



# Biotechnology

*Biotechnology is an exploratory course designed to introduce students to methods and technologies that support bioscience research and practice. Students are introduced to career possibilities in the field of biotechnology. Opportunities to participate with the, Utah Governor's Office of Economic Development, Medical Innovations Pathway are available.*

**Grade Level: 11-12**

**Full Year**

**Pre-requisite: Biology or Chemistry**

**State Certification Skills Test #708**

***Students will investigate the past, present, and future applications of Biotechnology as well as relevant careers.***

**Standard 1** Describe historical applications of Biotechnology. Create a timeline of historical biotechnology developments.

Discuss or replicate a historical application of biotechnology (e.g., yogurt, cheese, sauerkraut, bread)

**Standard 2** Describe applications of present technology and theorize future implications.

Evaluate the ethical, legal, and social implications in biotechnology (e.g., vaccines, genetically modified organisms (GMO), cloning, genetic engineering).

Describe the technologies that have been developed to identify, diagnose, and treat genetic diseases (e.g., gene therapy, genetic testing, genetic counseling, Human Genome Project, Real-time PCR, Next Gen sequencing).

Research and present biotechnology concepts and methodologies using effective communication skills (e.g., Pharmacogenomics, Therapeutic cloning, Transgenics).

**Standard 3** Explore the various science and non-science fields and careers associated with biotechnology.

Use the Internet, field trips, job fairs, interviews, and speakers to explore biotechnology.

Outline career paths for various occupations in the biotechnology field.

## ***Performance Skills***

Research and present biotechnology concepts using effective communication skills.

***Students will demonstrate appropriate safety procedures and equipment use in the laboratory.***

Standard 1 Demonstrate appropriate use of personal protective equipment (PPE).

Standard 2 Maintain a sanitary laboratory environment.

Standard 3 Exhibit appropriate behavior to protect coworkers and self.





## DAVIS ESSENTIAL SKILLS & KNOWLEDGE

Standard 4 Use biotechnology laboratory equipment correctly and safely.

### ***Performance Skills***

Demonstrate proper use of personal protective devices.

Demonstrate proper use and handling of micropipettes.

### ***Students will follow laboratory procedures properly.***

Standard 1 Follow laboratory protocols.

Standard 2 Comply with policies and requirements for documentation and record keeping.

Standard 3 Demonstrate proper handling of chemicals.

### ***Performance Skills***

Maintain accurate records and documentation according to minimum good documentation practices (GDP).

### ***Students will describe the properties of atoms and molecules and prepare lab reagents.***

Standard 1 Explain chemical concepts relevant to biotechnology.

Standard 2 Demonstrate accurate and correct solution preparation.

Standard 3 Relate dilution to solution preparation.

### ***Performance Skills***

Research and present biotechnology concepts using effective communication skills.

Prepare solutions of defined concentrations and pH.

### ***Students will describe the structure and function of cells and their components.***

Standard 1 Identify key cellular components and correlate with function.

Standard 2 Compare and contrast the Three-domain system.

### ***Students will demonstrate proper bacterial identification and maintenance of cultures.***

Standard 1 Prepare bacterial growth media.

Standard 2 Inoculate agar and broth media.

Standard 3 Identify common categories of bacteria.

### ***Performance Skills***

Prepare bacterial growth media.

Demonstrate the ability to culture and maintain microorganisms.





***Students will compare and contrast different types of nucleic acids and proteins and illustrate the flow of genetic information within the cell.***

Standard 1 Describe the structure of nucleic acids.

Standard 2 Describe how DNA functions as a template for DNA replication.

Standard 3 Describe the structure and function of proteins.

Standard 4 Outline the process of protein synthesis as related to the Central Dogma of Molecular Biology.

Standard 5 Describe how DNA mutations affect the organism.

***Performance Skills***

Demonstrate the ability to use PCR technology.

***Students will explain recombinant DNA techniques in bacteria.***

Standard 1 Describe the use of plasmids in bacterial transformation.

Standard 2 Describe the process of plasmid DNA isolation.

***Performance Skills***

Demonstrate proper aseptic/sterilizing procedures.

Perform a restriction digest and analyze the results with gel electrophoresis.

