SI Quantities/Units/Prefixes/Symbols

#64 of Gottschalk's Gestalts

A Series Illustrating Innovative Forms
of the Organization & Exposition
of Mathematics
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☐ le Système International d'Unités (French)
= the International System of Units
= SI units
= SI
wh SI comes from the initial letters of
Système International
= the internationally accepted
system of physical units
originally proposed in 1960
and which is based on the metric system

☐ the terminology & notation
of the SI base/derived quantities/units
are given here
but their physical definitions are not;
the terminology & notation & meanings
of the SI numerical prefixes
are given here

☐ in general
subscripts of equaters are omitted to reduce clutter

☐ a few fundamental notions

• a measurement
= a process of measuring
  or
  a result of measuring
= a process that ends up with a numerical result
  or
  the result itself = the measure

note: a numerical result
is understood to be
a real number
or
a set of real numbers
accurate to
a certain number of decimal places say

• a physical quanitity
= quantity
= any property of a physical object
  that can be measured

• a unit of a quantity
must be chosen
ito which the measurement of the quantity takes place
&
ito which the quantity is measured
&
ito which the measure is stated

□ SI contains systematically organized
quantities & units & prefixes & symbols

• an SI quantity is
an SI base quantity
or
an SI derived quantity

• SI has 7 SI base quantities

• SI has about 400 SI derived quantities
which are definable ito the 7 SI base quantities
and
which are in scientific use

• SI has two notable SI derived quantities
that are called
SI supplementary quantities

• the SI quantities are used
to describe/explain/measure
the physical world

• an SI unit is
an SI base unit
or
an SI derived unit

• each SI quantity has its assigned SI unit;
an SI base quantity has an SI base unit;
an SI derived quantity has an SI derived unit;
an SI supplementary quantity has an SI supplementary unit;
the measure of an SI quantity
attached to a particular physical object
is expressed in the SI system as
a real number times the SI unit of the SI quantity
wh the real number is regarded as having
a certain degree of accuracy

• each SI derived quantity x is defined ito
SI base quantities
&
other previously defined SI derived quantities;
such a definition of x leads to
a quotient of products of these SI quantities,
the entire expression being called
the SI total quantity-dimension of x
&
the terms of the expression being called
the SI partial quantity-dimensions of x;
by repeated reduction,
an expression for
the SI total quantity-dimension of x as
a quotient of products of SI base quantities
may be obtained;
using negative exponents
the expression may be reduced to a single product;
the overall idea is similar to that of writing
a positive rational number
as a product of powers of prime numbers
with integer exponents

• each SI derived unit x is defined ito
SI base units
&
other previously defined SI derived units;
such a definition of x leads to
a quotient of products of these SI units;
the entire expression being called
the SI total unit-dimension of x
&
the terms of the expression being called
the SI partial unit-dimensions of x;
by repeated reduction,
an expression for
the SI total unit-dimension of x as
a quotient of products of SI base units
may be obtained;
using negative exponents
the expression may be reduced to a single product;
the overall idea is similar to that of writing
a positive rational number
as a product of powers of prime numbers
with integer exponents

• SI has
SI names
for
all 7 SI base quantities

• SI has
special SI names & special SI symbols
for
all 7 SI base units

• SI has
special SI names
for
some SI derived quantities

• SI has
special SI names & special SI symbols
for
some SI derived units

• SI has
20 SI numerical decimal prefixes = SI prefixes
that multiply the SI units
by an integer power of 10;
each SI prefix has
its own SI word and its own SI symbol

• a quantity may have one or more
standard symbol in frequent use
that is not a part of SI

☐ SI is an independent coherent complete system
of quantities/units

here
independent
means minimal
ie
no base quantity/unit
can be defined ito
the other base quantities/units

here
coherent
means that
every quantity/unit considered
can be defined ito
the base quantities/units

here
complete
means that every known physical property
can be defined ito
the base quantities
&
can be measured ito
the base units

here
a definition
means a quotient of products of powers,
all exponents being positive integers
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☐ first summary list of the 7 matching triplets of
the 7 SI base quantities,
the 7 SI base units,
the 7 SI base unit symbols

