Common Conversions & Estimations

Measurement and the SI system

Chemistry & Physics use S.I. (metric) units

We will not be using the "Imperial System" you've grown up with.

95% of the world uses the Metric System.. So we need to speak the same language.

Countries using Imperial System: United States, Liberia, and Myanmar

Imperial	Metric
1 inch	about 2.5 cm
1 foot	30 cm
1 yard	almost 1 m
1 mile	just over 1.5 km
1 ounce	about 30 g
1 pound	about half a kg
1 stone	about 6.5 kg
1 pint	just over half a litre
1 gallon	about 4.5 litres

Sci Notation Warm Up

Complete the chart with the missing values in Sci Notation or Standard Notation.

Sci Notation template:

$\#.\#\# \times 10^{(+/-)\,\#}$

Sci Notation	Standard
	2,400
5×10^{-1}	
3.5×10^{0}	
	.00919
1×10^{2}	

Metric Units in Physics vs Chem

Introductory SI Units		
Measurement	**Physics Units**	**Chem Units**
Distance	Meters (m)	Centimeters (cm)
Mass	Kilograms (kg)	Grams (g)

In Physics, we are studying much larger and heavier quantities than in Chemistry so it is important for us to explore their conversions.

Conversion 1 - Using Prefixes Table

In science, a **prefix** is a term attached to the front of a word that implies a factor upon which a root unit is measured.

Recall from Sci Notation lesson:

Positive exponent = _____

Negative exponent = _____

As we look down the table, the measurement gets smaller.

As we look up the table, the measurement gets larger.

Prefixes for Powers of 10		
Prefix	**Symbol**	**Notation**
tera	T	10^{12}
giga	G	10^{9}
mega	M	10^{6}
kilo	k	10^{3}
deci	d	10^{-1}
centi	c	10^{-2}
milli	m	10^{-3}
micro	μ	10^{-6}
nano	n	10^{-9}
pico	p	10^{-12}

How to Read the Prefix Chart

The base unit may change depending on the context. However, the prefixes can be assigned to any unit.

Example:

4K televisions have 4,000 horizontal pixels

4 kilo of anything is 4,000 of that thing

8 gigabytes = 8 GB = 8 x 10^9 bytes

8,000,000,000 bytes or 8 billion bytes

Prefixes for Powers of 10		
Prefix	**Symbol**	**Notation**
tera	T	10^{12}
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kilo	k	10^{3}
deci	d	10^{-1}
centi	c	10^{-2}
milli	m	10^{-3}
micro	μ	10^{-6}
nano	n	10^{-9}
pico	p	10^{-12}

Strategize vs Memorize

The most common conversions we must be prepared for in physics are:

- Centimeters to meters
- Grams to kilograms

It is up to each individual to determine which method works most effectively for them.

Prefixes for Powers of 10		
Prefix	**Symbol**	**Notation**
tera	T	10^{12}
giga	G	10^{9}
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kilo	k	10^{3}
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centi	c	10^{-2}
milli	m	10^{-3}
micro	μ	10^{-6}
nano	n	10^{-9}
pico	p	10^{-12}

Centimeters to Meters
Strategy not Memory

This strategy tends to work best when values provided are in sci notation

Centimeters to Meters:

1 centimeter = 1×10^{-2} meters

Centimeters	Meters (Sci Notation)	Meters (Standard)
7.8 cm		
22 cm		
121 cm		
243 cm		

Prefixes for Powers of 10

Prefix	Symbol	Notation
tera	T	10^{12}
giga	G	10^{9}
mega	M	10^{6}
kilo	k	10^{3}
deci	d	10^{-1}
centi	c	10^{-2}
milli	m	10^{-3}
micro	μ	10^{-6}
nano	n	10^{-9}
pico	p	10^{-12}

Centimeters and Meters
Both directions

This method tends to work best when values provided are in standard notation or when converting in either direction.

1 centimeter = 1×10^{-2} m = .01m

1×10^{2} cm = 100cm = 1 m

Centimeters	Meters (Standard)
9.1 cm	
52 cm	
156 cm	
321 cm	

Centimeters	Meters (Standard)
	.03 m
	.92 m
	1.77 m
	3.37 m

Prefixes for Powers of 10

Prefix	Symbol	Notation
tera	T	10^{12}
giga	G	10^{9}
mega	M	10^{6}
kilo	k	10^{3}
deci	d	10^{-1}
centi	c	10^{-2}
milli	m	10^{-3}
micro	μ	10^{-6}
nano	n	10^{-9}
pico	p	10^{-12}

Common Estimations & Conversions

Estimating Distances			
References	Centimeters	Meters (Sci Notation)	Meters (Standard)
Width of pinky	1 cm		
Length of pencil	20 cm	2×10^{-1} m	
Height of table	**100 cm**	**1×10^{0} m**	**1 m**
Length of classroom	xxxxxxxx		10 m
Skyscraper	xxxxxxxx	1×10^{2}	

Grams to Kilograms

This method tends to work best when values provided are in standard notation or when converting in either direction.

1 kilogram= 1 x 10^3 g = 1,000g or 1 x 10^{-3} kg = .001kg = 1g

Grams	Kilograms (Sci notation)	Kilograms (Standard)
43 g		
253 g		
1,470 g		
2,808 g		

Prefixes for Powers of 10		
Prefix	**Symbol**	**Notation**
tera	T	10^{12}
giga	G	10^{9}
mega	M	10^{6}
kilo	k	10^{3}
deci	d	10^{-1}
centi	c	10^{-2}
milli	m	10^{-3}
micro	μ	10^{-6}
nano	n	10^{-9}
pico	p	10^{-12}

Estimations for kg

Not in Ref Table: 1 kg = 2.2 lbs

Estimations & Sci Notation			
References	Grams	Kg (Sci Notation)	Kg (Standard)
Paper clip	1 g		
USB drive	10 g		
An egg	100 g		
A textbook	1,000 g		
A bowling ball	10,000 g		
A human	100,000 g		
A car	1,000,000 g		