# Teacher's Guide For

# Core Biology: Microbiology and Genetics

For grade 7 - College

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## Table of Contents

Page
Table of Contents and Rights……. 2
Materials in the Programs……...…… 3
Instructional Notes…….. 3
Introduction and Summary of the Series……. 3
Links to Curriculum Standards…… 4
Programs – *Core Biology: Microbiology and Genetics*
1673 - Anton Leeuwenhoek Describes Microscopic Life…… 5
1838 – The Cellular Basis of Life…… 5
1866 – Mendel's Laws of Inheritance…… 5
1878 - Germ Theory of Disease…… 5
1884 - The Structure of Cells…… 5
1884 – Mitosis and Cell Division……. 6
1905 – Meiosis…….. 6
1911 – Genes……. 6
1967 - The Symbiotic Cell……. 6

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## MATERIALS IN THE PROGRAM

Teacher's Guide -This Teacher's Guide has been prepared to aid the teacher in utilizing materials contained within this program. In addition to this introductory material, the guide contains the following:

- Suggested Instructional Notes
- Student Learning Goals
- Test Questions on Blackline Masters A for duplication and handout to students.

## INSTRUCTIONAL NOTES

It is suggested that you preview the program and read the related Student Goals and Teacher Points. By doing so, you will become familiar with the materials and be better prepared to adapt the program to the needs of your class. You will probably find it best to follow the programs in the order in which they are presented in this Teacher's Guide, but this is not necessary. It is also suggested that the program presentation take place before the entire class and under your direction. As you review the instructional program outlined in the Teacher's Guide, you may find it necessary to make some changes, deletions, or additions to fit the specific needs of your students. After viewing the programs you may wish to copy the Test Questions on Blackline Masters 1A, and distribute to your class to measure their comprehension of the events.

## INTRODUCTION AND SUMMARY OF SERIES

*Core Biology: Microbiology and Genetics* is a new approach to presenting in an exciting way the core principles of microbiology and genetics. The series is designed to present *Core Biology: Microbiology and Genetics* in a way that promotes successful student learning. *Core Biology: Microbiology and Genetics* covers the significant turning points in the history of microbiology and genetics, beginning with Anton Leeuwenhoek's use of the newly invented microscope to look at life. The series continues with Pasteur's discovery of the germ theory of disease, followed by presentations of the structure of cells, mitosis and meiosis. Next it shows how the discovery of genes formed the basis of modern genetics and helps explains evolution. It ends with how eukaryote cells – the building blocks of all complex life – are a product of cooperation.

Below is a list of the program and its segments. Using this program, teachers can create a lesson plan to cover the specific issues, themes and the historical figures mentioned.

**Program:** ***Core Biology: Microbiology and Genetics***

1673 – Anton Leeuwenhoek Describes Microscopic Life
1838 – The Cellular Basis of Life
1866 – Mendel's Laws of Inheritance
1878 – Germ Theory of Disease
1884 – The Structure of Cells
1884 – Mitosis and Cell Division
1905 – Meiosis
1911 – Genes
1967 – The Symbiotic Cell

**LINKS TO CURRICULUM STANDARDS**

The design for this series includes the following curriculum correlations: National Science Educations Standards, Content Standard C - Life Sciences (Grades 9-12); California State Content Standards for Biology-Life Sciences: Cell Biology, Genetics, Ecology, Evolution and Physiology (Grades 9-12). The content of this series is based more on the historical evolution of these principles and the people involved in discovering them than on problem solving.

**SUMMARY OF SERIES PROGRAMS**

## Program - *Core Biology: Microbiology and Genetics*

This program examines the key points in the development of the sciences of microbiology and genetics from the 17th century through the 20th century.

Segment one shows how Anton van Leeuwenhoek's discovery of the micro-world would lay the foundation for microbiology and genetics.

How all life is made up of cells is examined in Segment two.

Mendel's laws of inheritance and what they mean are discussed in Segment three.

Segment four outlines Louis Pasteur's remarkable theories.

The structure of cells and their component parts are outlined in Segment five.

The complicated processes of mitosis and cell division are discussed in Segment six.

