

## Chapter: 09 Nature and Science of Physics

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### 9.1 Objectives of Physics

#### Definition:

Physics is the branch of science that describes matter, energy, space, time, and their mutual connections and interactions throughout the universe. The objective of physics is to provide an understanding of the physical world by developing theories based on observations and experiments.

#### Notes:

- **Physics in Everyday Life:** Physics explains everything in our surroundings, from atoms to galaxies. Both natural and artificial phenomena involve the laws of physics.
- **Examples of Physics:**
  - GPS in mobile phones for location tracking.
  - Airplanes use the difference in air pressure for flight.
  - The functioning of submarines, satellites, and vehicles is based on the principles of physics.

#### Applications:

- Cell phones use electromagnetic waves to transfer energy and information.
- Vehicles operate by converting chemical energy into kinetic energy using mechanics and thermodynamics.

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### 9.2 Fields of Physics

#### Definition:

Physics encompasses various subfields, each focusing on different aspects of the natural world. These subfields are often interdisciplinary, contributing to a deeper understanding of natural phenomena.

#### Notes:

- **Biophysics:** Studies living systems using physics principles like fluid dynamics.

- **Astronomy:** Studies celestial bodies, space, and the universe.
  - **Astrophysics:** Focuses on the physical nature of celestial bodies and their phenomena.
  - **Cosmology:** Studies the origin, structure, and history of the universe.
  - **Thermal Physics:** Deals with thermodynamics and the kinetic theory of gases.
  - **Optics:** Studies the properties and behavior of light and its interactions with matter.
  - **Nuclear Physics:** Explores the properties and behavior of atomic nuclei.
  - **Electromagnetism:** Studies the electromagnetic forces between charged particles.
  - **Acoustics:** Focuses on sound production, transmission, and effects.
  - **Computational Physics:** Applies numerical methods to solve complex physical problems.
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### 9.3 Hypothesis, Theory, and Law

#### Definitions:

- **Hypothesis:** A tentative assumption made before conducting research that can be tested.
- **Theory:** A well-supported explanation of some aspect of the natural world, based on experimental evidence.
- **Law:** A statement summarizing an observed regularity or pattern in nature.

#### Notes:

- **Hypothesis:** Serves as a foundation for further research. It can be verified to determine its validity.
- **Theory:** Once a hypothesis is validated, it can evolve into a theory. Theories explain "why" phenomena occur and predict future occurrences.
- **Law:** Describes the consistent relationships between variables but does not explain "why" something happens.

#### Examples:

- **Kinetic Molecular Theory** explains the behavior of gases.

- **Newton's Law of Universal Gravitation** describes the gravitational attraction between two masses.
  - **Theory of General Relativity** explains how gravity works in the context of space-time.
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## 9.4 Science, Technology, and Engineering

### Definitions:

- **Science:** The systematic study of the natural world to understand its laws through observation and experimentation.
- **Technology:** The practical application of scientific knowledge to develop tools and systems that satisfy human needs.
- **Engineering:** The application of scientific principles to design and build systems, structures, and devices.

### Notes:

- **Science:** Focuses on understanding how things work.
- **Technology:** Uses scientific knowledge to create solutions for human needs.
- **Engineering:** Translates scientific principles into practical designs.

### Examples:

- **Smartphones:** A product of engineering, utilizing principles of physics, materials science, and electronics.
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### All Formulae (Collected at End)

*“No Formulae in this Chapter.”* 😊