Student Name: _____ **Date: _____**

PROGRAM COMPETENCY PROFILE FOR CAREER TECHNICAL EDUCATION
Career Cluster: Science, Technology, Engineering and Mathematics

Program Name: Biotechnology CIP: 261201 **Effective: 9/2017**

National Standard/ Organization: Educational Development Center, Inc. "Gateway to the Future: Skill Standards for the Bioscience Industry"

Competencies (statement that provides the overview of instructional area) Learner can:	**Performance Indicators** (examples of what educators may see in performance tasks when learners demonstrate their increasing understanding and use of the competencies) Learner can:	**Rating Scale:** (1) No Exposure (2) Novice (3) Proficient (4) Mastery
1. Understand through principles and practices laboratory safety concepts, procedures, and protocols to operate in a safe laboratory environment and demonstrate general lab practices, including protocols and sterile procedures to use, care for, and maintain lab instruments. ELA: 2,4,5-9 M: 1,2,6,8	• Apply proper safety and disposal practices while utilizing chemical and biological agents.	1 2 3 4
	• Demonstrate an ability to utilize SDS (Safety Data Sheet) appropriately and be able to recognize universally recognized hazard symbols.	1 2 3 4
	• Prepare and utilize SOPs (Standard Operating Procedures).	1 2 3 4
	• Utilize and apply principles of measurement.	1 2 3 4
	• Perform serial dilutions and calculate concentration.	1 2 3 4
	• Practice aseptic technique.	1 2 3 4
	• Develop and utilize a standard curve.	1 2 3 4
	• Practice precise and accurate micropipetting.	1 2 3 4
	• Employ proper centrifugation techniques.	1 2 3 4
	• Maintain and operate lab equipment properly.	1 2 3 4
	• Differentiate between the different types of microscopes and describe and demonstrate their uses.	1 2 3 4
	• Discuss and explain the principals of proper cryogenic techniques.	1 2 3 4
2. Understand scientific process and designs in order to successfully complete a scientific inquiry. ELA:1-9 M:6,8	• Demonstrate the ability to utilize the scientific method.	1 2 3 4
	• Demonstrate technical reading and writing by: ○ *Reading a variety of scientific writing (academic journal writing), and demonstrating knowledge of databases (PubMed, ERIC, etc.),* ○ *Writing lab reports, reading and interpreting charts/graphs in journal articles, generating graphs, and using Excel or other graphing software*	1 2 3 4
	• Apply proper experimental design.	1 2 3 4

Key: Rating Scale: 1 NO EXPOSURE; 2 = NOVICE (Information was covered in class, but student cannot demonstrate skill or knowledge without significant supervision); 3 = PROFICIENT (Student regularly demonstrates the knowledge or skill); 4= MASTERY (Student demonstrates successful completion of this skill numerous times without supervision.)
Common Core: E=English Language Arts (Reading, Writing, Research, Listening Speaking, Technology) M=Mathematics (Numbers Quantity, Algebra, Functions, Geometry, Stat&Prob)
All Aspect Industry (AAI) Career Ready Practice (CRP)

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3. Understand concepts and techniques for cGMP (current good manufacturing practices), GLP (good lab practices), and GDP (good documentation practices). ELA: 2,7	• Define and differentiate GLP, GMP, and GDP.	1 2 3 4
	• Demonstrate an understanding of quality assurance, quality control, and regulatory practices.	1 2 3 4
	• Explain role of various regulatory agencies, and demonstrate an understanding of compliance requirements related to approvals required by those agencies.	1 2 3 4
4. Understand concepts, techniques, and diagnostic procedures in microbiology that are critical for prokaryotic identification, cultivation, and the impact on the community. ELA: 1-9 M: 1,2,6,8	• Practice and demonstrate culturing techniques.	1 2 3 4
	• Employ identification techniques.	1 2 3 4
	• Determine cell concentrations, evaluate culture conditions, and assess growth kinetics.	1 2 3 4
	• Apply appropriate concepts in relation to disease, disease spread, and prevention.	1 2 3 4
5. Understand eukaryotic cellular structure and function and growth factors. ELA: 1-4,7,8	• Demonstrate an ability to properly identify cells and their parts.	1 2 3 4
	• Interpret interaction of a cell and its environment.	1 2 3 4
	• Demonstrate culture skills.	1 2 3 4
6. Understand concepts and techniques used in immunology in order to assist in the development of a cell-based assay. ELA: 2-5,7,9	• Employ immunological techniques.	1 2 3 4
	• Explain techniques for mono/polyclonal antibody production.	1 2 3 4
	• Describe the role of antibodies.	1 2 3 4
7. Understand concepts, techniques, and methodologies in chemistry and biochemistry in order to work in a	• Apply concepts and/or techniques of analytical chemistry.	1 2 3 4
	• Predict and/or manipulate chemical reactions.	1 2 3 4

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biotechnology laboratory. ELA: 2,3,7 M: 1,6	• Illustrate and employ enzymatic reactions.	1 2 3 4
	• Trace the flow of energy and matter through a system.	1 2 3 4
	• Utilize and demonstrate biomolecules and their interactions.	1 2 3 4
	• Explain principles of protein structure and function.	1 2 3 4
	• Utilize and apply analytical and purification techniques.	1 2 3 4
8. Understand concepts and techniques in molecular biology in order to successfully perform various genetic manipulations. ELA: 2-7,9 M:1,2,6,8	• Explain the relationship between nucleic acids and protein.	1 2 3 4
	• Utilize bioinformatics technology.	1 2 3 4
	• Explain and apply techniques in molecular biology.	1 2 3 4
9. Understand and apply principles of bioethical conduct. ELA: 1-3,6-9	• Summarize and explain the larger ethical, moral, and legal issues related to biotech research, product development, and use in society (animal use/ human research, etc.).	
	• Discuss bioethical case studies, including animal handling, human subject research, and GMOs.	1 2 3 4
10. Career Readiness: Understand the necessary employability and career readiness skills in order to achieve success in today's workplace. AAI:1-9 CRP:1-13 http://www.education.nh.gov/career/career/documents/aai_crp_emp.pdf	• Identify trends in the field of biotechnology. • Predict how nanotechnology, bioinformatics, proteomics, genomics, and transcriptomics will create new career opportunities and their impact on society.	1 2 3 4
	• Explain the various departments in a business model of a biotech company, and identify the role of biotech skills in hospitals, universities, pharmacies, research centers, etc.	1 2 3 4

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	• Communicate effectively by: o *Organizing oral and written information* o *Interpreting and communicating information, data, and observations* o *Presenting formal and informal presentations and adjusting presentation for audience* o *Applying active listening skills to obtain and clarify information* o *Listening to and speaking with a variety of individuals from diverse backgrounds*	1 2 3 4
	• Discuss, practice, and demonstrate the knowledge and skills to be an effective student and/or employee.	1 2 3 4
	• Develop, practice, and demonstrate skills through participation in biotechnology events, including those offered through professional and student organizations.	1 2 3 4