• length
meter
m

• mass
kilogram
kg

• time
second
s

• electric current
ampere
A

• thermodynamic temperature
kelvin
K

• luminous intensity
candela
cd

• amount of substance
mole
mol

☐ second summary list of the 7 matching triplets of
the 7 SI base quantities,
the 7 SI base units,
the 7 SI base unit symbols

quantity	unit	symbol
length	meter	m
mass	kilogram	kg
time	second	s
electric current	ampere	A
thermodynamic temperature	kelvin	K
luminous intensity	candela	cd
amount of substance	mole	mol

☐ the 7 SI base quantities
& related items

pattern for each base quantity

• SI base quantity
name of quantity

• SI base unit of quantity
name of unit
symbol of unit

• symbol(s) for quantity
that are not a part of SI

• etymology of unit name

• SI base quantity

= length

• SI base unit of length

= meter

= m ← meter

• nonSI symbols for length

= l (lowercase el), L ← length

• meter

↑

μετρον (Greek)

= measure

• SI base quantity
= mass

• SI base unit of mass
= kilogram
= kg ← kilogram

• nonSI symbols for mass
= m, M ← mass

• kilogram

↑

kilo -

= thousand

+

gram

= metric unit of mass

↑

χιλιοι (Greek)

= thousand

+

γραμμα (Greek)

= letter, writing, small weight

• SI base quantity

= time

• SI base unit of time

= second

= s ← second

• nonSI symbols for time

= t, T ← time

• second

↑

pars minuta secunda (Latin)

= second small part (of an hour)

ie

$$1\,\text{hour} \times \frac{1}{60} \times \frac{1}{60} = 1 \text{ second}$$

note: ' minute' comes from

pars minuta prima (Latin)

= first small part (of an hour)

ie

$$1\,\text{hour} \times \frac{1}{60} = 1 \text{ minute}$$

• SI base quantity
= electric current

• SI base unit of electric current
= ampere
= A ← a̲mpere

• nonSI symbol for electric current
= I

• ampere
↑
André – Marie Ampère
1775 – 1836
French
physicist

• SI base quantity
= thermodynamic temperature

• SI base unit of thermodynamic temperature
= kelvin
= K ← kelvin

• nonSI symbol
for thermodynamic temperature
= T ← thermodynamic temperature

• kelvin
↑
Lord Kelvin = William Thomson
1824 – 1907
Scottish
physicist

• SI base quantity

= luminous intensity

• SI base unit of luminous intensity

= candela

= kan - DEL - uh

= cd ← candela

• nonSI symbol for luminous intensity

= I_v ← intensity

• candela

↑

candela (Latin)

= candle

• SI base quantity

= amount of substance

• SI base unit of amount of substance

= mole

= mol ← mole

• nonSI symbol for amount of substance

= n ← number

• mole

↑

das Moleculargewicht (German)

= molecular weight

☐ first summary list of the 2 matching triplets of
the 2 SI supplementary quantities,
the 2 SI supplementary units,
the 2 SI supplementary unit symbols

• plane angle
radian
rad

• solid angle
steradian
sr

☐ second summary list of the 2 matching triplets of
the 2 SI supplementary quantities,
the 2 SI supplementary units,
the 2 SI supplementary unit symbols

quantity	unit	symbol
plane angle	radian	rad
solid angle	steradian	sr

• SI supplementary quantity
= plane angle

• SI supplementary unit of plane angle
= radian
= RAY - dee - uhn
= rad ← radian

• nonSI symbols for a plane angle
= lowercase Greek letters

• radian
↑ (conjectured)
a blend of
radius & angle
viz
radius + angle;
the word radian was first used in 1873
by James Thomson,
a brother of Lord Kelvin = William Thomson

