

# BRANCHES OF SCIENCE

Chapter 1

# UNDERSTANDING THE DIFFERENT FIELDS OF SCIENCE AND THEIR RELATIONSHIP TO CHEMISTRY

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# LEARNING OBJECTIVES

After this lesson, students should be able to:

- Define science.
- Explain why science is called a systematized body of knowledge.
- Identify the major branches of science.
- Differentiate natural science, social science, and applied science.

# LEARNING OBJECTIVES

After this lesson, students should be able to:

- Classify different scientific disciplines.
- Explain why chemistry is considered the central science.
- Appreciate the importance of science in solving real-world problems.

# WHAT IS SCIENCE?

Science is the systematized body of knowledge that is based on facts gathered through observations, experiences and experiments in order to formulate a verifiable conclusion or law that serves as basis of technology for the benefit of man and his environment.

# WHAT IS SCIENCE?

The goal of science is to formulate:

- Scientific principles
- Laws
- Theories
- Models

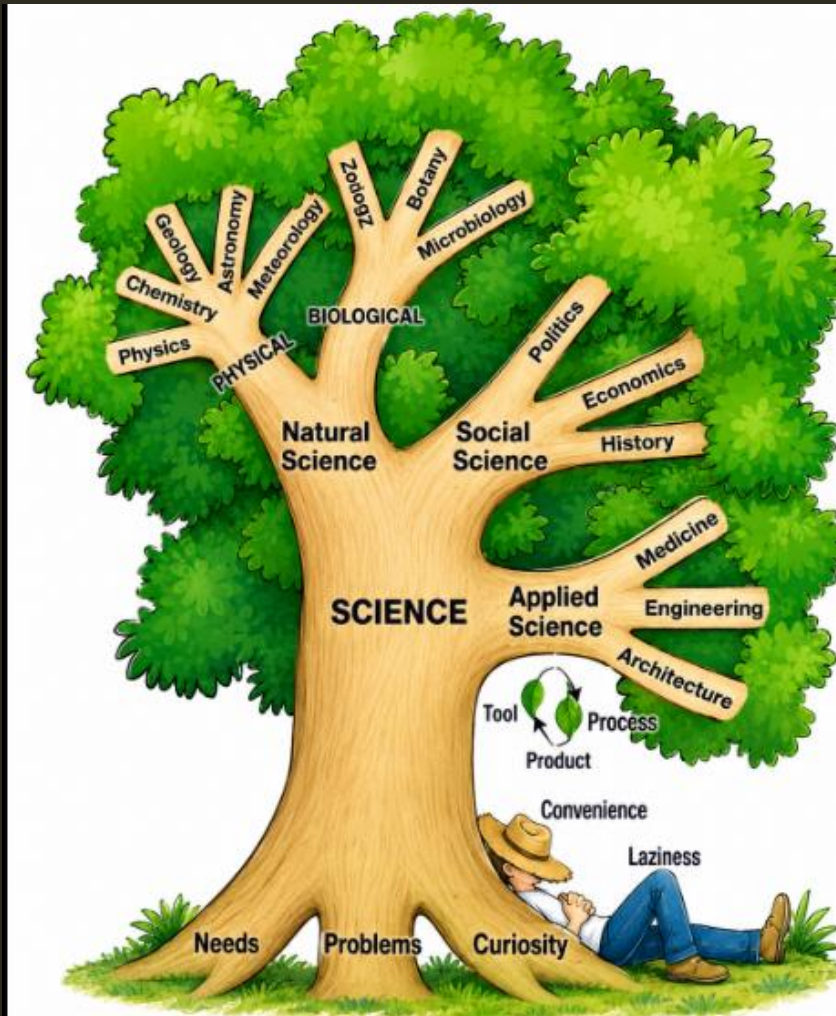
These become the foundation of technology and human progress.

