

HS: Biotechnology (E)

Below is the syllabus for your course.

COURSE DESCRIPTION:

Can we bring back extinct species? Will the cures for cancer, malaria, and other diseases come from the combination of natural materials and new technologies? How is science changing the foods we eat? Welcome to the world of biotechnology! In this course, you will explore the history of biotechnology, including early attempts at food preservation, the development of antibiotics, and changes to food crops around the world. You'll also learn more about some of the challenges of biotechnology, such as the growth of antibiotic resistant bacteria and questions about the safety of commercially produced genetically modified organisms (GMOs). Finally, you'll research new biotechnologies and how they are changing the world we live in.

Unit 1: Biotechnology Basics

After studying this unit, you will be able to:

- * Recognize different types of cells.
- * Categorize organisms.
- * Define taxonomy and scientific naming of organisms.
- * Explain the basics of evolutionary theory.

Unit 2: The Beginning of Biotechnology

After studying this unit, you will be able to:

- * Explain the differences between the Paleolithic and Neolithic.
- * Describe how humans domesticated plants and animals.
- * Categorize the regional variances in agriculture and domestication.
- * Summarize the changes that occurred as humans domesticated plants and animals.

Unit 3: Food Preservation & Fermentation

After studying this unit, you will be able to:

- * Classify the various ways to store and preserve food.
- * Describe the different types of fermentation.
- * Explain the process of fermentation.
- * Discuss the study of microbiology and the work of Pasteur.

Unit 4: Collection & Breeding

After studying this unit, you will be able to:

- * Discuss the importance of early collectors and their collections.
- * Describe how collectors bred plants.
- * Illustrate the importance of hybridization and the impact of hybrids.
- * Explain how early breeding programs led to genetics.

Unit 5: The Beginning of Genetics

After studying this unit, you will be able to:

- * Discuss the function of genes.
- * Summarize the historical development of the study of genetics.
- * Describe Mendel's experiments and explain their significance.
- * Create a timeline describing the history of genetics from Mendel's time through the late twentieth century.

Unit 6: Early Industrial Discoveries

After studying this unit, you will be able to:

- * Summarize the developments in biotechnology that accompanied the Industrial Revolution.
- * Identify the changes that occurred during the period defined as classical biotechnology.
- * Explain the role of enzymes in an industrial setting.
- * Describe how war drove productivity and innovation in biotechnology.

Biotechnology Midterm Exam

Learning Objectives:

- * Review information acquired and mastered from this course up to this point.
- * Take a course exam based on material from the first six units in this course (Note: You will be able to open this exam only one time.)

Unit 7: The Discovery of Antibiotics

After studying this unit, you will be able to:

- * Explain the origin of antibiotics.
- * Arrange the timeline of antibiotic development.
- * Describe how antibiotics treat bacterial infections.
- * Discuss the concerns about antibiotic resistance and possible solutions.

Unit 8: Agricultural Biotechnology through the Green Revolution

After studying this unit, you will be able to:

- * Describe the changes in agricultural biotechnology in the late nineteenth century.
- * Explain how double crossbreeding changed plants.
- * Report on the developments that led to the Green Revolution.
- * Discuss how technological advances led to genetic modification in modern agriculture.

Unit 9: Mapping the Human Genome

After studying this unit, you will be able to:

- * Relate the history of the Human Genome Project.
- * Recognize the accomplishments of the Human Genome Project.

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- * Describe developments since the completion of the Human Genome Project.
- * Explain the potential for genetic research and understanding.

Unit 10: Modern Industrial Biotechnology

After studying this unit, you will be able to:

- * Describe the modern industrial uses for enzymes.
- * Recognize the role of genetics in modern industrial biotechnology.
- * Explain how and why biofuels are important.
- * List the environmental benefits of industrial biotechnology.

Unit 11: Modern Agricultural Biotechnology

After studying this unit, you will be able to:

- * Describe how organisms are genetically modified.
- * Report on the prevalence of GMOs.
- * Summarize the risks and benefits of GMOs.
- * Develop an educated opinion about the role of GMOs in our food supply.

Unit 12: Modern Pharmaceutical Biotechnology

After studying this unit, you will be able to:

- * Explain innovations in pharmaceutical biotechnology.
- * Define the importance of genetically modified hormones, insulin, and other compounds typically produced in the body.
- * Recognize the potential for new treatments for cancer and other illnesses.
- * Describe the importance of vaccines.

Biotechnology Final Exam

Learning Objectives:

- * Review information acquired and mastered from this course up to this point.
- * Take a course exam based on material from units seven to twelve in this course – the last six units. (Note: You will be able to open this exam only one time.)