Applied Sciences

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Introduction to Science

- The word **science** comes from the Latin word *scientia* meaning **knowledge**.
- Science is a **systematic study of the natural world**, based on **observation, experimentation, and reasoning**.
- It helps us **understand the universe**, explain natural phenomena, and apply knowledge for human welfare.

Branches of Science

- **Physical Sciences** – study of non-living things
  - Physics (matter, energy, forces)
  - Chemistry (composition, structure, reactions of matter)
  - Astronomy (study of space, planets, stars)
- **Biological Sciences** – study of living organisms
  - Zoology (animals)
  - Botany (plants)
  - Microbiology (microorganisms)
  - Human Biology

Branches of Science

- **Earth Sciences** – study of earth and its environment
  - Geology (rocks, earth structure)
  - Meteorology (weather, climate)
  - Environmental Science

Importance of Science

- Explains natural phenomena.
- Improves human life through technology, medicine, and agriculture.
- Helps solve global issues like climate change and energy needs.
- Develops **critical thinking** and **problem-solving skills**.

What is Physics?

- Physics comes from the Greek word *physis* meaning **nature**.
- It is the branch of science concerned with the **study of matter, energy, motion, and the fundamental forces of nature**.
- Physics explains **how the universe works**, from the smallest particles to the largest galaxies.

Main Areas of Physics

- **Mechanics** – motion, force, energy, work, power.
- **Heat & Thermodynamics** – temperature, heat, laws of energy.
- **Waves & Optics** – sound, light, lenses, mirrors.
- **Electricity & Magnetism** – charges, current, circuits, magnetic fields.
- **Modern Physics** – atoms, nuclei, relativity, quantum physics.
- **Astrophysics & Cosmology** – study of space, stars, and the universe.

Role of Physics in Daily Life

- Electricity, mobile phones, internet, and computers.
- Medical technologies (X-rays, ultrasound, MRI).
- Transportation (cars, airplanes, rockets).
- Communication (satellites, radio, TV).
- Understanding nature (earthquakes, climate, space).

Methods of Study in Physics

- **Observation** – noticing natural phenomena.
- **Hypothesis** – proposing an explanation.
- **Experimentation** – testing under controlled conditions.
- **Laws & Theories** – universal principles (e.g., Newton's laws, laws of motion).

Importance of Physics

- Explains the **laws of nature**.
- Provides the **foundation for engineering, technology, and medicine**.
- Develops **logical and analytical thinking**.
- Helps improve the **quality of life** through innovations.

Physical Quantities and Units

- **Physical Quantities**
- A **physical quantity** is any measurable property of a body or phenomenon.
- It is expressed in **two parts**:
  - **Numerical value** (magnitude)
  - **Unit** (standard of measurement)
- ☞ Example: Length of a table = **2.0 m**
- "2.0" = numerical value
- "m" (meter) = unit

Types of Physical Quantities

- **Base (Fundamental) Quantities**
- Independent, cannot be derived from others.
- Examples: Length, Mass, Time, Temperature, Electric current, Amount of substance, Luminous intensity.
- **Derived Quantities**
- Obtained from base quantities by multiplication/division.
- Examples:
  - Area = Length × Width (m^2)
  - Volume = Length^3 (m^3)
  - Speed = Distance / Time (m/s)
  - Force = Mass × Acceleration ($kg \cdot m/s^2$)

International System of Units (SI Units)

- To avoid confusion, scientists use **SI Units** (International System of Units).
- It is a globally accepted system.

International System of Units (SI Units)

Quantity	Symbol	SI Unit	Symbol
Length	l	meter	m
Mass	m	kilogram	kg
Time	t	second	s
Electric Current	I	ampere	A
Temperature	T	kelvin	K
Amount of Substance	n	mole	mol
Luminous Intensity	Iv	candela	cd

Prefixes for Multiples & Submultiples

Prefix	Symbol	Value
kilo	k	$10^3 = 1000$
centi	c	$10^{-2} = 1/100$
milli	m	$10^{-3} = 1/1000$
micro	μ	10^{-6}
nano	n	10^{-9}
mega	M	10^6
giga	G	10^9

Importance of Units

- Provide a **standard** for measurement.
- Make data **understandable and comparable** worldwide.
- Help in **scientific accuracy** and practical use.