• SI supplementary quantity

= solid angle

• SI supplementary unit of solid angle

= steradian

= stih - RAY - dee - uhn

= sr ← steradian

• nonSI symbols for a solid angle

= capital Greek letters

• steradian

↑

stereo - + radian

wh

the prefix stereo - = solid

comes from

στερεος (Greek)

= solid

□ some SI derived quantities & their SI derived units
for which the units are given
SI special names/symbols

pattern

• SI derived quantity
= names & manifestations of quantity
= expression of quantity ito other SI quantities

• SI derived unit of quantity
= name of unit
= symbol of unit
= expression of unit ito other SI units
= expression of unit ito SI base units

• etymology of name of unit

• SI derived quantity

= absorbed dose

= absorbed dose index

= kerma (= acronym for

kinetic energy released in material)

= specific energy imparted

= energy per mass

= energy / mass

• SI derived unit of absorbed dose

= gray

= Gy ← gray

= J / kg = $m^2 s^{-2}$

• gray

↑

Louis Harold Gray

1905 – 1965

English

radiologist

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• SI derived quantity

= activity

= radionuclide activity

= unity per time

= 1 / time

• SI derived unit of activity

= becquerel

= BEK - kuh - rel

= Bq ← becquerel

= 1 / s = s^{-1}

• becquerel

↑

Antoine Henri Becquerel

1852 – 1908

French

physicist

• SI derived quantity
= capacitance
= charge per potential
= charge / potential

• SI derived unit of capacitance
= farad
= FAIR - uhd
= F ← farad
= C / V = $m^{-2}\ kg^{-1}\ s^{4}\ A^{2}$

• farad
↑
Michael Faraday
1791 – 1867
English
physicist

• SI derived quantity
= celsius temperature

• SI derived unit of celsius temperature
= degree celsius
= dee - GREE SEHL - see - uhs
= ^{o}C ← super circle for ' degree' & celsius
= ' degree celsius'

• degree

↑

degradus (Latin)

= lit: a step down

↑

de - (Latin)

= down

+

gradus (Latin)

= step, grade

• celsius

↑

Anders Celsius

1701 – 1744

Swedish

astronomer, physicist

• SI derived quantity

= dose equivalent

= dose equivalent index

= energy per mass

= energy / mass

• SI derived unit of dose equivalent

= sievert

= SEE - vert

= Sv ← <u>s</u>ie<u>v</u>ert

= $J / kg = m^2 s^{-2}$

• sievert

↑

Rolf Maximilian Sievert

1896 – 1966

Swedish

radiologist

• SI derived quantity

= electric charge

= quantity of electricity

= current times time

= current $\times$ time

• SI derived unit of electric charge

= coulomb

= KOO - lom

= C ← <u>c</u>oulomb

= A $\times$ s = s A

• coulomb

↑

Charles Augustin de Coulomb

1736 – 1806

French

physicist

• SI derived quantity
= electric conductance
= current per potential = unity per resistance
= current / potential = unity / resistance

• SI derived unit of electric conductance
= siemens
= SEE - menz
= S ← siemens
= A / V = 1 / Ω = $m^{-2}\ kg^{-1}\ s^{3}\ A^{2}$

• siemens
↑
Ernst Werner von Siemens
1816 – 1892
German
electrical engineer, inventor

• SI derived quantity
= electric potential
= electromotive force (= EMF)
= potential difference
= power per current
= power / current

• SI derived unit of electric potential
= volt
= V ← volt
= W / A = m^2 kg s^{-3} A^{-1}

• volt
↑
AlessandroVolta
1745 – 1827
Italian
physicist

• SI derived quantity
= electric resistance
= potential per current = unity per conductance
= potential / current = unity / conductance

• SI derived unit of electric resistance
= ohm
= Ω ← capital Greek letter omega
which is transliterated by
the capital English letter oh O ← o̲hm
= $\mathrm{V / A = 1 / S = m^2\ kg\ s^{-3}\ A^{-2}}$

