{15} nm to Gm

$$\left(\frac{3.81\times10^{15}\times10^{-9}\,m}{1}\right)\left(\frac{1\ Gm}{10^{9}\ m}\right) = 3.81\times10^{6}\times10^{-9}\,Gm$$

$$= 3.81\times10^{-3}\,Gm$$