# CHARACTERISTICS OF SCIENCE

Science is:

- Objective
- Evidence-based
- Systematic
- Testable
- Verifiable
- Reproducible
- Dynamic and self-correcting

# THE TREE OF SCIENCE



Branches:

- Natural Science
- Social Science
- Applied Science

# WHY DO WE STUDY SCIENCE?

Science helps us:

- Understand nature
- Improve health
- Develop technology
- Protect the environment
- Increase agricultural production
- Discover medicines
- Improve quality of life

# NATURAL SCIENCE

Natural Science studies:

- Nature
- Matter
- Energy
- Living organisms

➤ Earth

➤ Space

➤ Natural phenomena

It seeks to understand  
how the universe works.

# BRANCHES OF NATURAL SCIENCE

## Physical Science

Physical Science deals  
with the study of  
nonliving things

## Biological Science

Biological Science  
deals with the study of  
living things.

# PHYSICAL SCIENCE

Major Branches:

Physics

Chemistry

Geology

Astronomy

Meteorology

Oceanography

Planetary Science

Materials Science

Mineralogy

Geophysics

Geochemistry

Hydrology

Paleoclimatology

# SUBBRANCHES OF PHYSICS

Physics studies matter, energy, and their interactions.

Two main branches:

1. Classical Physics
2. Modern Physics

# SUBBRANCHES OF PHYSICS

- ❖ Classical Physics refers to the traditional topics in physics that were recognized and developed before the beginning of the 20<sup>th</sup> century. These topics are concerned with matter and energy under normal conditions.
- ❖ Modern Physics refers to concepts in physics that have surfaced since the beginning of the 20<sup>th</sup> century. This branch is mostly concerned with the behavior of matter and energy under extreme conditions (the very large or the very small)

# CLASSICAL PHYSICS

## 1. Mechanics

It is the study of forces acting on bodies, whether at rest or in motion

A. Statics – on forces acting on bodies at rest

B. Kinematics – on motion without regard to its cause

C. Dynamics – on motion and the forces that affect it

# CLASSICAL PHYSICS

2. Acoustics – the study of the production and propagation of sound waves

3. Optics – the study of light

A. Physical optics – on the production, nature and properties of light

B. Physiological optics – on the part played by light in vision

# CLASSICAL PHYSICS

## 3. Optics

A. Physical optics

B. Physiological optics

C. Geometrical optics – on the reflection and refraction of light as encountered in the study of mirrors and lenses

# CLASSICAL PHYSICS

4. Thermodynamics – the study of the relationship between heat and other forms of energy

5. Electromagnetism – the study of the properties of electric current and magnetism, and their relationship

# CLASSICAL PHYSICS

## 5. Electromagnetism

A. Electrostatics – on electric charges at rest

B. Electrodynamics – on moving charges

C. Magnetostatics – on magnetic poles at rest

# MODERN PHYSICS

1. Atomic and Nuclear Physics – the study of the components, structure and behavior of the nucleus of the atom
2. Quantum Physics – the study of the discrete nature of phenomena at the atomic and subatomic levels: its focus is on the indivisible units of energy called quanta as described by the Quantum Theory

# MODERN PHYSICS

3. Relativistic Physics – the study of phenomena that take place in a frame of reference that is in motion with respect to an observer

4. Solid state Physics – the study of all properties of solid materials, including electrical conduction in crystals of semiconductors and metals, superconductivity and photoconductivity

# MODERN PHYSICS

5. Condensed Matter Physics – the study of the properties of condensed materials (solids, liquids and those intermediate between them, and dense gas) with the ultimate goal of developing new materials with better properties; it is an extension of Solid State Physics

# MODERN PHYSICS

6. Plasma Physics – the study of the fourth state of matter, plasma

7. Low-Temperature Physics – the study of the production and maintenance of temperatures down to almost absolute zero, and the various phenomena that occur only at such temperatures

# CHEMISTRY AS A PHYSICAL SCIENCE

Chemistry studies:

➤ Composition of matter

➤ Structure

➤ Properties

➤ Changes

➤ Energy changes

# CHEMISTRY AS A PHYSICAL SCIENCE

## Major branches:

- Organic Chemistry
- Inorganic Chemistry
- Analytical Chemistry
- Physical Chemistry
- Biochemistry

## Additional fields:

- Environmental Chemistry
- Industrial Chemistry
- Nuclear Chemistry
- Polymer Chemistry
- Materials Chemistry

# EARTH AND SPACE SCIENCES

Includes:

- Geology
- Meteorology
- Astronomy
- Oceanography
- Hydrology
- Mineralogy
- Volcanology
- Seismology
- Climatology
- Geochemistry
- Geophysics

# PHYSICAL SCIENCE

## Geology

Study of the Earth's solid rocks, materials, and history.

