

Module 1: Cells as the Basis of Life

Content Focus:

Cells are the basis of life. They coordinate activities to form colonial and multicellular organisms. Students examine the structure and function of organisms at both the cellular and tissue levels in order to describe how they facilitate the efficient provision and removal of materials to and from all cells in organisms. They are introduced to and investigate biochemical processes through the application of the Working Scientifically skills processes.

Students are introduced to the study of microbiology and the tools that scientists use in this field.

These tools will be used throughout the course to assist in making predictions and solving problems of a multidisciplinary nature.

(NESA Biology Stage 6 Syllabus)

Outcomes:

A student:

- Conducts investigations to collect valid and reliable primary and secondary data and information
- Selects and processes appropriate qualitative and quantitative data and information using a range of appropriate media
- Describes single cells as the basis for all life by analyzing and explaining cells' ultrastructures and biochemical processes

Content	Week
<u>Cell Structure</u> Inquiry question: <i>What distinguishes one cell from another?</i>	1 - 2
<u>Cell Function</u> Inquiry question: <i>How do cells coordinate activities within their internal environment and the external environment?</i>	2 - 4



1. Introduction

The discipline of **biology** studies life and how it is structured organized and functions. It covers life on a vast scale and is **organized** and **hierarchal**.

Biology can be studied in the following ways:

- an **ecosystem** level, where the interactions between living things, or organisms, and non-living things are studied on
- a **community** level, where the interactions between all the organism in an ecosystem is studied
- a **population** level, where the interactions between one species of organism is studied
- an **organ system** level, where the structure and function of a particular organ system is examined. For example, the nervous system.
- an **organ** level, where the structure and function of an organ is examined. For example, the brain.
- a **cellular** level, where the structure and function of cells are studied. For example, a nerve cell.
- an **organelle** level, where the specialized structures inside a cell are studied. For example, mitochondria.
- a **biochemical** level, where the chemistry inside a living thing is studied. For example, the thermodynamics of an enzyme catalyzed reaction.

From many years of experimentation, scientists have hypothesized **the cell theory** states that:

- all living organisms are composed of **cells**
- all cells are produced from pre-existing cells.

Organisms can be classified into two types, **multicellular** and **unicellular**. A unicellular organism is composed **one** cell. A multicellular organism is composed of **many** cells. A multicellular organism is composed of **systems**, such as the nervous system, a circulatory system. A system is made up of a number of **organs**, such as the brain and the heart. Organs have **tissues** such as heart muscle tissue. Tissues are composed of cells such as cardiac muscle cells and neurons.

➤ Exercise 1.1

Define the following terms:

a) Organism

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b) Unicellular

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c) Multicellular

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d) The Cell Theory

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e) Tissue

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f) Organ

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g) Scientific Method

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h) Hypothesis

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i) Theory

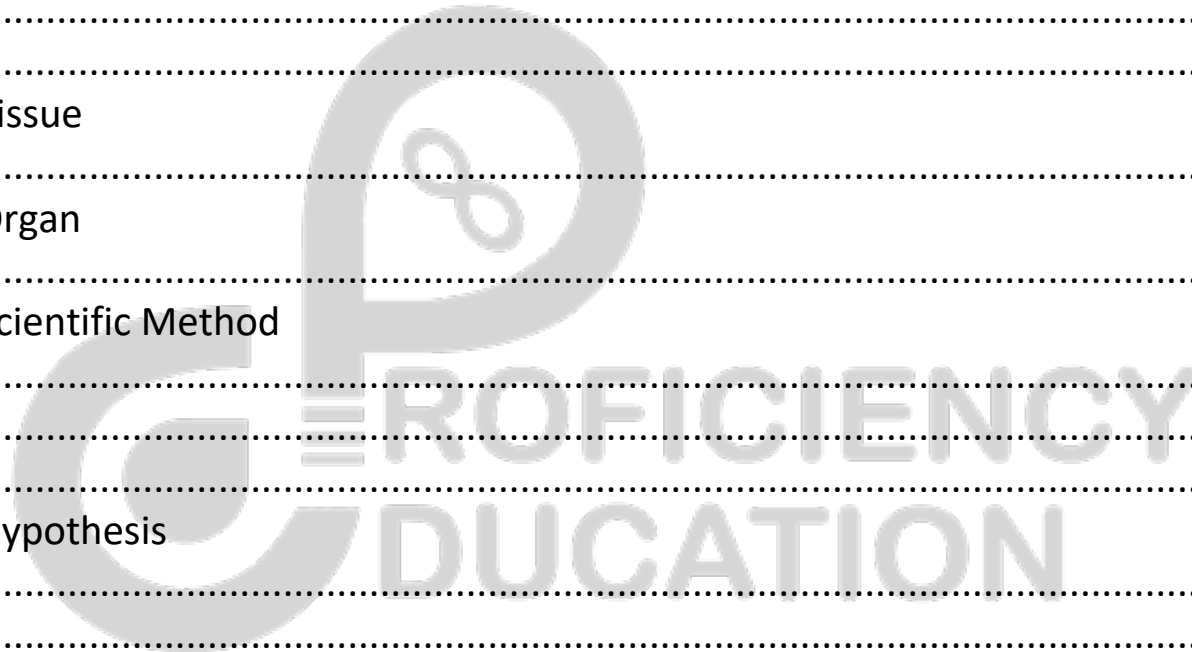
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j) Experiment

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2. Cell Structure of Prokaryotes and Eukaryotes

Year 11 Syllabus:

Inquiry question: *What distinguishes one cell from another?*

- Investigate different cellular structures, including but not limited to:
 - examining a variety of prokaryotic and eukaryotic cells

➤ Introduction

Life is found everywhere on Earth, in many different environments. Over the last 3.7 billion years, living **organisms** have diversified and adapted to almost every environment imaginable. All living organisms share certain similarities; they are able to **reproduce** or replicate to pass their **genetic** information, stored in a chemical molecule called **deoxyribonucleic acid** or **DNA**, to their offspring. The DNA contains information to build **fats, proteins** and **carbohydrates**. Another similarity across all types of organisms is that they are all made of **cells**. These cells are able to **replicate**, pass on their **DNA**, and make **new cells**.

Scientists have endeavored to **classify** life based on similarities in cell structure. The most recent classification system is the **Three Domains of Life**. This classification system encompasses the **prokaryotic domains bacteria** and **archaea**, and the **domain eukaryota**, which includes **protists, fungi, animals** and **plants**. Each domain has unique **cellular** features that define the domain.

However, all cells have similar features. They all:

- reproduce
- respire
- communicate (chemically)
- respond to stimulus
- grow and age
- obtain energy and use energy
- excrete waste

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