

PRESENTATION

In order to give you an overview of the unit, there's a large picture and some questions to stimulate previous knowledge. This will help you relate the unit content to some aspects of your daily life, and show you how the content can be applied to real life. We recommend that you answer the questions throughout the unit. There's also a **Final task** which will prepare you as you go through the unit. The same task is also presented in digital format in **Oxford investigation**. The link near the picture will take you to a short introductory video.

1 CELLS

YOU WILL LEARN TO...

- Compare prokaryotic cells with eukaryotic cells and animal cells with plant cells. This will focus on understanding the functions of organelles and the relationship between their shape and function.
- Identify the outline of the cell, as well as the organelles occurring in the different phases of the cell cycle.
- Differentiate the structure of microorganisms from the structure of animal and plant cells.
- Name the organelles that have plant cells but not animal cells, and vice versa, and explain their structure and biological importance.
- Carry out a research task.

YOU WILL LEARN TO...

- What are the three life functions that all cells have in common?
- How are the prokaryotic cells in the image to be distinguished from the eukaryotic cells?
- What are the main differences between prokaryotic and eukaryotic cells?
- What organelles can you see that are eukaryotic cells?
- How do cells reproduce?

Endosymbiosis theory by Lynn Margulis

Lynn Margulis was an American biologist who revolutionised cellular biology when she proposed the endosymbiosis theory to the scientific community. The theory stated that eukaryotic cells are a result of the union of different types of bacteria. In this unit, we will study the different parts of a cell and their characteristics. We will also study the endosymbiosis theory and how it explains the origin of mitochondria. At the end of the unit, you will produce a digital presentation that describes how life on earth evolved over time.

1. CELL STRUCTURE AND CELL FUNCTIONS

In 1665, two German scientists named **Mattias Schleiden** and **Rudolf Virchow** proposed the cell theory. **Cell theory** states that the cell is the basic unit of life. It is the smallest unit of life that can perform all the functions of life. The cell is the basic unit of structure and function of an organism. It is the smallest unit of life that can perform all the functions of life. The cell is the basic unit of structure and function of an organism. It is the smallest unit of life that can perform all the functions of life.

1.1. Cell structure and cell functions

Cells are the basic units of the body and perform the three vital functions: nutrition, excretion and reproduction. They are the smallest units of life that can perform all the functions of life. The cell is the basic unit of structure and function of an organism. It is the smallest unit of life that can perform all the functions of life.

1.2. Cell wall

The cell wall is a rigid layer that surrounds the cell. It is made of cellulose in plants and chitin in fungi. It provides structural support and protection to the cell. It is the outermost layer of the cell. It is the basic unit of structure and function of an organism. It is the smallest unit of life that can perform all the functions of life.

Micrograph showing plant cells. The cell walls are clearly visible as thick, dark lines surrounding the cells.

1.3. Cytoplasm

The cytoplasm is the fluid medium inside the cell. It contains various organelles and is the site of many cellular processes. It is the basic unit of structure and function of an organism. It is the smallest unit of life that can perform all the functions of life.

1.4. Nucleus

The nucleus is the control center of the cell. It contains the cell's genetic material (DNA) and is surrounded by a nuclear envelope. It is the basic unit of structure and function of an organism. It is the smallest unit of life that can perform all the functions of life.

Micrograph showing animal cells. The nuclei are visible as dark, spherical structures within the cells.

CONTENT DEVELOPMENT

On these pages, there is an explanation of the material you are going to study. The activities are classified as lower-order thinking skills (Remember, Understand and Apply), or higher-order thinking skills (Analyse, Evaluate, Create). There is a brief summary of the content (**Key concepts**) at the end of each lesson in the margin.

CONSOLIDATION

This is a double page of activities that relate to the unit content. There are two highlighted sections: **Read and understand science** and **Study skills**. These consist of a summary, a concept map and a glossary of scientific terms.

CONSOLIDATION

Cell structure and cell functions

Cells are the basic units of the body and perform the three vital functions: nutrition, excretion and reproduction. They are the smallest units of life that can perform all the functions of life. The cell is the basic unit of structure and function of an organism. It is the smallest unit of life that can perform all the functions of life.

42. The following photograph shows a cell organelle.

Micrograph showing a cell organelle. The organelle is a small, dark, spherical structure within the cell.

43. The following table shows the structure of various types of cells.

Cell Type	Structure	Function
Plant Cell	Cell wall, Chloroplasts, Large central vacuole	Photosynthesis, Storage
Animal Cell	No cell wall, No chloroplasts, Small vacuoles	Energy production, Waste removal

44. Explain how a cell can obtain the following:

44.1. Nutrients: Through the cell membrane.

44.2. Water: Through osmosis.

44.3. Oxygen: Through diffusion.

44.4. Waste products: Through excretion.

45. Explain why the following statements are true:

45.1. All cells have a cell membrane.

45.2. All cells have cytoplasm.

45.3. All cells have a nucleus.

46. If the haploid number of a species is 5, identify the number of chromosomes during the following stages:

46.1. Prophase I: 5 chromosomes.

46.2. Metaphase I: 5 chromosomes.

46.3. Anaphase I: 5 chromosomes.

46.4. Telophase I: 5 chromosomes.

WORK AND EXPERIMENTATION TECHNIQUES

Creating a karyotype

A karyotype is the set of chromosomes of an individual. It is arranged in pairs according to their size and shape. It is used to identify chromosomal abnormalities. The procedure involves taking cells from a patient, treating them with a chemical to arrest them in metaphase, and then photographing and arranging the chromosomes in pairs.

Procedure

- Use the internet to find photographs of human cells in which individual chromosomes can be easily recognised.
- Magnify the images and print them.
- Cut out the chromosomes.
- Order the chromosomes in homologous pairs according to their structure and size.
- Stick all the pairs on a piece of card.

Endosymbiosis theory by Lynn Margulis

Lynn Margulis was an American scientist who proposed the endosymbiosis theory. She suggested that mitochondria and chloroplasts were once free-living prokaryotic cells that were engulfed by a larger cell. Over time, they became integrated into the host cell and evolved into the organelles we know today.

Procedure

- Organise your information into short paragraphs that can be used in your report.
- Add graphs, tables and images that support the information provided.
- Check your work. Make sure that you have covered all the points.

WORK AND EXPERIMENTATION TECHNIQUES

In this section, you'll find out about interesting methods and procedures for handling instruments and for carrying out your study. These will help you learn about your surroundings and the things found there. With these techniques, you will be able to put into practice what you have learnt in this unit.

FINAL TASK

We will guide you through the task you have to carry out, and explain how you should present your results. This **Final task** for the unit is also available in digital format in **Oxford investigation**.

You have a **DUAL BOOK**: a printed book and its electronic version, which includes resources for you to use together with the unit. In order to access the electronic version, use the code in the book and follow the instructions. You will be able to work either online or offline.

Digital icon: This icon reminds you that there is a digital version of your DUAL BOOK, Oxford investigation. In this version, you will find reading comprehension worksheets, animated videos, videos, relevant web links and interactive versions of all the course book activities.