## Meteorology

Study of the atmosphere, weather patterns, and daily forecasting.

# PHYSICAL SCIENCE

## Astronomy

Study of celestial objects, space, and the physical universe.

## Oceanography

Study of the ocean's biological, chemical, and physical properties.

# PHYSICAL SCIENCE

## Hydrology

Study of Earth's water movement, distribution, and quality.

## Mineralogy

Study of the structure, chemistry, and properties of minerals.

# PHYSICAL SCIENCE

## Volcanology

Study of volcanoes, lava, magma, and related eruptive phenomena.

## Seismology

Study of earthquakes and mechanical waves moving through Earth.

# PHYSICAL SCIENCE

## Climatology

Study of long-term weather patterns and climate trends.

## Geochemistry

Study of the chemical composition of Earth and rocks.

# PHYSICAL SCIENCE

## Geophysics

Study of Earth using mathematical and physical principles.

# BIOLOGICAL SCIENCE

Biological Science studies:

- Living organisms
- Life processes
- Evolution
- Heredity
- Ecology

# MAJOR BRANCHES OF BIOLOGICAL SCIENCE

➤ Zoology

➤ Botany

➤ Microbiology

➤ Genetics

➤ Ecology

➤ Anatomy

➤ Physiology

➤ Cell Biology

➤ Molecular Biology

➤ Marine Biology

# MAJOR BRANCHES OF BIOLOGICAL SCIENCE

➤ Biotechnology

➤ Evolutionary

➤ Biology

➤ Taxonomy

➤ Mycology

➤ Entomology

➤ Parasitology

➤ Virology

➤ Immunology

# SOCIAL SCIENCE

Social Science studies:

- Human society
- Human behavior
- Culture
- Economy
- Government
- Relationships

# BRANCHES OF SOCIAL SCIENCE

- Political Science
- Economics
- History
- Sociology
- Anthropology
- Psychology
- Human Geography
- Archaeology
- Linguistics
- Demography
- Criminology
- International Relations

# APPLIED SCIENCE

Applied Science  
applies scientific  
knowledge to solve  
practical problems.

Purpose:

Transform scientific  
discoveries into useful  
products and services.

# BRANCHES OF APPLIED SCIENCE

Major branches include:

- Medicine
- Engineering
- Architecture
- Pharmacy
- Agriculture
- Veterinary Medicine
- Dentistry
- Nursing
- Computer Science
- Food Science