• ohm
↑
Georg Simon Ohm
1787 – 1854
German
physicist

• SI derived quantity

= energy

= work

= quantity of heat

= force times distance

= force $\times$ distance

• SI derived unit of energy

= joule

= JOOL

= J $\leftarrow$ joule

$= \mathrm{N \times m} = \mathrm{N \cdot m} = \mathrm{m^2\ kg\ s^{-2}}$

• joule

$\uparrow$

James Prescott Joule

1818 – 1889

English

physicist

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• SI derived quantity

= force

= mass times acceleration

= mass $\times$ acceleration

• SI derived unit of force

= newton

= N $\leftarrow$ <u>n</u>ewton

= kg $\times$ (m / s^2) = m kg s^{-2}

• newton

$\uparrow$

Isaac Newton

1642 – 1727

English

mathematician, physicist;

said to be the greatest scientist of all time

• SI derived quantity
= frequency
= unity per time
= unity / time

• SI derived unit of frequency
= hertz
= Hz ← <u>h</u>ert<u>z</u>
= $1 / s = s^{-1}$

• hertz
↑
Heinrich Rudolph Hertz
1857 – 1894
German
physicist

• SI derived quantity

= illuminance

= illumination

= luminous flux per area

= (luminous flux) / area

• SI derived unit of illuminance

= lux

= lx ← lux

= $\mathrm{lm} / \mathrm{m}^2 = \mathrm{m}^{-2}\,\mathrm{cd\,sr}$

• lux

↑

lux (Latin)

= light, brightness

• SI derived quantity
= inductance
= magnetic flux per current
= (magnetic flux) / current

• SI derived unit of inductance
= henry
= H ← h̲enry
= Wb / A = $m^2\ kg\ s^{-2}\ A^{-2}$

• henry
↑
Joseph Henry
1797 – 1878
American
physicist

• SI derived quantity

= luminous flux

= luminous flux times solid angle

= (luminous intensity) $\times$ (solid angle)

• SI derived unit of luminous flux

= lumen

= LOO - min

= lm $\leftarrow$ $\underline{\text{l}}\text{u}\underline{\text{m}}\text{en}$

= $\text{cd} \times \text{sr} = \text{cd} \cdot \text{sr} = \text{cd}\,\text{sr}$

• lumen

$\uparrow$

lumen(Latin)

= light, lamp

• SI derived quantity
= magnetic flux
= potential times time
= potential $\times$ time

• SI derived unit of magnetic flux
= weber
= WEB - er
= Wb $\leftarrow$ <u>w</u>e<u>b</u>er
= $\mathrm{V \times s} = \mathrm{V \cdot s} = \mathrm{Vs} = \mathrm{m^2\,kg\,s^{-2}\,A^{-2}}$

• weber
$\uparrow$
Wilhelm Eduard Weber
1804 – 1891
German
physicist

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• SI derived quantity
= magnetic flux density
= magnetic flux per area
= (magnetic flux) / area

• SI derived unit of magnetic flux density
= tesla
= TES - luh
= T ← tesla
= $Wb / m^2 = kg\ s^{-2}\ A^{-1}$

• tesla
↑
Nikola Tesla
1856 – 1945
Croatian - American
physicist, electrical engineer, inventor

• SI derived quantity

= power

= radiant flux

= energy per time

= energy / time

• SI derived unit of power

= watt

= W ← <u>w</u>att

= J / s = m^2 kg s^{-3}

• watt

↑

James Watt

1736 – 1819

Scottish

engineer, imventor

• SI derived quantity

= pressure

= stress

= force per area

= force / area

• SI derived unit of pressure

= pascal

= PASS - kul

= Pa $\leftarrow$ pascal

$= \mathrm{N} / \mathrm{m}^2 = \mathrm{m}^{-1}\ \mathrm{kg}\ \mathrm{s}^{-2}$

• pascal

$\uparrow$

Blaise Pascal

1623 – 1662

French

mathematician, physicist,

philosopher, inventor

☐ some SI derived quantities & their SI derived units
for which the units are not given
SI special names/symbols

pattern

• SI derived quantity
= names & manifestations of quantity
= expression of quantity ito other SI quantities

