

**CTAN Name: Biotechnology Principles**

This document contains information about the Career-Technical Articulation Numbers (CTANs) for the Biotechnology for Health and Disease Career-Technical Assurance Guide (CTAG).

- 1. **Biotechnology for Health and Disease:** CTAN alignment with the Health Sciences Pathway in the Career Field Technical Content Standards of the Ohio Department of Education (**ODE course 072125** ).
  
- 2. **Animal Science and Technology:** CTAN alignment with the Agriculture and Environmental Systems Pathway in the Career Field Technical Content Standards of the Ohio Department of Education (**ODE course 010910**).

**Course Description:** : This course covers the foundation of modern biotechnology. It reviews the history and foundational principles of the science. Students will learn the theoretical basis of DNA, RNA, and protein detection, analysis, manipulation, and engineering. Present and future applications of Biotechnology as they relate to areas such as industrial applications, medicine, environment, and agriculture will be explored.

**Credits:** 3 Semester Hours

**Alignment:**

All learning outcomes are considered essential and are marked with an asterisk\*.

<b>Learning Outcomes</b> <b>The student will be able to:</b>	<b>Competencies in ODE’s Revised Career Field Technical Content Standards</b>
1.Describe the history of and evaluate the implications of biotechnology in society, e.g., ethics, medicine, agriculture, environment and industry.	1.3.1 Analyze how regulatory compliance affects business operations and organizational performance. 1.3.9 Identify potential conflicts of interest (e.g., personal gain, project bidding) between personal, organizational and professional ethical standards. 1.5.8 Identify how multicultural teaming and globalization can foster development of new and improved products and services and recognition of new opportunities. 1.6.6 Identify the target market served by the organization, the niche that the organization fills and an outlook of the industry.

<p>2. Demonstrate an understanding of the process of DNA replication, transcription, translation, and gene regulation mechanisms.</p>	<p>5.4.3. Explain and model the structure of DNA from nucleotide to chromosome.  5.4.4. Model the Central Dogma Theory.  5.4.5. Describe the processes involved in gene regulation.  5.4.11. Apply concepts of a pedigree.</p>
<p>3. Explain the theoretical basis of genome analysis, including Sanger sequencing and current sequencing technologies.</p>	<p>5.4.9. Compare nucleic acids and chromosomal DNA molecules using a sequence database.  5.4.14. Explain results from the Human Genome project and other sequencing projects and explain how gene sequencing is performed.</p>
<p>4. Explain the theoretical basis of recombinant DNA technologies and its application.</p>	<p>5.4.7. Summarize the steps in creating a recombinant DNA molecule.  5.3.14. Describe the uses and limitations of various lab assays.</p>
<p>5. Explain the theoretical basis of gene expression analysis and its application.</p>	<p>5.3.14. Describe the uses and limitations of various lab assays.  5.4.2. Identify complex gene expression and transmission patterns.  5.4.16. Explain the role of RNA and its role in gene expression.</p>
<p>6. Explain the theoretical basis of PCR and basic chromatography techniques for separating and identifying nucleic acids, carbohydrates, proteins, and biological metabolites.</p>	<p>5.3.14. Describe the uses and limitations of various lab assays.  5.4.6. Identify and isolate peptides and proteins.  5.4.8. Isolate and purify nucleic acids, including chromosomal and extra-chromosomal DNA molecules.  5.4.10. Perform and interpret the results of restriction enzyme digests.  5.4.12. Perform and interpret the results of a polymerase chain reaction.  5.4.13. Use electrophoresis to separate nucleic acids and determine molecular weight.  5.5.7. Perform separation techniques, including chemical separations (chromatography), centrifugation, distillation and filtration and describe their principles and interpret the results  5.5.11. Perform a chromatography separation of a given mixture of substances.</p>
<p>7. Explore biotechnology fields and the career opportunities within each.</p>	<p>1.1.2. Identify the scope of career opportunities and the requirements for education, training, certification, licensure and experience.  1.1.3. Develop a career plan that reflects career interests, pathways, and secondary and postsecondary options</p>