# LON-CAPA Help

# Physical Units Accepted by LON-CAPA

The following subsections show the physical units that LON-CAPA accepts. The symbols must be used when entering the units, for example "35 kg".

Note that compound units are formed by using *, / and ^. For example, an acceleration might be in terms of "m/s^2" or meters per second squared. This could also be expressed as"m/s/s". Units of Newton-meters (for torque) would be entered as "N*m". Parentheses may be used to guarantee the correct sense of the unit. Kilometers per Ampere-hour could be written as "km/(A*hr)" or "km/A/hr" but not "km/A*hr". The last option would be interpreted as kilometer times hours per Ampere.

LON-CAPA will automatically perform some conversions between units of the same dimension when units are provided for a problem. You can provide an answer of "1.45 km" for a distance. If the computer expects the answer in cm, it will convert your answer before comparing against the numerical solution.

Please note that if your units are inappropriate, the computer has no way of checking the appropriateness of your answer. If units are required, only once appropriate units are provided will the system check your numerical answer.

## Base Units

```
# name          symbol      comment

meter             m         # length
kilogram          kg        # mass
second            s         # time
ampere            A         # electric current
kelvin            K         # thermodynamic temperature
mole              mol       # amount of substance
candela           cd        # luminous intensity
decibel           dB        # log of pressure amplitude
```

## Prefixes

```
#    Prefix      symbol      factor

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              D           10^1

deci              d           10^-1
centi             c           10^-2
milli             m           10^-3
micro             u           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}
```

# Derived Units

```
# Derived Unit
# name          symbol    comment

gram             g        # mass
minute           min      # time
hour             hr       # time
hour             h        # time
day              day      # time
day              days     # time
year             yr       # time
pound            lb       # mass
ounce            oz       # mass
inch             in       # length
foot             ft       # length
mile             mi       # length
yard             yd       # length
nautical_mile    n_mi     # length, nautical mile (UK)
rood             rood     # area, rood
acre             acre     # area, acre
hertz            Hz       # frequency
litre            L        # volume
newton           N        # force
pound_force      lbf      # force
dyne             dyn      # force
pascal           Pa       # pressure, stress
bar              bar      # pressure
mmHg             mmHg     # pressure, millimeter of mercury
torr             torr     # pressure
atm              atm      # standard atmosphere
joule            J        # energy, work, heat
electronvolt     eV       # energy
calorie          cal      # energy
Btu              Btu      # energy
watt             W        # power, radiant flux
coulomb          C        # electric charge
volt             V        # electric potential, electromotive force
ohm              ohm      # electric resistance, use this in /ANS
ohm              ohms     # electric resistance
ohm              Ohm      # electric resistance
ohm              Ohms     # electric resistance
mho              mho      # electric conductance
mho              mhos     # electric conductance
mho              Mho      # electric conductance
mho              Mhos     # electric conductance
siemens          S        # electric conductance
farad            F        # electric capacitance
tesla            T        # magnetic flux density
weber            Wb       # magnetic flux
henry            H        # inductance
radian           rad      # plane angle
degree           deg      # plane angle (Pi rad=180 deg)
steradian        sr       # solid angle
lumen            lm       # luminous flux
lux              lx       # illuminance
```

```
becquerel        Bq     # activity (radioactive)
curie            Ci     # activity (radioactive)
gray             Gy     # absorbed dose (of radiation)
sievert          Sv     # dose equivalent (dose equivalent index)
astroUnit        AU     # mean distance earth to sun
celcius          degC   # multiplicatively OK
farenheight      degF   # multiplicatively OK
molarity         M      # chemisty
amu              amu    # atomic mass unit
amu              u      # atomic mass unit
lightspeed       c      # speed of light
cubiccentimeter cc     # cubic centimeter
electroncharge   e      # elementary charge
hbar             hbar   # Planck constant
milesperhour     mph    # miles per hour
rpm              rpm    # rounds per minute
rpm              rpms   # rounds per minute
parsec           pc     # parsec
```

## Interpretation

The coded units are interpreted in the order of basic unit, derived unit, then prefix. For example, "T" will be matched against "tesla" instead of considered the prefix "T". Another example is that "min" will match "minutes" instead of treated as a combination of the prefix "m" and units.

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