• SI derived unit of quantity
= name of unit
= expression of unit ito other SI units
= expression of unit ito SI base units

• standard symbols for quantity
that are not a part of SI

• SI derived quantity

= area

= $(\text{length})^2$

• SI derived unit of area

= square meter

= m^2

• nonSI symbols for area

= A ← area & S ← surface area

• SI derived quantity

= volume

= $(\text{length})^3$

• SI derived unit of volume

= cubic meter

= m^3

• nonSI symbol for volume

= V ← volume

• SI derived quantity
= (linear / orbital) speed
= magnitude of velocity (vector)
= distance per time
= length / time

• SI derived unit of speed
= meter per second
= m / s = m s^{-1}

• nonSI symbols for speed
= r ← rate of speed & v ← magnitude of velocity

• SI derived quantity
= (linear / orbital) acceleration
= magnitude of acceleration vector
= distance per time per time
= (length / time) / time

• SI derived unit of acceleration
= meter per second per second
= meter per second squared
= $(m / s) / s = m / s^2 = m\ s^{-2}$

• nonSI symbol for acceleration
= a ← acceleration

• SI derived quantity
= angular speed
= magnitude of rotation vector
= angular displacement per time
= angle / time

• SI derived unit of angular speed
= radian per second
= rad / s = s^{-1} rad

• nonSI symbol for angular speed
= ω

• SI derived quantity
= angular acceleration
= angular displacement per time per time
= (angle / time) / time

• SI derived unit of angular acceleration
= radian per second per second
= radian per second squared
= (rad / s) / s = rad / s^2 = s^{-2} rad

• nonSI symbol for angular acceleration
= α ← a̲ngular a̲cceleration
(a being the transliteration of α)

• SI derived quantity

= torque

= moment of force

= force times distance

= force $\times$ distance

• SI derived unit of torque

= newton meter

= $N \times m = N \cdot m = N\,m = m^2\,kg\,s^{-2}$

• nonSI symbol for torque

= T $\leftarrow$ torque

• SI derived quantity
= (linear / orbital) momentum
= mass times speed
= mass $\times$ speed

• SI derived unit of momentum
= meter kilogram per second
= $(\mathrm{m} \times \mathrm{kg}) / \mathrm{s} = \mathrm{m\ kg\ s^{-1}}$

• nonSI symbol for momentum
= p $\leftarrow$ potentia (Latin) = might

• SI derived quantity
= angular momentum
= spin angular momentun
= orbital angular momentum
= moment of linear momentum
= linear momentum times distance
= (linear momentum) $\times$ distance

• SI derived unit of angular momentum
= square meter kilogram per second
= $(m^2 \times kg) / s = m^2\ kg\ s^{-1}$

• nonSI symbol for angular momentum
= L

• SI derived quantity
= surface tension
= force per length
= force / length

• SI derived unit of surface tension
= newton per meter
= N / m = kg s^{-2}

• nonSI symbol for surface tension
= T ← tension

• SI derived quantity
= electric field strength
= electric potential per length
= (electric potential) / length

• SI derived unit of electric field strength
= volt per meter
= $V / m = m\ kg\ s^{-3}\ A^{-1}$

• nonSI symbol for electric field strength
= E ← <u>e</u>lectric

• SI derived quantity

= magnetic field strength

= magnetic field intensity

= current per length

= current / length

• SI derived unit of magnetic field strength

= ampere per meter

= $A / m = m^{-1} A$

• nonSI symbol for magnetic field strength

= H

• SI derived quantity
= luminance
= luminous intensity per area
= (luminous intensity) / area

• SI derived unit of luminance
= candela per square meter
= $\mathrm{cd} / \mathrm{m}^2 = \mathrm{m}^{-2}\,\mathrm{cd}$

