



# BIOTECHNOLOGY

**Purpose:** To provide Health Science students with an opportunity to develop and demonstrate knowledge and skills in medical and health care biotechnology careers.

**Description of Event:** This event will consist of two rounds of competition. Round One will be a written, multiple choice test of knowledge and understanding. The top scoring competitors will advance to Round Two for the performance of selected skill procedure(s) identified in a written scenario. The scenario will require the use of critical thinking skills. The performance will be timed and evaluated according to the event guidelines.

**Dress Code:** Competitors shall wear proper business attire or official HOSA uniform, or attire appropriate to the occupational area, during the orientation and written test. Competitors will wear attire appropriate to the occupational area during the skill procedure(s). School identification or name pins must be removed or covered during competition. Bonus points will be awarded for proper dress.

- Rules and Procedures**
- Competitors in this event must be active members of HOSA in good standing in the category in which they are registered to compete (Secondary or Postsecondary/Collegiate).
  - The test shall be developed from the National HOSA test item bank and will consist of fifty (50) multiple choice items. Competitors will be given one hour to complete the test.

Round One: Written Test Plan

Biotechnology industry, equipment and products .....	10%
Raw materials of biotechnology .....	8%
Biotech workplace skills.....	10%
DNA structure and function .....	8%
Proteins and enzymes .....	10%
Genetic engineering.....	8%
Biotechnology in Health Care .....	20%
DNA synthesis, sequencing and genomics .....	8%
Careers in medical biotechnology.....	8%
Bioethics .....	10%
1. Somatic gene cell therapy	
2. Cloning	
3. Bioterrorism	
4. Gene patenting	
5. Stem cells	

- All competitors shall report to the site of the event orientation at the time designated. The Round One test will immediately follow the orientation. **No proxies will be allowed for the orientation.** No study materials are allowed in the room.

4. All official references, including websites, are used in the development of the written test. The specific reference selected for each procedure is listed in the Facilities, Equipment and Materials section of these guidelines.
  - Walters, Estridge, Reynolds. *Basic Clinical Laboratory Techniques*. Delmar Publishing. Latest edition.
  - Daugherty, Ellyn. *Biotechnology: Science for the New Millennium*. Paradigm Publishing ([www.emcp.com](http://www.emcp.com)) Latest edition.
  - Simmers, Louise. *Diversified Health Occupations*. Delmar Cengage Learning, latest edition.
  - Bioethics.com <http://www.bioethics.com/>
  - Biotechnology Industry Organization <http://www.bio.org/>
5. The test score from Round One will be used to qualify the competitor for the Round Two skill procedures. The skill procedures approved for Round Two for this event are:
  - Procedure I: Identification of laboratory equipment
  - Procedure II: Infection control and transmission-based precautions
  - Procedure III: Inoculate and streak an agar plate
  - Procedure IV: Using a microscope

**\*(FOR ALL PROCEDURES, BODY FLUIDS WILL BE A SIMULATED PRODUCT)**
6. States/National HOSA have the option of including Procedure I: Identification of laboratory equipment, at the same time as the Round One written test.
7. The selected procedure(s) for Round Two, in the form of a written scenario, will be presented to the competitor at the start of the skill to be performed. The timing for the skill will begin when the scenario is presented. The scenario will be the same for each competitor and will include a challenging component that will require the competitor to apply critical thinking skills.
8. The scenario is a secret topic. Professional ethics demand that competitors DO NOT discuss or reveal the secret topic until after the event has concluded. Competitors who violate this ethical standard will be disqualified.
9. In case of a tie, the highest test score will be used to determine the rank.
10. Competitors must complete all steps of the procedure listed in the guidelines even if the steps must be simulated/verbalized. Steps may not be simulated/verbalized when the equipment/materials are available.
11. The competitor must earn a score of 70% or higher on the combined skill procedure(s) of the event (excluding the test) in order to be recognized as an award winner at the NLC.
12. Competitors will be stopped at the end of the time allowed for a selected procedure(s).
13. Competitors must bring all items noted with \*\*\* in the materials section of these guidelines to the event.
14. Competitors must be familiar with and adhere to the "**General Rules and Regulations of the National HOSA Competitive Events Program.**"

**Required Personnel**

1. One Event Manager per event
2. One Section Leader per section
3. One judge per procedure selected per section (with expertise in the specific skill area)
4. Proctors for testing
5. One-two Courtesy Corps per section
6. Timekeepers (if necessary)

**Facilities, Equipment and Materials (Per Section)**

**General**

1. Clinical and/or laboratory stations for selected procedures
2. Holding rooms or areas for competitors
3. Written scenario (one copy per competitor and judge)
4. Calculators, note pads, pencils for judges
5. Certificates for each competitor who completes Round One
6. Event evaluations and pencils to complete.
7. Stopwatch
- \*\*\* 8. Watch with second hand
- \*\*\* 9. Pens and pencils for all events

