**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

**Learner can:**

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

**Performance Indicators**

**Learner can:**

- Apply proper safety and disposal practices while utilizing chemical and biological agents.
- Demonstrate an ability to utilize SDS (Safety Data Sheet) appropriately and be able to recognize universally recognized hazard symbols.
- Prepare and utilize SOPs (Standard Operating Procedures).
- Utilize and apply principles of measurement.
- Perform serial dilutions and calculate concentration.
- Practice aseptic technique.
- Develop and utilize a standard curve.
- Practice precise and accurate micropipetting.
- Employ proper centrifugation techniques.
- Maintain and operate lab equipment properly.
- Differentiate between the different types of microscopes and describe and demonstrate their uses.
- Discuss and explain the principals of proper cryogenic techniques.

**Rating Scale:**

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2. Understand scientific process and designs in order to successfully complete a scientific inquiry.

**ELA:** 1-9  
**M:** 6,8

**Performance Indicators**

- Demonstrate the ability to utilize the scientific method.
- 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.
- Apply proper experimental design.

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**Key:**

- 1 NO EXPOSURE: Information was covered in class, but student cannot demonstrate skill or knowledge without significant supervision;
- 2 NOVICE: Student regularly demonstrates the knowledge or skill;
- 3 PROFICIENT: Student demonstrates successful completion of this skill numerous times without supervision;
- 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)
### Program Name: Biotechnology

**CIP:** 261201  
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#### Competencies (statement that provides the overview of instructional area)

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<th>Learner can:</th>
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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.  
- Demonstrate an understanding of quality assurance, quality control, and regulatory practices.  
- 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.  
- Employ identification techniques.  
- Determine cell concentrations, evaluate culture conditions, and assess growth kinetics.  
- 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.  
- Interpret interaction of a cell and its environment.  
- 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.  
- Explain techniques for mono/polyclonal antibody production.  
- 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.  
- Predict and/or manipulate chemical reactions. | 1 2 3 4 | |

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**All Aspect Industry (AAI)  Career Ready Practice (CRP)**
**PROGRAM COMPETENCY PROFILE FOR CAREER TECHNICAL EDUCATION**  
**Career Cluster: Science, Technology, Engineering and Mathematics**  
**Program Name: Biotechnology**  
**CIP: 261201**  
**National Standard/Organization:** Educational Development Center, Inc. “Gateway to the Future: Skill Standards for the Bioscience Industry”  
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<td>Learner can: biotechnology laboratory. ELA: 2,3,7 M: 1,6</td>
<td>• Illustrate and employ enzymatic reactions.</td>
<td>1 2 3 4</td>
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<td>• Trace the flow of energy and matter through a system.</td>
<td>1 2 3 4</td>
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<td>• Utilize and demonstrate biomolecules and their interactions.</td>
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<td>• Explain principles of protein structure and function.</td>
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<td>• Utilize and apply analytical and purification techniques.</td>
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<td>Learner can: 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</td>
<td>• Explain the relationship between nucleic acids and protein.</td>
<td>1 2 3 4</td>
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<td>• Utilize bioinformatics technology.</td>
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<td>• Explain and apply techniques in molecular biology.</td>
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<td>Learner can: 9. Understand and apply principles of bioethical conduct. ELA: 1-3,6-9</td>
<td>• 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.).</td>
<td>1 2 3 4</td>
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<td>• Discuss bioethical case studies, including animal handling, human subject research, and GMOs.</td>
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<td>Learner can: 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</td>
<td>• Identify trends in the field of biotechnology.</td>
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<td>• Predict how nanotechnology, bioinformatics, proteomics, genomics, and transcriptomics will create new career opportunities and their impact on society.</td>
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<td>• 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.</td>
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All Aspect Industry (AAI)  Career Ready Practice (CRP)
### PROGRAM COMPETENCY PROFILE FOR CAREER TECHNICAL EDUCATION

**Career Cluster:** Science, Technology, Engineering and Mathematics

**Program Name:** Biotechnology  
**CIP:** 261201

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

**Effective:** 9/2017

### Competencies

**Communicate effectively by:**
- Organizing oral and written information
- Interpreting and communicating information, data, and observations
- Presenting formal and informal presentations and adjusting presentation for audience
- Applying active listening skills to obtain and clarify information
- Listening to and speaking with a variety of individuals from diverse backgrounds

**Discuss, practice, and demonstrate the knowledge and skills to be an effective student and/or employee.**

**Develop, practice, and demonstrate skills through participation in biotechnology events, including those offered through professional and student organizations.**

**Learner can:**

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