

# SNC2D BIOLOGY

TISSUES, ORGANS & SYSTEMS OF ...

☛ Cells – The Basic Unit of Life  
(P.8-16)

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## Cells – The Basic Unit of Life

*Can you easily tell what is alive and what is not alive? You know that animals and plants are alive, while rocks and buildings are not. What makes something alive? There are five characteristic traits that all living things share.*



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## Characteristics of Living Things

**ALL LIVING THINGS:**

- ① have a lifespan.
- ② grow in size, reproduce, and are able to repair themselves.
- ③ can sense and respond to changes in their environment.
- ④ require energy.
- ⑤ produce waste.



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### Cells & the Cell Theory

All living things are made up of cells. A **cell** is the smallest and most basic unit of life that can perform all the tasks listed previously. Large organisms, such as humans, are made up of trillions of cells. Other organisms, such as bacteria, are so tiny that they are made up of only one cell.

**CELL**

- ❖ the smallest and most basic unit of life that displays the 5 characteristics of living things
- ❖ most have a cell membrane, cytoplasm, nucleus, mitochondria, and vacuoles

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### Cells Classification

While all living things are made up of cells, these cells may be very simple or very complex. The simplest organisms are archaea and bacteria. These simple, single-celled life forms are called **prokaryotes** (pro-kary-ots). The cells do not have a nucleus.

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### Cells Classification

```
graph TD; ORGANISM[ORGANISM] -- "without a nucleus" --> prokaryote[prokaryote]; prokaryote -- "(e.g., E.coli)" --> E_coli["(a)"]; style E_coli fill:#000,stroke:#fff,stroke-width:2px
```

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### Cells Classification

More complex cells can exist as single-celled organisms or multicellular organisms. The cells of these organisms, known as **eukaryotes** (eu-kary-ots), have a more complex internal organization, including a nucleus. Eukaryotes include all protists, fungi, animals, and plants, from the tiniest amoeba to the longest whale and tallest tree. The cells of eukaryotes are much larger than the cells of prokaryotes: tens to thousands of times larger.

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### Cells Classification

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    graph TD
      ORGANISM -->|without a nucleus| prokaryote
      ORGANISM -->|with a nucleus| eukaryote
      prokaryote --> Ecoli["(e.g., E.coli)"]
      eukaryote -->|one cell| single_celled["single-celled organism"]
      eukaryote -->|many cells| multicellular["multicellular organism"]
      single_celled --> Amoeba["(e.g., Amoeba)"]
      multicellular --> animal
      multicellular --> plant
      animal --> whale["(e.g., whale)"]
      plant --> pine_tree["(e.g., pine tree)"]
  
```

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### Cells & the Cell Theory

After years of observations, scientists concluded that the cell is the basic unit of all living things. This conclusion became the foundation of the **cell theory**. Biology, the study of living things, is built on these three simple but very important ideas.

**CELL THEORY**

- ① all living things are made up of one or more cells
- ② cells are the basic unit of life
- ③ all cells come from pre-existing cells

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### Animal & Plant Cells

*Each part of your body has a specific function. Your heart pumps blood. Your teeth chew and break down food. In a similar way, individual cells contain organelles that perform specific tasks. An **organelle** is a smaller part of a cell that has a specific function. The nucleus, vacuoles, and mitochondria are examples of organelles. The various organelles of a cell work together so that the cell can perform all life functions including the intake of nutrients, the exchange of gases, movement, growth, waste removal, and reproduction.*

**ORGANELLE**

- ❖ cell structure within the cytoplasm that performs a specific function
- ❖ cell membrane, nucleus, vacuoles, ...

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### Activity: Animal & Plant Cells (WS1/P.10-11)

**INSTRUCTIONS**

A. Use the information on (i) the next two slides and (ii) P.10-11 of your text to complete 2DBIOL - WS1 (Animal & Plant Cell Structures).

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### Activity: Animal & Plant Cells (WS1/P.10-11)

**vacuole:** fluid-filled space containing water, sugar, minerals, and proteins

**chloroplast:** organelle containing chlorophyll used in photosynthesis

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**Chromosomes & DNA**

*Our DNA determines which species we belong to, how many limbs we have, what colour our eyes are, and so on. Not surprisingly, this information is handed down from parent to offspring.*



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**Chromosomes & DNA**

**NOTE!**  
*If you look carefully at the diagram, you can see that the 46 human chromosomes are grouped into 23 pairs. In humans, and in most animals, each parent contributes a sex cell that contain half the DNA: one chromosome of each pair. This is why we are the same species as our parent, and we generally look like them.*



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**Chromosomes & DNA**

**DNA**

- ❖ controls the cell
- ❖ determines an organism's appearance and function
- ❖ found in the chromosomes (humans have 46 chromosomes grouped into 23 pairs)

**NOTE!**  
*The size/complexity of an organism is not related to the number of chromosomes.*

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### Chromosomes & DNA

The DNA is exactly the same in every cell in an organism's body. Occasionally, a random change occurs in the DNA. This is called a **mutation**. If a mutation occurs in a sperm or egg cell, it can be passed on to the offspring that grows from that cell. The mutation in the DNA is copied in every cell of the growing offspring. The young organism is now genetically different from its parent.



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### Chromosomes & DNA

**NOTE!**  
Thalidomide was a sedative introduced in the late 1950s. It was used to treat morning sickness and to aid sleep. However, it was found to cause birth defects (i.e. thalidomide babies). The tragedy led to much stricter testing being introduced for drug and pesticide licensing.



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### Chromosomes & DNA

**MUTATION**

- ❖ random change in a cell's DNA
- ❖ some are beneficial to the cell (i.e. evolution)
- ❖ most are either neutral or damaging (i.e. cancer)



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 **Check Your Learning**

1. When you are hungry, you eat. How does this observation demonstrate at least one characteristic of living things?

living things require energy

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 **Check Your Learning**

2. Explain why you would expect the cells of a desert plant, such as a cactus, to have thickened cell walls.

to provide strength, protection, and support

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 **Check Your Learning**

3. Think about the function of the mitochondria. You have been asked to view cells taken from the leg muscle of an athlete and cells taken from the skin of an elderly individual. What differences in the number of mitochondria would you see in the two samples? Explain.

since mitochondria provide cells with energy, you would expect to see more of them in the leg muscle of an athlete

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 Check Your Learning

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**TEXTBOOK**  
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