• nonSI symbol for luminance
= L ← l̲uminance

• SI derived quantity

= irradiance

= heat flux density

= power per area

= power / area

• SI derived unit of irradiance

= watt per square meter

= W / m^2 = $kg\ s^{-3}$

• nonSI symbol for irradiance

= E

• SI derived quantity
= concentration
= amount of substance per volume
= (amount of substance) / volume

• SI derived unit of concentration
= mole per cubic meter
= $\text{mol} / \text{m}^3 = \text{m}^{-3}\ \text{mol}$

• SI derived quantity
= wave number
= unity per length
= 1 / length

• SI derived unit of wave number
= reciprocal meter
= per meter
= 1 / m = m^{-1}

• nonSI symbol for wave number
= σ

• SI derived quantity
= density
= mass density
= mass per volume
= mass / volume

• SI derived unit of density
= kilogram per cubic meter
= $kg / m^3 = m^{-3} kg$

• nonSI symbol for density
= d ← d̲ensity

• SI derived quantity
= volumetric flow rate
= volume per time
= volume / time

• SI derived unit of volumetric flow rate
= cubic meter per second
= $m^3 / s = m^3 s^{-1}$

• nonSI symbol for volumetric flow rate
= r ← rate

• SI derived quantity

= entropy

= heat capacity

= energy per thermodynamic temperature

= energy / (thermodynamic temperature)

• SI derived unit of entropy

= joule per kelvin

= J / K = m^2 kg s^{-2} K^{-1}

• nonSI symbol for entropy

= S

☐ a note that is more math than physics

• the three quantities
length, distance, linear displacement
are mathematically related
but differ in concept;
usually distance is defined ito length
and linear displacement is defined ito distance;
all three quantities are measured ito
the SI base unit of length
viz meter
wi denoted by
the SI base symbol
m

• length
is an SI base quantity;
but
distance & linear displacement
are SI derived quantities

• nonSI symbols for length

L ← length

s ← subtending arc (conjecture)

• nonSI symbol for distance

d ← distance

• nonSI symbol for displacement

d ← displacement

• angular displacement
is an SI derived quantity
wi an angle
& $\therefore$
is measured by
the SI derived unit of angle
viz radian
wi denoted by
the SI derived symbol
rad

• nonSI symbol for angular displacement
ϑ $\leftarrow$ notational convention
of denoting angles by lowercase Greek letters;
also ϑ is the customary angle variable
for the second plane polar coordinate
& the second cylindrical coordinate

☐ several terminological conventions
that are of frequent or occasional use
but are not of universal applicability

• specific quantity
= quantity per unit mass

• quantity density
= quantity per unit volume/area/length

• quantity strength
= quantity intensity

• quantity index
= quantity

• omitting a word
from a phrase naming a quantity
in a particular context
when no ambiguity can occur
eg
electric charge = charge
magnetic flux = flux
linear speed = speed
velocity vector = velocity

☐ the 20 SI prefixes of SI units

pattern

• prefix
pronunciation
symbol
word form
expanded base ten form
exponent form
etymology
example

• deca -

= DEK - uh

= da ← <u>d</u>ec<u>a</u> -

= ten

= 10

= 10^1

↑

δεκα (Greek)

= ten

eg

one decameter

= 1 dam

= ten meters

= 10 m

= 10^1 m

• hecto -

= HEK - toh

= h ← hecto -

= one hundred

= 100

= 10^2

↑

εκατον (Greek)

= hundred

eg

one hectometer

= 1 hm

= one hundred meters

= 100 m

= 10^2 m

• kilo -

= KIL - oh

= k ← kilo -

= one thousand

= 1 000

= 10^3

↑

χιλιοι (Greek)

= thousand

eg

one kilometer

= 1 km

= one thousand meters

= 1000 m

= 10^3 m

• mega -

= MEG - uh

= M ← <u>m</u>ega -

= one million

= 1 000 000

= 10^6

↑

μεγας (Greek)

