WERB "cheat sheet"

For complete SI and usage information: http://physics.nist.gov/Pubs/SP811/contents.html

1) Don't forget the **commercial product disclaimer** (necessary if names of commercial enterprises are mentioned, e.g.**,** *Keithley Instruments***):**

Long version:

Certain trade names and company products are identified in order to specify adequately the experimental procedure. In no case does such identification imply recommendation or endorsement by the National Institute of Standards and Technology, nor does it imply that the products are necessarily the best for the purpose.

Short version:

The identification of any commercial product or trade name does not imply endorsement or recommendation by the National Institute of Standards and Technology.

2) Don't forget to give an explanation of **what uncertainties/error bars represent** (e.g., 1σ, 2σ, 95 % confidence interval, etc.) For example, in the text describing a figure add a statement that says: *Error bars represent* ± 1σ.

Some Common Errors	**Correct Way**
10 wt (mol/at) %	a mass fraction (mole fraction/atomic fraction) of 10 %
hyphens to indicate ranges, e.g., 3-5 nm	3 nm to 5 nm, or (3 to 5) nm
A=B+C	A = B + C (spaces needed.)
Spaces before units and %: 5kg, 10%	5 kg, 10 %
~ to represent "approx."	≈
ppm (except for NMR), ppb, etc.	μg/g, etc.
M for molarity - not SI	mol/L
Å - "strongly discouraged"	nm (but Å has been ruled OK for div. 856!)

NIST requires us to replace cgs (emu) with SI units (even though the former may be commonly used). Some useful conversions are given below.

Magnetic field intensity: *H*

1 Oe = **(1000/4π) A/m** (Note: If your graph axis is labled *H* (Oe), it may be easier to change it to $\mu_o H$, because then, for example, 1000 Oe converts to 0.1 T.)

Magnetic flux density: *B*

(Note: in cgs: $B = H + 4\pi M$. In this formula, *B* and *M* have the same units, G, while *H* is in Oe. But in SI: $B = \mu_o(H+M)$, where $\mu_o = 4\pi 10^{-7}$ N/A^2 , so *H* and *M* have the same units.)

1 G = $\mathbf{10^{-4}}$ **T**

Magnetic moment: *m*

1 emu = 1 G cm^3 = $\mathbf{10^{-3}}$ **A m^2**

Volume magnetization *M* (magnetic mom. per unit vol. : *m*/*V*)Note that from this definition that *M* is measured in 1 emu/cm^3 = 1 G.

M = emu/cm^3 = $\mathbf{10^3}$ **A/m**

Mass magnetization σ (magnetic moment per unit mass)

σ=1 emu/g = **1 A m^2/kg** (Note that $\sigma = M/\rho$, where ρ = density (mass/volume).)

Volume magnetic susceptibility $\kappa = M/H$: dimensionless in both cgs and SI.

κ = emu/(Oe cm^3) = [dimensionless], **1 emu/(Oe cm^3) = 4π (A/m)/(A/m) = 4π**

Mass magnetic susceptibility $\chi = \sigma/H$ 1 emu/(g Oe) = $\mathbf{4\pi\ 10^{-3}}$ **m^3/kg**

Molar magnetic susceptibility $\chi_m = M V_m/H$, where V_m is the volume per gram mole. 1 emu/(mol Oe) = $\mathbf{4\pi\ 10^{-6}}$ **m^3/mol**