

Biotechnology

2023-2024 MICHIGAN HOSA EVENT MODIFICATIONS FOR REGIONAL CONFERENCES!



New for 2023 – 2024

Skill events now require attire appropriate to the occupational area be worn for Round 2.

These guidelines are written for ILC. States may modify events or have different event processes and deadlines.

Be sure to check with your Local/State advisor (or state website) to determine how the event is implemented for the

regional/area or state conference. Editorial updates have been made. These guidelines are specifically

for Michigan HOSA members in preparation for the regional leadership conferences. For more information about regionals, please visit www.michiganhosa.org/regionals.

Event Summary

Biotechnology provides members with the opportunity to gain knowledge and skills required for a laboratory setting using biotechnology. This competitive event consists of two rounds. Round One is a written, multiple-choice test and the top-scoring competitors will advance to Round Two for the skills assessment. This event aims to inspire members to learn more about biotechnology careers. At the regional level, all teams will advance to the round two- skill round. The test scores will be combined with the skill scores for final rating.

Sponsorship

This competitive event is sponsored by [Bio-Rad Laboratories, Inc.](http://Bio-Rad Laboratories, Inc)

For resources, helpful videos, and support specifically designed for HOSA and this competitive event, please visit www.biorad.com/hosa



Dress Code

Competitors shall wear proper business attire or official HOSA uniform or attire appropriate to the occupational area during testing. Round 2 skill events require attire appropriate to the occupational area be worn. Bonus points will be awarded for proper dress. At the regional level, teams can wear the occupational appropriate attire to test in, in addition to the skills. They do NOT need to change into business attire to take the test. Bonus points will not be added for proper dress, but judges/event managers will make note if competitors are NOT in proper dress which could result in overall point deduction.

Competitors must provide:

- [A photo ID](#)
- Two #2 pencils (not mechanical) with eraser
- Ruler (metric, w mm marks)
- Glasses, safety glasses, face shield or goggles
- Closed-toe shoes
- Disposable non-latex gloves
- Lab Coat (Optional)

General Rules

1. Competitors in this event must be active members of HOSA and in good standing.
2. **Eligible Divisions:** Secondary and Postsecondary/Collegiate divisions are eligible to compete in this event.
3. Competitors must be familiar with and adhere to the “[General Rules and Regulations of the HOSA Competitive Events Program \(GRR\)](#).”
 - A. Per the [GRRs](#) and [Appendix H](#), HOSA members may request accommodation in any competitive event. To learn the definition of an accommodation, please read [Appendix H](#). To request accommodation for the International Leadership Conference, [submit the request form here](#) by May 15 at midnight EST.
 - B. To request accommodation for any regional/area or state level conferences, submit the request form [here](#) by your state published deadline. Accommodations must first be done at state in order to be considered for ILC. **Regional accommodations MUST be submitted two weeks prior to your regional conference date. Email Samantha.pohl@mhc.org for questions.**
4. All competitors shall report to the site of the event at the time designated for each round of competition. At ILC, competitor’s [photo ID](#) must be presented prior to ALL competition rounds. **Event managers will be checking photo IDs at the regional level as well. A digital copy of a photo is appropriate (i.e. picture on phone of photo ID on school portal).**

Official References

5. All official references, including websites, are used in the development of the written test and skill rating sheets. In addition, some skills have supporting video resources to help competitors prepare for competition per item #14 below.
6. [Brown, J. Kirk. *Biotechnology A Laboratory Skills Course*. Bio-Rad. Latest edition.](#)
7. [Starr and Taggart. *Biology: The Unity and Diversity of Life AP*. National Geographic Learning Cengage. Latest edition.](#)
8. [Biotechnology Careers](#)

Round One Test

9. [Test Instructions](#): The written test will consist of 50 multiple choice items in a maximum of 60 minutes.
10. **Time Remaining Announcements:** There will be NO verbal announcements for time remaining during ILC testing. All ILC testing will be completed in the Testing Center and competitors are responsible for monitoring their own time. **There will be NO verbal announcements for time remaining during**

regional testing. Students are responsible for monitoring their own time.

11. **Written Test Plan**

- Biotechnology industry practices and careers4%
- Biotechnology in health.....4%
- Governmental regulation of biotechnology.....4%
- Basic laboratory skills14%
 - PPE
 - Preparing solutions (calculations, use of balance and other equipment)
 - Pipetting
- Microbiology and cell culture12%
- DNA structure and analysis.....14%
- Bacterial transformation.....10%
- Polymerase chain reaction (PCR).....14%
- Protein structure, function, and analysis14%
- Immunological applications.....10%

12. The test score from Round One will be used to qualify the competitor for Round Two. **All teams will advance to the round two skills.**

13. At the International Leadership Conference, HOSA will provide basic handheld calculators (no graphing calculators) for addition, subtraction, division, multiplication, and square root calculations.

