**PHYSICS**

* Comes from the Greek word “physis”, meaning “of nature”
* Fundamental Science
  + Concerned with the fundamental principles of the Universe
    - It deals with the study of matter, energy, forces and the interaction among them.
  + Foundation of other physical sciences

***The study of physics can be divided into six main areas:***

**1. *classical mechanics,*** concerning the motion of objects that are large relative to atoms and move at speeds much slower than the speed of light

**2. *relativity,*** a theory describing objects moving at any speed, even speeds approaching the speed of light

**3. *thermodynamics,*** dealing with heat, work, temperature, and the statistical behavior of systems with large numbers of particles

**4. *electromagnetism,*** concerning electricity, magnetism, and electromagnetic fields

**5. *optics,*** the study of the behavior of light and its interaction with materials

**6. *quantum mechanics,*** a collection of theories connecting the behavior of matter at the submicroscopic level to macroscopic observations

***Classical and Modern Physics***

Classical physics

* + Developed before 1900
  + classical mechanics, thermodynamics, optics, and electromagnetism

Modern physics

* + From about 1900 to the present
  + relativity and quantum mechanics

***Objectives of Physics***

* To find the limited number of fundamental laws that governs natural phenomena
* To use these laws to develop theories that can predict the results of future experiments
* Express the laws in the language of mathematics (Mathematics provides the bridge between theory and experiment)

**MEASUREMENTS**

* Used to describe natural phenomena
* Each measurement is associated with a physical quantity
* Physical Quantity – any number that is used to describe a physical phenomenon quantitatively (ex. weight, height, time, temperature, etc).

\* *Fundamental Quantities* are physical quantities used to define length, mass, time, electric current, luminous intensity and amount of substance

\**Derived Quantities* are combinations of two or more basic quantities

***Two Systems of Measurements***

1. International System of Units (French “ Le Systéme International d’ Unite’s)

* Metric System
* was agreed upon by the “General Conference on Weight s and Measurements” in 1960
* has two subsystems/ variations, the *mks (*meter – kilograms – seconds) and the *cgs (*centimeter- grams – seconds)

1. US Customary System or English System

* used only in US and few countries

FUNDAMENTAL QUANTITIES AND THEIR UNITS SOME DERIVED QUANTITIES

|  |  |  |
| --- | --- | --- |
| QUANTITY | METRIC SYSTEM | ENGLISH SYSTEM |
| Length | meter | foot |
| Mass | kilogram | slug |
| Time | second | second |
| Temperature | Kelvin |  |
| Electric Current | Ampere |  |
| Luminous Intensity | candela |  |
| Amount of substance | mole |  |

|  |  |  |
| --- | --- | --- |
| QUANTITY | METRIC SYSTEM | |
| UNIT | SYMBOL |
| Speed | Meter per second |  |
| Density | Kilogram per cu. Meter |  |
| Force | Newton | ; |
| Power | Watt |  |
| Energy | Joules |  |
| Pressure | Pascal |  |
| Work | Newton –meter |  |

**STANDARDS**

* a fixed magnitudes of a unit established to have a precise and reproducible definition of the unit

Characteristics of standards for measurements

* + Readily accessible
  + Possess some property that can be measured reliably
  + Must yield the same results when used by anyone anywhere
  + Cannot change with time

1. Length

* 1 meter - the distance traveled by light in vacuum during a time of 1/299 792 458 second

1. Mass

* 1 kilogram - the mass of a specific platinum–iridium alloy cylinder kept at the International Bureau of Weights and Measures at Sèvres, France

1. Time

* 1 second - the time taken by 9 192 631 770 oscillations of the light (of a specified wavelength) emitted by a cesium-133 atom.

**SI PREFIXES**

* Prefixes correspond to powers of 10.
* Each prefix has a specific name.
* Each prefix has a specific abbreviation.
* The prefixes can be used with any basic units.
* They are multipliers of the basic unit.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| PREFIXES | SYMBOL | VALUE | PREFIXES | SYMBOL | VALUE |
| Yotta | Y |  | Yocto | y |  |
| Zetta | Z |  | Zepto | z |  |
| Exa | E |  | Atto | a |  |
| Peta | P |  | Femto | f |  |
| Tera | T |  | Pico | P |  |
| Giga | H |  | Nano | n |  |
| Mega | M |  | Micro | μ |  |
| Kilo | K |  | milli | M |  |
| Hecto | h |  | centi | c |  |
| Deka | da |  | deci | d |  |

**CONVERSION OF UNITS and DIMENSIONAL ANALYSIS**

\* DIMENSION

* refers to the physical nature of a quantity and the type of unit to specify it; treated like algebraic quantities
* only quantities of the same unit may be added or subtracted

\* DIMENSIONAL ANALYSIS

* also known as “FACTOR LABEL or UNIT FACTOR METHOD”
* used to check whether an expression is in the correct form. The relationship is correct if both sides of the equation have the same dimension.
* It is also used for consistency of units

\* CONVERSION

- re-expressing one unit in terms of another unit