

# Chapter 9 Microbial Genetics

## 9.1 Introduction to Genetics and Genes

**Genetics:** the study of the inheritance, or **heredity**, of living things. It explores:

- The transmission of biological properties (traits) from parent to offspring
- How those traits are expressed
- The structure and function of the genetic material
- How this material changes

### The Nature of the Genetic Material

For a species to survive, it must be able to self-replicate.

### The Levels of Structure and Function of the Genome

**Genomes:** sum total of genetic material of an organism.

- **Genomics:** study of an organism's entire genome.

**Chromosomes:** a distinct cellular structure composed of a neatly packaged DNA molecule.

- Eukaryotic chromosomes have DNA around histone proteins.
  - Located in the nucleus
  - Few to hundreds
  - Linear appearance
- Bacterial chromosomes are condensed into a pocket form by histonelike proteins.
  - Singular
  - Some have multiple, circular or linear chromosomes

**Gene:** a site on the chromosome that provides info for a certain cell function.

- A segment of DNA that has the info to make a **protein** or an RNA.

3 basic categories of genes:

- Structural genes that code for proteins
- Genes that code for the RNA machinery used in protein production
- Regulatory genes that control gene expression

● The sum of all three is an organism's genetic makeup, or **genotype**.

● Only a portion of genes are expressed, creating traits referred to as the **phenotype**

- Organisms have more genes than in their genotypes and phenotypes
- Phenotype can change depending on which genes are turned on

### The Size and Packaging of Genomes

Genomes vary in size

- Smallest viruses have 4 or 5 genes
- Bacterium *E. coli* has a single chromosome with 4000 and 5000 genes

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**Gerard J. Tortora**

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## **Table of Contents Microbial Genetics Study Guide Answers**

1. Understanding the eBook Microbial Genetics Study Guide Answers
  - The Rise of Digital Reading Microbial Genetics Study Guide Answers
  - Advantages of eBooks Over Traditional Books
2. Identifying Microbial Genetics Study Guide Answers
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Microbial Genetics Study Guide Answers
  - User-Friendly Interface
4. Exploring eBook Recommendations from Microbial Genetics Study Guide Answers
  - Personalized Recommendations
  - Microbial Genetics Study Guide Answers User Reviews and Ratings
  - Microbial Genetics Study Guide Answers and Bestseller Lists

5. Accessing Microbial Genetics Study Guide Answers Free and Paid eBooks
  - Microbial Genetics Study Guide Answers Public Domain eBooks
  - Microbial Genetics Study Guide Answers eBook Subscription Services
  - Microbial Genetics Study Guide Answers Budget-Friendly Options
6. Navigating Microbial Genetics Study Guide Answers eBook Formats
  - ePUB, PDF, MOBI, and More
  - Microbial Genetics Study Guide Answers Compatibility with Devices
  - Microbial Genetics Study Guide Answers Enhanced eBook Features
7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of Microbial Genetics Study Guide Answers
  - Highlighting and Note-Taking Microbial Genetics Study Guide Answers
  - Interactive Elements Microbial Genetics Study Guide Answers
8. Staying Engaged with Microbial Genetics Study Guide Answers
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers Microbial Genetics Study Guide Answers
9. Balancing eBooks and Physical Books Microbial Genetics Study Guide Answers
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection Microbial Genetics Study Guide Answers
10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
11. Cultivating a Reading Routine Microbial Genetics Study Guide Answers
  - Setting Reading Goals Microbial Genetics Study Guide Answers
  - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Microbial Genetics Study Guide Answers
  - Fact-Checking eBook Content of Microbial Genetics Study Guide Answers
  - Distinguishing Credible Sources
13. Promoting Lifelong Learning

- Utilizing eBooks for Skill Development
- Exploring Educational eBooks

14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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