Introduction – SI Units

Physics is a **physical science**. As such, it involves the measurement of **physical quantities**. For national and international collaboration and comparison, there must be common units of measurements used.

For centuries a range of different units of measurement were used around the globe for various physical quantities. Consider the following historic units of measurement shown below in Table 1.

Table.1 – Historic units of measurement

Quantity	Possible units of measurement					
length	cubit	hand	foot	light year	mile	hammer unit
mass	pound	slug	kilogram	tonne	solar mass	atomic mass unit
temperature	Celsius	Kelvin	Fahrenheit	Rankine	Réaumur	Rømer

Task:
Select one unit of measurement for each quantity shown in Table 1. Alternatively, select one from your own research, and outline its origin.
NB: A sample for each has been provided below:

Quantity: length
Unit: cubit
Description: The cubit is based on the length of the arm from the elbow to the tip of the middle finger.

Unit:
Description:

Quantity: mass
Unit: atomic mass unit (amu)
Description: An atomic mass unit is defined as a mass equal to one-twelfth the mass of an atom of carbon-12.

Unit:
Description:

Quantity: temperature
Unit: Fahrenheit
Description: Fahrenheit is a temperature scale that bases the boiling point of water at 212 and the freezing point at 32.

Unit:
Description:

What does SI stand for?

The abbreviation "SI" stands for **Système Internationale** or **International System**. It is the current globally used modern metric system of measurement. The SI metric measurement system is used by scientists all around the world and provides a consistent means of measuring physics values.

There are only seven (7) base units used in the SI system, these are shown below in Table 2.

Table 2: 7 base SI Units of Measurement

Quantities	SI Unit of measurement	Symbol
length	metre	m
mass	kilogram	kg
time	seconds	s
electric current	ampere	A
thermodynamic temperature	kelvin	K
amount of substance	mole	mol
luminous intensity	candela	cd

SI Derived Units

Several other quantities are measured using units that are derived from the seven base SI units of measurements.

Example:

Consider the calculation of an area. From junior mathematics, we know that:

$$area(\boldsymbol{m^2}) = length(\boldsymbol{m}) \times width(\boldsymbol{m})$$

So the unit of measurement for area is the **square metre (m^2).** This unit of measurement is not one of the seven base SI units of measurement. However, it is **derived** from the base SI units of measurement.

Example:

Consider the calculation of speed. The equation for speed is as follows:

$$speed(\boldsymbol{m/s}) = \frac{distance(\boldsymbol{m})}{time(\boldsymbol{s})}$$

So the unit of measurement for speed is **metre per second (m/s).** This unit of measurement is not one of the seven base SI units of measurement. However, it is **derived** from the base SI units of measurement.

Derived units with special names and symbols

Several derived units have been given **special names and symbols.** Consider the following examples.

Example:
Quantity: Force
SI Derived units: $m. kg. s^{-2}$
Alternative unit: $newton\ (N)$

Example:
Quantity: Energy
SI Derived units: $m^2. kg. s^{-2}$ or $N. m$
Alternative unit: $joule\ (J)$

Example:
Quantity: Electric Charge
SI Derived units: $s. A$
Alternative unit: $coulomb\ (C)$

For further examples of derived SI units use the following URL:
https://physics.nist.gov/cuu/Units/units.html