SI Units

The International System of Units (SI) is system of units of measurements that is widely used all over the world. This modern form of the Metric system is based around the number 10 for convenience. A set unit of prefixes have been established and are known as the SI prefixes or the metric prefixes (or units). The prefixes indicate whether the unit is a multiple or a fraction of the base ten. It allows the reduction of zeros of a very small number or a very larger number such as 0.00000001 meter and 7,500,000 Joules into 1 nanometer and 7.5 Megajoules respectively. These SI prefixes also have a set of symbols that precede unit symbol.

Introduction

However countries such as the United States, Liberia, and Berma have not officially adopted the International System of Units as their primary system of measurements. Since the SI Units are nearly globally though, the scientific and mathematical field will use these SI units in order to provide ease between the sharing data with one another because of a common set of measurements.

Base Units

The SI contains seven BASE UNITS that each represent a different kind of physical quantity. These are commonly used as a convention.

<table>
<thead>
<tr>
<th>PHYSICAL QUANTITY</th>
<th>NAME OF UNIT</th>
<th>ABBREVIATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass</td>
<td>Kilogram</td>
<td>kg</td>
</tr>
<tr>
<td>Length</td>
<td>Meter</td>
<td>m</td>
</tr>
<tr>
<td>Time</td>
<td>Second</td>
<td>s</td>
</tr>
<tr>
<td>Temperature</td>
<td>Kelvin</td>
<td>K</td>
</tr>
</tbody>
</table>
**Derived Units**

Derived Units are created by mathematical relationships between other Base Units and are expressed in a combination of fundamental and base quantities.

<table>
<thead>
<tr>
<th>Derived Quantity</th>
<th>Name</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area</td>
<td>Square Meter</td>
<td>m²</td>
</tr>
<tr>
<td>Volume</td>
<td>Cubic Meter</td>
<td>m³</td>
</tr>
<tr>
<td>Mass Density</td>
<td>Kilogram Per Cubic Meter</td>
<td>kg/m³</td>
</tr>
<tr>
<td>Specific Volume</td>
<td>Cubic Meter Per Kilogram</td>
<td>m³/kg</td>
</tr>
<tr>
<td>Celsius Temperature</td>
<td>degree Celsius</td>
<td>°C</td>
</tr>
</tbody>
</table>

**Prefixes**

Metric units use a prefix, used for conversion from or to an SI unit. Below is a chart illustrating how prefixes are labeled in metric measurements. The chart may be printed for quick reference, if needed.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Prefix</th>
<th>Multiplication Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>Tera</td>
<td>10^{12}</td>
</tr>
<tr>
<td>G</td>
<td>Giga</td>
<td>10^9</td>
</tr>
<tr>
<td>M</td>
<td>Mega</td>
<td>10^6</td>
</tr>
<tr>
<td>k</td>
<td>Kilo</td>
<td>10^3</td>
</tr>
</tbody>
</table>
Temperature

Temperature is usually measured in Celsius (although the U.S. still uses Fahrenheit), but is often converted to for the absolute Kelvin scale for many chemistry problems.

- For Fahrenheit to Celsius: \[F= \dfrac{9}{5} \times C+32\]
- For Celsius to Fahrenheit: \[C= \dfrac{5}{9} \times F - 32\]
- For Celsius to Kelvin: \[K=C+273.15\]

Reference Points:

- Melting Point of ice is 0° C = 32° F
- Boiling Point of water is 100° C = 212° F

The Kelvin scale does not use the degree symbol (°) and only K, which can only be positive since it is an absolute scale

Mass

Mass is usually measured by a sensitive balance machine

- 1 kilograms = 2.205 lbs.
- (Remember that 1 kg = 1000 grams)

Length

The U.S. usually makes measurements in inches and feet, but the SI system prefers meters as the unit for length.

- 1 meter = 3.281 feet.
Volume

SI units commonly uses derived units for Volume such as meters cubed to liters.

- $1 \text{ cm}^3$ (centimeter cubed) = 1 mL (milliliter)
- $1000 \text{ cm}^3 = 1 \text{ L} = 1 \text{ dm}^3$

Energy

- 1 calorie = 4.184 Joules

Amount of Substance

- 1 mole = $6.022 \times 10^{23}$ molecules/atoms
- (Avogadro's number)

Problems

Convert to the appropriate SI Units:

1. 1 Day 4 Hours and 20 Minutes
2. 10.8 Lbs.
3. 58.8 Ft.
4. 10,288 grams
5. 128,968,888 mL
6. 1.4 Degrees Celcius
7. 16.13 Cal
8. 18,888,888 km

Answers

#1-4

#5-8

References


**Contributors**

- Christina Doan (UCD), Ryan Cheung (UCD)