= large

eg

one megameter

= 1 Mm

= one million meters

= 1 000 000 m

= 10^6 m

• giga -

= JIG - uh

= G ← giga -

= one billion

= 1 000 000 000

= 10^9

↑

gigas (Latin)

= giant

↑

γιγας (Greek)

= giant

eg

one gigameter

= 1Gm

= one billion meters

= 1 000 000 000 m

= 10^9 m

• tera -

= TER - uh

= T ← tera -

= one trillion

= 1 000 000 000 000

= 10^{12}

↑

τερας (Greek)

= monster

eg

one terameter

= 1 Tm

= one trillion meters

= 1 000 000 000 000 m

= 10^{12} m

• peta -

= PED - uh

= P ← peta -

= one quadrillion

= 1 000 000 000 000 000

= 10^{15}

↑

designed variation of

πεντε (Greek)

= five

eg

one petameter

= 1 Pm

= one quadrillion meters

= 1 000 000 000 000 000 m

= 10^{15} m

• exa -

= EKS - uh

= E ← e̲xa -

= one quintillion

= 1 000 000 000 000 000 000

= 10^{18}

↑

designed variation of

εξ (Greek)

= six

eg

one exameter

= 1 Em

= one quintillion meters

= 1 000 000 000 000 000 000 m

= 10^{18} m

• zetta -

= ZET - uh

= Z ← zetta -

= one sextillion

= 1 000 000 000 000 000 000 000

= 10^{21}

↑

designed variation of

septem (Latin)

= seven

eg

one zettameter

= 1 Zm

= one sextillion meters

= 1 000 000 000 000 000 000 000 m

= 10^{21} m

• yotta -

= YOT - uh

= Y ← yotta -

= one septillion

= 1 000 000 000 000 000 000 000 000

= 10^{24}

↑

designed variation of

octo (Latin)

= eight

eg

one yottameter

= 1 Ym

= one septillion meters

= 1 000 000 000 000 000 000 000 000 m

= 10^{24} m

- deci -

= DES - ee

= D $\leftarrow$ <u>d</u>eci -

= one tenth

= 0.1

= 10^{-1}

$\uparrow$

decimus (Latin)

= tenth

eg

one decimeter

= 1 dm

= one tenth of a meter

= 0.1 m

= 10^{-1} m

- centi -

= SEN - tee

= c $\leftarrow$ c̲enti -

= one hundredth

= 0.01

= 10^{-2}

$\uparrow$

centum (Latin)

= hundred

eg

one centimeter

= 1 cm

= one hundredth of a meter

= 0.01 m

= 10^{-2} m

• milli -

= MIL - ee

= m ← milli -

= one thousandth

= 0.001

= 10^{-3}

↑

mille (Latin)

= thousand

eg

one millimeter

= 1 mm

= one thousandth of a meter

= 0.001 m

= 10^{-3} m

• micro -

= MEY - kroh

= μ ← lowercase Greek letter mu

corresponding to

the lowercase English letter em

m ← <u>m</u>icro -

= one millionth

= 0.000 001

= 10^{-6}

↑

μικρος (Greek)

= small

eg

one micrometer

= one micron

= 1μm

= one millionth of a meter

= 0.000 001 m

= 10^{-6} m

- nano -

= NAN - oh

= n ← nano -

= one billionth

= 0.000 000 001

= 10^{-9}

↑

νανος (Greek)

= dwarf

eg

one nanometer

= 1 nm

= one billionth of a meter

= 0.000 000 001 m

= 10^{-9} m

- pico -

= PIK - oh

= p ← <u>p</u>ico -

= one trillionth

= 0.000 000 000 001

= 10^{-12}

↑

pico (Spanish)

= beak, tip, peak, small amount

&

piccolo (Italian)

= small

eg

one picometer

= 1 pm

= one trillionth of a meter

= 0.000 000 000 001 m

= 10^{-12} m

GG64-87

• femto -

= FEM - toh

= f $\leftarrow$ <u>f</u>emto -

= one quadrillionth

= 0.000 000 000 000 001

= 10^{-15}

$\uparrow$

femten (Danish & Norwegian)

