

Thread NSTA Metric prefixes for powers of 10 question

From: physics-request@list.nsta.org [mailto:physics-request@list.nsta.org] **On Behalf Of** Ann Huber
Sent: Monday, August 27, 2012 9:53 AM
To: physics@list.nsta.org
Subject: metric prefixes for powers of 10

Dear Colleagues,

Today, I had a student ask what the prefixes are for metric units between a nanometer and a millimeter. I have "googled" and am obviously not using the correct prompt. Does anyone have a link or know those prefixes?

Thanks
Ann Huber
Delta State University
E-Learning: Physics and Physical Science
Cleveland, MS

There isn't one. Officially, there are only 20 metric prefixes.

Perry

Ann,

Here is a great link...
<http://www.metricconversion.us/prefixes.htm>

Kathy

When all else fails - go to the source. In this case, the Bureau International des Poids et Mesures and their document entitled the International System of Units. English version, French original is definitive.

Your answer is in Chapter 3. Enjoy!

http://www.bipm.org/utls/common/pdf/si_brochure_8_en.pdf

Edward

10^{-3} = milli- (millimeter)
 10^{-6} = micro- (micrometer or micron)
 10^{-9} = nano- (nanometer)
 10^{-12} = pico- (picometer)

10^{-15} = femto- (femtometer)

Bob Drake

My bad - but there is nothing between the common ones (10^{-6} , 10^{-9} , 10^{-12} , etc..)

Perry

Au contraire!!

Millimeters are 1/1000 of a meter. Nanometers are a millionth of that. 1/1000 of a millimeter is called a micrometer!! It is the unit between the two!!

PHIL

Hi Ann,

SI has a specific number of metric prefixes. If you notice from the table, prefixes greater than *kilo* or smaller than *milli* are have exponents that are divisible by 3. This might be a nice exploration for the student to pursue... "*What effect would inclusion of additional prefixes have on the SI system?*"

Best,

Peter

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Of course there is the old (like me!) unit helpful to chemists, the Ångstrom:

10^{-10} m = 1 Å (ångstrom)

Since bond lengths are on the order of one Ångstrom.

Bob Drake

I recommend googling "Powers of Ten" to find video or simulations to link the metric prefixes to the sizes of actual things.

-Jenn Broekman

Tableau 5. Préfixes SI

Facteur	Nom	Symbole	Facteur	Nom	Symbole
10^1	déca	da	10^{-1}	déci	d
10^2	hecto	h	10^{-2}	centi	c
10^3	kilo	k	10^{-3}	milli	m
10^6	méga	M	10^{-6}	micro	μ
10^9	giga	G	10^{-9}	nano	n
10^{12}	téra	T	10^{-12}	pico	p
10^{15}	péta	P	10^{-15}	femto	f
10^{18}	exa	E	10^{-18}	atto	a
10^{21}	zetta	Z	10^{-21}	zepto	z
10^{24}	yotta	Y	10^{-24}	yocto	y

Edward Werner Cook [ewcook@caprilands.org]

Here's a great link for powers of ten, if you think the old video is a bit outdated (I know my kids do):

<http://htwins.net/scale2/>

Scale of the Universe 2

It's great on a SMARTBoard too.

Cheers

CHRIS OSTERS

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WEBSITE: [HTTP://OSTERS.WEEBLY.COM](http://osters.weebly.com)

There is a game available on iTunes called Zombie Slasher which teaches the metric prefixes in a fun way.

L. Tull [lptull@earthlink.net]

Just a little metric humor for you.

10¹² microphones = 1 megaphone

2000 Mockingbirds = 2 kilomockingbirds

10²¹ picolos = 1 gigolo

10¹² pins = 1 terrapin

10 cards = 1 decacards

10 halls with boughs of holly = 1 deca halls with balls of holly

10⁻¹² boos = 1 picaboo

10⁹ antics - gigantic

10¹⁵ coats = 1 petacoat

Rob

Robert Sparks [rsparks@noao.edu]

More . . .

<http://www.primepuzzle.com/leesnewest/funny-metric-chart.html>

Peter Tordo [ptordo@gmail.com]

Do a search on "SI prefixes" .

There is also "prefixes for binary multiples" adopted by the IEC.

Bob Gannon

There's a lot to be said for the students knowing the accuracy of measurements -- very important.

But I try to get away from mnemonic aids for the metric prefixes -- I think that the kids should just know them, and not just ending with kilo or milli. We're living in an age of nanotechnology. Kids can be deceived if they buy an iPod that stores only 4 Mb of songs instead of 4Gb. It's the difference between storing 1 mp3 song and 1000 of them. And disk drives are easily in the 1Tb range now.