Segment seven answers the question of how specialized sex cells came about through meiosis.

Segment eight shows how scientists learned that genes were the carriers of inheritance

How all life on Earth developed from eukaryote cells is discussed in Segment nine.

## 1673 - Anton Leeuwenhoek Describes Microscopic Life

**Student Goals - In this *Core Biology: Microbiology and Genetics* segment the students will learn:**

- Anton van Leeuwenhoek use of the microscope opened up the world of microscopic biology
- The single celled organisms van Leeuwenhoek saw were in many ways like the plants and animals in every day life
- Leeunwenhoek's discovery of the micro world would lead to the sciences of germ theory, genetics, and a better understanding of evolution

## 1838 – The Cellular Basis of Life

**Student Goals - In this *Core Biology: Plant Sciences* segment the students will learn:**

- The single lens microscope by the Dutch lens maker Anton van Leeuwenhoek in the last half of the 17th century would lead to answering many questions about cells
- English naturalist Robert Hooke gave the name to cells and described them
- All life is cellular life

## 1866 – Mendel's laws of Inheritance

**Student Goals - In this *Core Biology: Plant Sciences* segment the students will learn:**

- Prior to Mendel's ground-breaking work, the way physical traits were passed from parents to children was a mystery
- Mendel's laws of inheritance, including the principle of genetic dominance
- Modern genetics would confirm Mendel's laws

## 1878 - Germ Theory of Disease

**Student Goals - In this *Core Biology: Microbiology and Genetics* segment the students will learn:**

- 150 years ago there was no germ theory of disease - scientists thought poisons in the air or bad blood caused sickness
- French chemist Louis Pasteur discovered that each disease, such as cholera or tuberculosis, was caused by a unique and specific species of bacteria
- The different shapes of bacteria
- Most bacteria do not produce illnesses, but perform benign and vital functions in maintaining the health of not only humans, but the Earth's ecosystems
- Other microbes such as virus can cause disease

## 1884 - The Structure of Cells

**Student Goals - In this *Core Biology: Microbiology and Genetics* segment the students will learn:**

- All life is based on cells
- The parts and structure of cells
- One of the major structural distinctions among cells is that some cells have walls and some do not
- There are two basic types of cells

## 1884 – Mitosis and Cell Division

**Student Goals - In this *Core Biology: Microbiology and Genetics* segment the students will learn:**

- The process of cell division
- For prokaryote cells such as bacteria, the process of cell division is simple
- The process of cell division is much more complex for eukaryote cells
- Mitosis – the phases that occur to make sure that each daughter cell gets a complete set of chromosomes, hence genes

## 1905 – Meiosis

**Student Goals - In this *Core Biology: Microbiology and Genetics* segment the students will learn:**

- There are specialized cells for plant and animal reproduction
- At some point in the process of creating a new organism, a special kind of cell is produced - either sperms or pollen for male organisms and an egg for female organisms
- Sex cells come about through the process of meiosis, and are characterized by having a unique set of half the chromosomes of the mother cells

## 1911 - Genes

**Student Goals - In this *Core Biology: Microbiology and Genetics* segment the students will learn:**

- The man who tied together the 19$^{th}$ century's breakthroughs in evolution, laws of inheritance and cellular differentiation was American, Thomas Hunt Morgan
- Genes are places along the chromosome's DNA containing instructions for the cell to make a particular protein molecule
- Humans have an estimated 25,000 to 35,000 genes
- Genes determine physical characteristics such as flower color
- Genes tie together the theories of evolution, inheritance and morphogenesis

## 1967 - The Symbiotic Cell

**Student Goals - In this *Core Biology: Microbiology and Genetics* segment the students will learn:**

- The most significant event in Earth's history was that around 2 billion years ago, when the eukaryote cell emerged
- All complex life - modern-day animals, plants and fungi - are made up of eukaryote cells
- American biologist Lynn Margulis showed that the eukaryote cell is actually a colony of microbes living in a symbiotic relationship

## Answers to Blackline Master 1A Quiz

1-d; 2-b; 3-a; 4-c; 5-a; 6-d; 7-b; 8-a; 9-b; 10-c; 11-d; 12-a; 13-b; 14-a