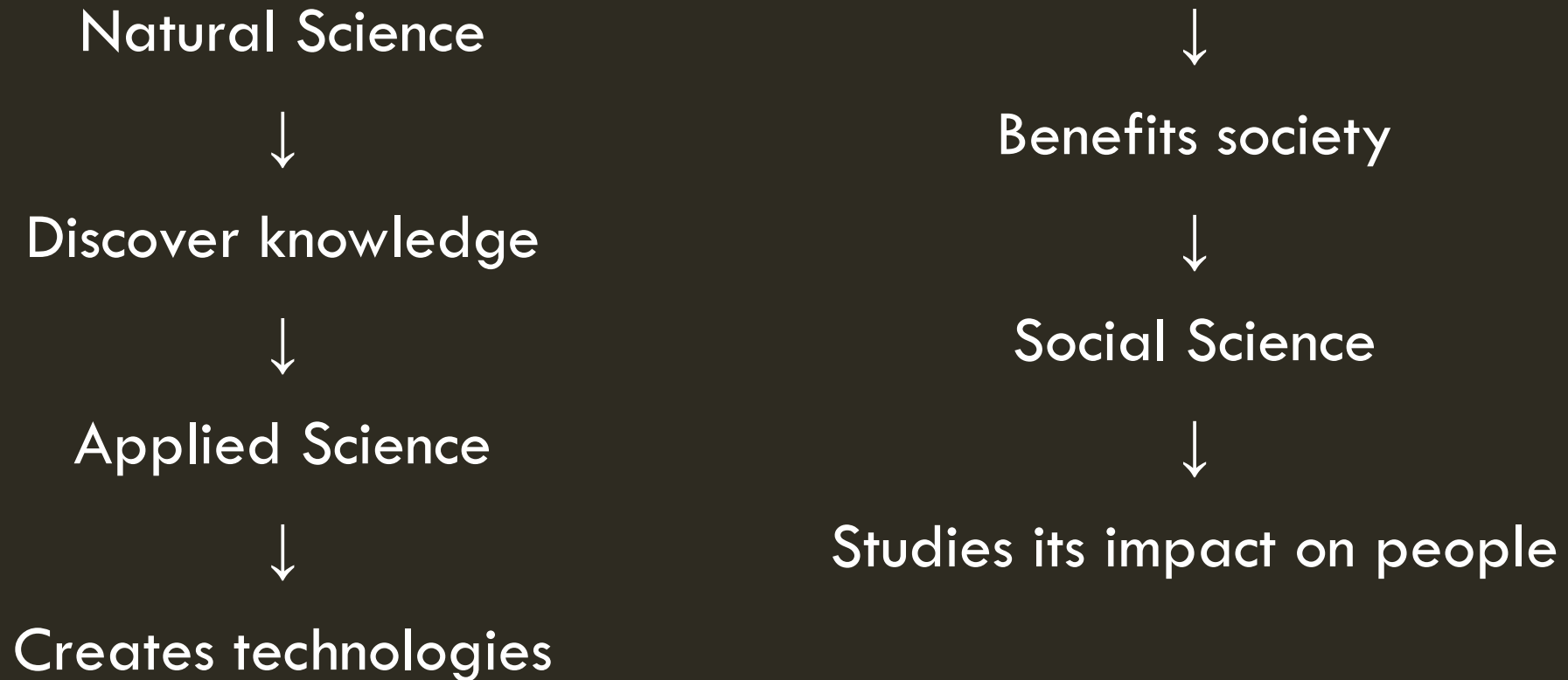
# BRANCHES OF APPLIED SCIENCE

- Environmental
- Engineering
- Biotechnology
- Information Technology
- Materials Engineering
- Chemical Engineering
- Civil Engineering
- Mechanical Engineering
- Electrical Engineering
- Industrial Engineering
- Biomedical Engineering
- Aerospace Engineering

# APPLIED SCIENCE VS TECHNOLOGY

| Applied Science             | Technology                       |
|-----------------------------|----------------------------------|
| Uses scientific knowledge   | Uses tools and techniques        |
| Focuses on solving problems | Focuses on practical application |
| Produces innovations        | Produces products and machines   |

# RELATIONSHIP AMONG THE BRANCHES



# SUMMARY

Science has three major branches:

- Natural Science
- Social Science
- Applied Science

Natural Science includes:

- Physical Science
- Biological Science

Chemistry belongs to Physical Science and serves as the Central Science because it connects many scientific disciplines.

# INTERACTIVE ACTIVITY

## **Classify the Discipline**

Determine whether each belongs to:

- A. Natural Science
- B. Social Science
- C. Applied Science

# INTERACTIVE ACTIVITY

## **Classify the Discipline**

Determine whether each belongs to:

- A. Natural Science
- B. Social Science
- C. Applied Science

➤ Botany

➤ Psychology

➤ Medicine

➤ Astronomy

➤ Civil Engineering

# INTERACTIVE ACTIVITY

## **Classify the Discipline**

Determine whether each belongs to:

- A. Natural Science
- B. Social Science
- C. Applied Science

➤ Zoology

➤ Economics

➤ Pharmacy

➤ Meteorology

➤ Sociology

# INTERACTIVE ACTIVITY

## **Classify the Discipline**

Determine whether each belongs to:

- A. Natural Science
- B. Social Science
- C. Applied Science

➤ Chemistry

➤ Geology

➤ Nursing

➤ Anthropology

➤ Oceanography