= fifteen

eg

one femtometer

= 1 fm

= one quadrillionth of a meter

= 0.000 000 000 000 001 m

= 10^{-15} m

• atto -

= AT - toh

= a ← atto -

= one quintillionth

= 0.000 000 000 000 000 001

= 10^{-18}

↑

atten (Danish & Norwegian)

= eighteen

eg

one attometer

= 1am

= one quintillionth of a meter

= 0.000 000 000 000 000 001m

= 10^{-18} m

• zepto -

= ZEP - toh

= z ← zepto -

= one sextillionth

= 0.000 000 000 000 000 000 001

= 10^{-21}

↑

designed variation of

septem (Latin)

= seven

eg

one zeptometer

= 1 zm

= one sextillionth of a meter

= 0.000 000 000 000 000 000 001 m

= 10^{-21} m

• yocto -

= YOK - toh

= y ← y̲octo -

= one septillionth

= 0.000 000 000 000 000 000 000 001

= 10^{-24}

↑

designed variation of

octo (Latin)

= eight

eg

one yoctometer

= 1 ym

= one septillionth of a meter

= 0.000 000 000 000 000 000 000 001 m

= 10^{-24} m

☐ twelve pages listing
all twenty of
the SI prefix / symbol / value triplets
in the order of
prefix, symbol, value,
vertically & horizontally,
increasing & decreasing

- deca

da

10^1

- hecto

h

10^2

- kilo

k

10^3

- mega

M

10^6

- giga

G

10^9

• tera

T

10^{12}

• peta

P

10^{15}

• exa

E

10^{18}

• zetta

Z

10^{21}

• yotta

Y

10^{24}

• deci

d

10^{-1}

• centi

c

10^{-2}

• milli

m

10^{-3}

• micro

μ

10^{-6}

• nano

n

10^{-9}

GG64-95

- pico

p

10^{-12}

- femto

f

10^{-15}

- atto

a

10^{-18}

- zepto

z

10^{-21}

- yocto

y

10^{-24}

• yotta

Y

10^{24}

• zetta

Z

10^{21}

• exa

E

10^{18}

• peta

P

10^{15}

• tera

T

10^{12}

- giga

G

10^9

- mega

M

10^6

- kilo

k

10^3

- hecto

h

10^2

- deca

da

10^1

- yocto

y

10^{-24}

- zepto

z

10^{-21}

- atto

a

10^{-18}

- femto

f

10^{-15}

- pico

p

10^{-12}

GG64-99

- nano

n

10^{-9}

- micro

μ

10^{-6}

- milli

m

10^{-3}

- centi

c

10^{-2}

- deci

d

10^{-1}

GG64-100

deca	da	10^{1}
hecto	h	10^{2}
kilo	k	10^{3}
mega	M	10^{6}
giga	G	10^{9}
tera	T	10^{12}
peta	P	10^{15}
exa	E	10^{18}
zetta	Z	10^{21}
yotta	Y	10^{24}

deci	d	10^{-1}
centi	c	10^{-2}
milli	m	10^{-3}
micro	μ	10^{-6}
nano	n	10^{-9}
pico	p	10^{-12}
femto	f	10^{-15}
atto	a	10^{-18}
zepto	z	10^{-21}
yocto	y	10^{-24}

yotta	Y	10^{24}
zetta	Z	10^{21}
exa	E	10^{18}
peta	P	10^{15}
tera	T	10^{12}
giga	G	10^{9}
mega	M	10^{6}
kilo	k	10^{3}
hecto	h	10^{2}
deca	da	10^{1}

yocto	y	10^{-24}
zepto	z	10^{-21}
atto	a	10^{-18}
femto	f	10^{-15}
pico	p	10^{-12}
micro	μ	10^{-6}
nano	n	10^{-9}
micro	μ	10^{-6}
milli	m	10^{-3}
centi	c	10^{-2}
deci	d	10^{-1}