--- Steve >>>>

~~~~~  
Steve Cooperman

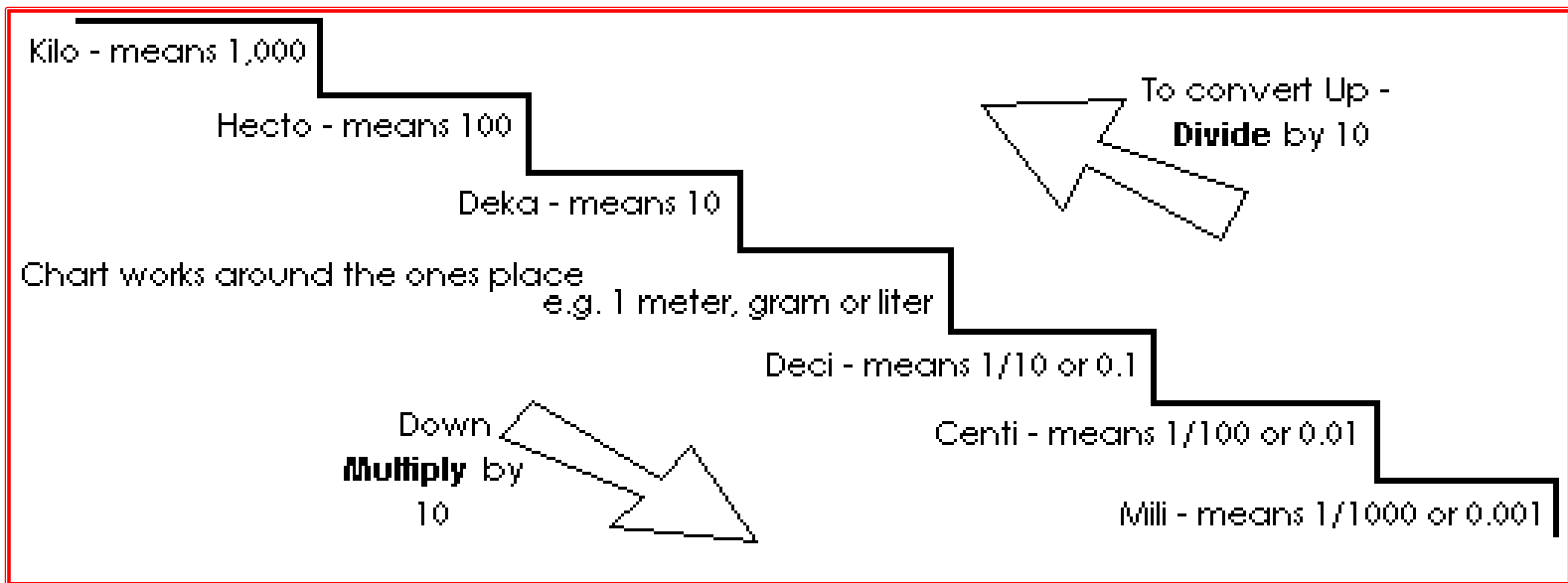
Physics/Chem/Astronomy Teacher  
Campbell Hall (Episcopal)  
North Hollywood, CA 91607  
34.15355°N, 118.3969°W

~~~~~  
Observatory Lecturer
Griffith Observatory
Los Angeles, CA 90027
34.11803°N, 118.30035°W

~~~~~  
Occidental College Physics Teachers' Day  
<http://members.dslextreme.com/users/oxyday>  
Norris Hall, Mosher 1  
Los Angeles, CA  
34.1259°N, 118.2112°W

Kurt,  
Attached please find the chart that I use for metric conversions.  
I also stress the equipment that we use to measure each of these units  
and their degree of accuracy as shown on the summary matrix.

Howard Alpert  
Teacher of Physics  
Washington Latin Public Charter High School  
Washington, DC  
**See below**



| Measurement              | What you are measuring                                    | base unit              | Abbreviation          | Device used to measure                                           | Accuracy              | Helpful hints in using the device                                                                         |
|--------------------------|-----------------------------------------------------------|------------------------|-----------------------|------------------------------------------------------------------|-----------------------|-----------------------------------------------------------------------------------------------------------|
| Length                   | Distance between two points                               | Meter                  | cm                    | Metric ruler                                                     | 1 mm (0.1 cm)         | Look at ruler from above, not from the side.                                                              |
| Mass                     | Amount of matter in a substance                           | Gram                   | mg                    | Triple beam balance                                              | 0.1 g                 | Carry the balance with two hands, zero out before using                                                   |
| Volume (liquid)          | Amount of space a liquid or gas takes up                  | Liter                  | mL<br>cm <sup>3</sup> | Graduated cylinder                                               | 1 mL                  | Keep eyes level with the cylinder. Read the bottom of the meniscus.                                       |
| Volume (regular solid)   | Amount of space a rectangular solid takes up              | Cubic centimeter       | cm <sup>3</sup>       | Metric ruler, calculator                                         | 0.1 cm <sup>3</sup>   | Use calculator to find the product of length, width and height. Round out the answer to the tenths place. |
| Volume (irregular solid) | Amount of space an irregular solid takes up.              | Cubic centimeter (mL)  | cm <sup>3</sup><br>mL | Overflow cup, graduated cylinder                                 | 1 mL                  | Fill cup to overflowing. Allow dripping to cease before dropping item into overflow cup.                  |
| Density                  | How close the particles of a substance are to one another | Grams/cubic centimeter | g/cm <sup>3</sup>     | Triple beam balance and devices for measuring volume+ calculator | 0.1 g/cm <sup>3</sup> | Obey rules for volume and mass.                                                                           |

Thanks to all who sent suggestions. I knew I was not familiar with the prefixes for those between nanometer and millimeter and feel much better to know that the "inbetweens" are not listed. I thought maybe I was having a "senior moment".

I especially liked the suggestion that students contemplate why not and what they might be and how they might be used if they were included.

Thanks again. Have a great day.

Ann Huber

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