

VIII. METRIC SYSTEM CONVERSIONS:

Follow along and complete these notes as you view video “#8: Dimensional Analysis: Metric Conversions” at <https://edpuzzle.com>.

- The US is one of only 3 countries not using the Metric System
- Science uses SI units, based on the Metric System

- Universally accepted and understood
- Conversions between units of different sizes involve only _____
 - Never have to memorize—always get conversion table
- Prefix indicates _____
- 1 is with the _____, exponent is with the _____
 - Prefixes are _____
 - Examples:
 -
 -
 -

Unit Prefixes: Can be used with <i>any unit</i> (m, L, g, etc.)		
Prefix	Meaning	Examples (with meters)
tera- (T)	1×10^{12}	1 Tm = 10^{12} m
giga- (G)	1×10^9	1 Gm = 10^9 m
mega- (M)	1×10^6	1 Mm = 10^6 m
kilo- (k)	1×10^3	1 km = 10^3 m (1000 m)
–	1×10^0	(1 m = 1 m)
deci- (d)	1×10^{-1}	1 dm = 10^{-1} m (<i>10 dm = 1 m</i>)
centi- (c)	1×10^{-2}	1 cm = 10^{-2} m (10^2 cm = 1 m)
milli- (m)	1×10^{-3}	1 mm = 10^{-3} m (10^3 mm = 1 m)
micro- (μ)	1×10^{-6}	1 μm = 10^{-6} m (10^6 μm = 1 m)
nano- (n)	1×10^{-9}	1 nm = 10^{-9} m (10^9 nm = 1 m)
pico- (p)	1×10^{-12}	1 pm = 10^{-12} m (<i>10^{12} pm = 1 m</i>)
femto- (f)	1×10^{-15}	1 fm = 10^{-15} m (<i>10^{15} fm = 1 m</i>)

LET’S PRACTICE!!!!!!!!!!!!!!!

A. ONE STEP CONVERSIONS

- Converting between a prefix and the base unit, only one step is needed
 - Use table to determine conversion factor from starting equality

Example. Current computer transistor gate oxides are approaching 32 nm (nanometers) in width. How many meters is this?

Example. How many microliters (μL) are there in 4.56×10^{-3} liters?



You MUST _____ for full credit!



B. Prefix to Prefix — REQUIRES TWO STEPS!

- Prefix-Prefix conversions require two steps
 - Use two conversion factors using the base unit tied to the starting and ending prefixes

Example. The Joule (J) is the SI unit of energy. How many kJ (kiloJoules) are equivalent to 367 mJ (milliJoules)?

Example. A Blu-ray player uses a blue laser beam with a wavelength of 405 nm. How many cm is this equal to?

C. YOUR TURN!

Example. A student has a mass of 58.97 kg. How many grams does this represent?

Example. Convert 6.99×10^8 μg (micrograms) to cg.

D. New Method for Prefix Conversions

- In this method, prefixes are treated not as part of the unit but as _____.
- First the given prefix will be _____
- Next we'll multiply by the definition (value) of the _____, effectively multiplying by 1.
- A _____ will then give us the value of the number with the new prefix.

Example: Prefix to Prefix: Convert 768 mg to μg _____

- 1) Use the table to replace the prefix with its factor. $\text{m} = 10^{-3}$, so write: _____
- 2) Find the factor for the desired unit and insert its inverse \times itself before the unit, effectively multiplying by 1. $\mu = 10^{-6}$, so write: _____
- 3) Regroup the factors to have the desired factor alone with the unit: _____
- 4) Perform the multiplication in the parentheses: _____
- 5) Replace the numerical factor of the desired prefix with its prefix ($10^{-6} = \mu$): _____
 - While this is not considered valid *scientific notation*, the value is correct. If you want to convert it to valid scientific notation (which you do not have to do), move the decimal point two to the left and increase the exponent by two: _____

Example: Prefix to Base: Convert 8.74×10^2 MHz to Hz _____

- 1) Change prefix to factor ($M = 10^6$): _____
- 2) Going to the base unit there is _____
- 3) Multiply exponents (if needed): _____
(rewrite if needed/wanted for proper scientific notation)

Example: Base to Prefix: Convert 3.28×10^{-2} L to mL _____

- 1) Starting from the base unit there is _____
- 2) Multiply by inverse of factor of new prefix and itself: _____
- 3) Regroup factors: _____
- 4) Multiply exponents (if needed): _____
- 5) Replace factor with new prefix ($10^{-3} = m$): _____
- 6) Rewrite if desired: _____

E. Your Turn

Example: Convert 41.3 km to nm: _____

Example 5: Convert 548.2 ns to s: _____

Example 6: Convert 254 J to kJ: _____