14. **Sample Round One Test Questions**

1. What type of bond connects nitrogenous base pairs and holds the two strands of a DNA molecule together? (Bio-Rad pg 114)
 - A. Hydrogen**
 - B. Nitrogenous
 - C. Oxygen
 - D. Carbon

2. Which discipline of systems biology investigates the full complement of DNA in a cell? (Bio-Rad pg 5)
 - A. Microbiomics
 - B. Proteomics
 - C. Genomics**
 - D. Metabolomics

3. What was the first bacterium used commercially to produce genetically engineered human insulin? (Starr pg 240)
 - A. *Saccharomyces*
 - B. *E. coli***
 - C. Epstein-Barr
 - D. Staphylococci

Round Two Skills

15. Round Two is the performance of a selected skill(s). The Round Two skills approved for this event are: **Highlighted in yellow are the two skills that will be evaluated at the regional level.**

	Textbook (Bio-Rad)	Time Allocated	Video Resource(s)
Skill I: Using Micropipets, Transfer Pipets, and a Balance	pp. 50-53 (Part 3), 381, and 383 (use of balance)	15 min	Videos 1 and 2
Skill II: Restriction Digestion Reaction	p. 140 (Part 1)	15 min	none

Skill III: DNA Gel Electrophoresis	pp. 140-141 (Part 2) 391	20 min	Video
Skill IV: DNA Gel Interpretation	pp. 136-138, 142, 392	15 min	none
Skill V: Bradford Protein Quantitation Assay	pp. 254-255 (through step 10), 395	20 min	Video
Skill VI: Bacterial Transformation	pp. 167-171, 392	20 min	Video
Skill VII: Calculation of Transformation Efficiency	pp. 155-156, 393	10 min	none
Skill VIII: Qualitative ELISA	pp. 314-316, 400	20 min	Video

(FOR ALL SKILLS, ANY BODY FLUIDS WILL BE A SIMULATED PRODUCT)

16. The selected skill(s) will be presented to competitors as a written scenario at the beginning of the round. The scenario will be the same for each competitor and may include a challenging component that will require the competitor to apply critical thinking skills. Where appropriate, scenarios will also provide protocols to those they could expect to see if working in an industry laboratory (these protocols will not be as detailed as those provided in the textbook; students are expected to know basic skills such as micropipet use, labeling of tubes, avoiding sample cross-contamination, lab hygiene, and basic workflows). A specific [Biotechnology sample scenario](#) can be found [HERE](#).
17. Timing will begin when the scenario is presented to the competitor and will be stopped at the end of the time allowed.
18. The scenario is a secret topic. Competitors MAY NOT discuss or reveal the secret topic until after the event has concluded or will face penalties per [the GRRs](#).
19. Judges will provide information to competitors as directed by the rating sheets.-
20. Competitors must use all equipment correctly and safety. Judges will stop a student and not award points for a step if they see a competitor is about to cause a risk of harm or about to damage equipment or other supplies.
21. Selection of the correct micropipet for a specified volume is an essential skill. Though other micropipets exist (2, 10, or 100 μ l, for example), the skills in this competitive event are to be performed using a 20, 20-200, or 100-1,000 μ l micropipet (a p20, p200, or p1000).
22. The protocols for these skills follow protocols given in the Bio-Rad textbook, Biotechnology A Laboratory Skills Course (Brown JK). Note that, in skill VIII, the incubation times have been shortened to enable competitors to complete the skill and see color development within the allotted time.

Final Scoring

23. The competitor must earn a score of 70% or higher on the combined skill(s) of the event to be recognized as an award winner at the ILC.
24. Final rank is determined by adding the round one test score plus round two skills score. In case of a tie, the highest test score will be used to determine the rank.

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Section # _____ Division: _____ SS _____ PS/C
Competitor # _____ Judge's Signature _____

Skill IV: DNA Gel Interpretation (Time: 15 minutes)	Possible	Awarded
1. Using a ruler, measured the distance (in mm) that each of the DNA fragments or bands traveled from the well. Recorded results for each sample and standard in the table provided.	4 0	
2. Using the semilog graph paper provided, plotted the distance versus size for the bands in the standard.	6 0	
3. Drew a line of best fit through the points.	4 0	
4. Used the graph to estimate the fragment size for each band in the samples. Recorded estimates in the table provided.	6 0	
TOTAL POINTS - SKILL IV 70% Mastery for Skill IV = 14	20	

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Section # _____ Division: _____ SS _____ PS/C
 Competitor # _____ Judge's Signature _____

**For all Judge verification steps, full points are only awarded if all components are accurate*

Skill VII: Calculation of Transformation Efficiency (Time: 10 minutes)	Possible	Awarded
1. Entered testing area wearing closed-toed shoes and donned proper PPE: glasses/safety glasses/goggles, and gloves (lab coat is optional).	2	0
2. Counted the number of transformed colonies on the plate and recorded that number on the printed scenario or paper provided. If there are >~50 colonies, an estimation made by counting colonies in a quadrant on the plate is acceptable.	4	0
3. Calculated how many micrograms of DNA were spread onto the plate.	4	0
4. Expressed answer to #3 using correct units (μg).	2	0
5. Calculated the transformation efficiency.	4	0
6. Expressed answer to #5 using correct units (CFU/ μg or colonies/ μg).	2	0
7. Removed PPE before leaving the area.	2	0
TOTAL POINTS - SKILL VII	20	
70% Mastery for Skill VII = 14		