

**SI (Metric) AWARD**  
sponsored by the  
**U. S. METRIC ASSOCIATION**

**JUDGING GUIDE**

(rev. 2009/03)

**ELIGIBILITY:** All students competing in the fair are eligible.

**THE PROJECT:** The project should involve quantitative measures and should use units of the SI metric system for those measures. The subject of the project should not be the SI system itself.

**THE USE OF SI UNITS:** Measures reported in the project, including all calculations, results, graphs, etc. should be expressed completely and correctly in units of the International System (SI) also called the metric system. It is preferable that equivalents in other units not be given at all (and if given, should be secondary to the SI expression). Measurements should actually be obtained in metric units, not obtained in old English units and then mathematically converted.

**CRITERIA:** Any project which involves measures and expresses those measures consistently and correctly in SI metric would be a good choice to win the metric award. A project which uses a variety of metric units for different kinds of measures (such as force in newtons, pressure in kilopascals, energy in joules, power in watts, etc.) would be a better choice than one which only uses centimetres to measure lengths or litres for volumes. A project in which the measures were integrally important to the research would be a better choice than one in which measures were only used to describe the sizes of containers or the amounts of substances tested (or the size of the display board!). Units of older (non-SI) metric systems are NOT acceptable. Examples of such non-acceptable units are: mmHg, cmHg or millibars for pressure; calories, kilocalories or ergs for energy or heat; dynes, grams or kilograms for force or weight. (Grams and kilograms are mass.) The table on the back gives the name and correct symbol for some of the units of the SI system, those for measures that are most likely to be encountered. Also shown are a few non-SI units which are officially considered acceptable for use with SI.

**COMMON ERRORS:** A common error is the incorrect use of unit symbols. Capital letters are not correct where lower case is prescribed and vice versa. For kilowatts, kW is right while Kw, kw and KW are wrong. The symbols are never followed by an "s" to form a plural. It is not good usage to use multiple slashes for division. Use  $m/s^2$ , not  $m/s/s$ . The product of units is formed by a raised dot or a space between the separate symbols; e.g., the symbol for the newton-second is N·s or N s, but not Ns. Symbols should not be mixed with words. Write the symbol km/h or spell out kilometres per hour; do not use kilometres/hour. The symbols are not considered abbreviations so they should not end with a period. The symbols should be used, not abbreviations. Use s rather than sec. and use  $cm^3$ , not cc or c.c. and use h not hr. etc.

**THANK YOU!** The members of the U.S. Metric Association thank you for assisting us by serving as a judge for the metric award.

**U.S. METRIC ASSOCIATION**

Science Fair Award Coordinator:  
Dr. William Hooper  
3350 South Fletcher Ave., Suite M-5  
Fernandina Beach, FL 32034-4302  
email: hooperbill@bellsouth.net

Headquarters:  
USMA  
10245 Andasol Ave.  
Northridge, CA 91325-1504

## SOME UNITS OF THE INTERNATIONAL SYSTEM (SI)

(revised 2008/08)

MEASURABLE QUANTITY	BASIC UNIT	EXAMPLES OF SOME ACCEPTABLE MULTIPLES AND SUBMULTIPLES	UNITS NOT PART OF SI BUT ACCEPTABLE FOR USE WITH SI
Length, Distance	metre (m)	millimetre (mm) kilometre (km)	astronomical unit (ua)
Mass (not weight)	kilogram (kg)	gram (g) milligram (mg)	tonne (t) (metric ton) atomic mass unit (u) or Dalton (Da)
Time	second (s)	millisecond (ms) microsecond ( $\mu$ s)	minute (min) hour (h) day (d)
Speed, Velocity	metre per second (m/s)	kilometre per second (km/s)	kilometre per hour (km/h)
Acceleration	metre per second squared (m/s <sup>2</sup> )	centimetre per second squared (cm/s <sup>2</sup> )	-----
Force (including weight)	newton (N)	kilonewton (kN)	-----
Energy (all forms, including heat)	joule (J)	kilojoule (kJ) megajoule (MJ)	electron-volt (eV) kilowatt-hour (kW·h)
Power	watt (W)	kilowatt (kW) megawatt (MW)	-----
Pressure, also Stress	pascal (Pa) or newton per square metre (N/m <sup>2</sup> )	megapascal (MPa) kilonewton per square metre (kN/m <sup>2</sup> )	-----
Area	square metre (m <sup>2</sup> )	square kilometre (km <sup>2</sup> )	hectare (ha)
Volume or Capacity	cubic metre (m <sup>3</sup> )	cubic centimetre (cm <sup>3</sup> )	litre (l or L) millilitre (ml or mL)
Angle	radian (rad)	milliradian (mrad)	degree (°), minute ('), second (")
Potential, Emf (voltage)	volt (V)	millivolt (mV) kilovolt (kV)	-----
Current	ampere (A)	milliampere (mA)	-----
Resistance	ohm ( $\Omega$ )	kiloohm (k $\Omega$ ) megohm (M $\Omega$ )	-----
Capacitance	farad (F)	microfarad ( $\mu$ F) picofarad (pF)	-----
Inductance	henry (H)	millihenry (mH)	-----
Temperature	kelvin (K), also degree Celsius (°C)	millikelvin (mK) (prefixes not used with °C)	-----

Columns 1 and 2 of this list do not contain all the quantities and basic units in SI. It includes most of the quantities and basic units that might be expected in the work of good high school science students. Column 3 contains only a couple examples of acceptable multiples and submultiples formed by adding the SI prefixes to the basic unit. There are many others. Any of the prefixes below is correct. Each is shown followed by the power of ten it represents and its symbol; e.g. tera represents  $10^{+12}$  and its symbol is T, as in one terrawatt (1 TW) equals one trillion watts ( $10^{+12}$  W).

----- Multiples -----	----- Submultiples -----
deka (10 <sup>+1</sup> ) da	deci (10 <sup>-1</sup> ) d
hecto (10 <sup>+2</sup> ) h	centi (10 <sup>-2</sup> ) c
kilo (10 <sup>+3</sup> ) k	milli (10 <sup>-3</sup> ) m
mega (10 <sup>+6</sup> ) M	micro (10 <sup>-6</sup> ) $\mu$
giga (10 <sup>+9</sup> ) G	nano (10 <sup>-9</sup> ) n
tera (10 <sup>+12</sup> ) T	pico (10 <sup>-12</sup> ) p
peta (10 <sup>+15</sup> ) P	femto (10 <sup>-15</sup> ) f
exa (10 <sup>+18</sup> ) E	atto (10 <sup>-18</sup> ) a
zetta (10 <sup>+21</sup> ) Z	zepto (10 <sup>-21</sup> ) z
yotta (10 <sup>+24</sup> ) Y	yocto (10 <sup>-24</sup> ) y