**Round One Written Test** (Reference: All resources)

1. One test copy per competitor
2. Scantron forms

**Round Two**

**Procedure I Identification of laboratory equipment** (Reference: Estridge/Reynolds and Daugherty)

- |                             |                          |
|-----------------------------|--------------------------|
| 1. Agar plate               | 22. Laminar flow hood    |
| 2. Agar slant tube          | 23. Medicine dropper     |
| 3. Autoclave                | 24. Micropipet           |
| 4. Automatic pipet          | 25. Micropipet tips      |
| 5. Beaker                   | 26. Monocular microscope |
| 6. Bottle                   | 27. Peg rack             |
| 7. Centrifuge               | 28. Petri dish           |
| 8. Concave microscope slide | 29. Pipet pump, blue     |
| 9. Disposable pipet         | 30. Pipet pump, green    |
| 10. Erlenmeyer flask        | 31. Pipetting bulbs      |
| 11. Florence flask          | 32. Pipetting device     |
| 12. Forceps                 | 33. Safety glasses       |
| 13. Funnel                  | 34. Scalpel              |
| 14. Gloves                  | 35. Stirring rod         |
| 15. Graduated cylinder      | 36. Swab                 |
| 16. Graduated pipet         | 37. Test tube            |
| 17. Hot water bath          | 38. Test tube rack       |
| 18. Hot plate               | 39. Transfer pipet       |
| 19. Incubator               | 40. Thermometer          |
| 20. Inoculating loop        | 41. Volumetric flask     |
| 21. Laboratory balance      | 42. Volumetric pipet     |

**Procedure II Infection control and transmission-based precautions** (Reference: Estridge and Reynolds)

1. Sink
2. Antiseptic soap
3. Alcohol-based antiseptic
4. Paper towels
- \*\*\* 5. Disposable masks and/or face shield
- \*\*\* 6. Disposable gown
- \*\*\* 7. Disposable glove
8. Disposal receptacle for used items
9. Biohazard bags or other plastic bags with materials for labeling

**Procedure III Inoculate and streak an agar plate** (Reference Estridge and Reynolds)

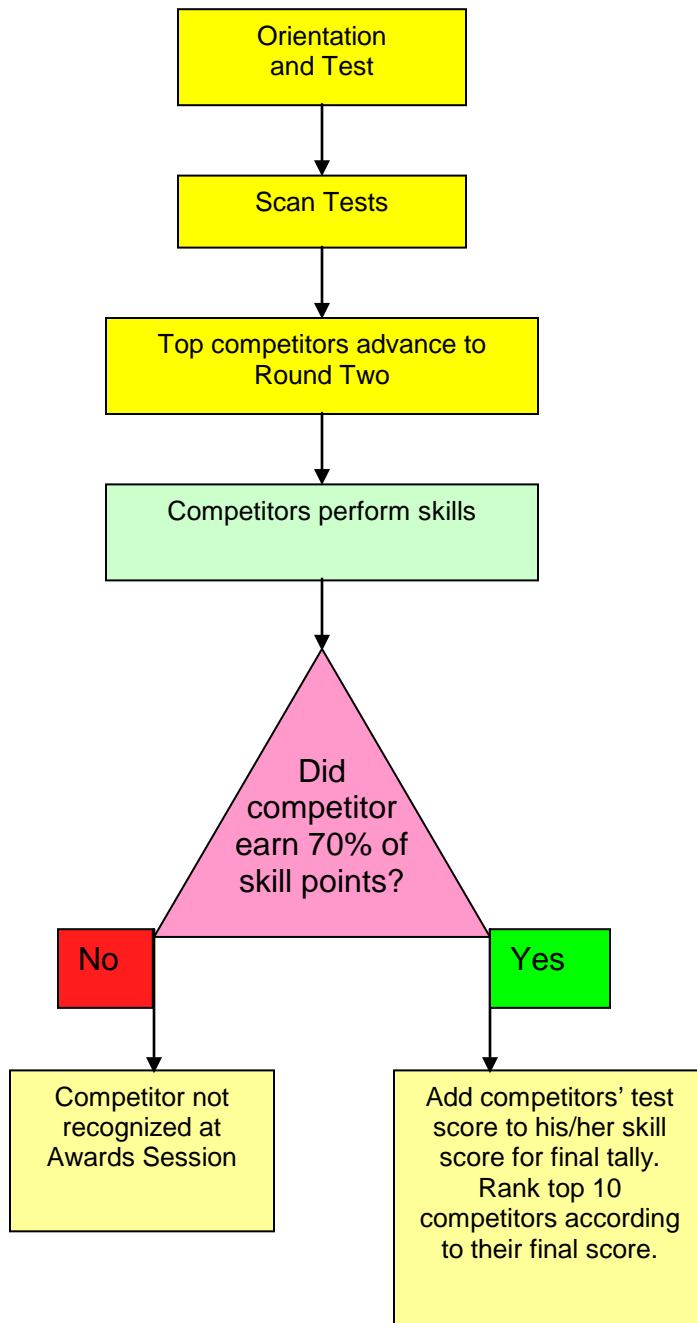
- \*\*\* 1. Gloves
2. Alcohol-based antiseptic
3. Surface disinfectant
4. Pre-inoculated (simulated) swabs stored in capped culture tube
5. Bood agar plates
6. Sterile disposable inoculating loops, 4 per competitor
7. Incubator set at 35° - 37° C (may be simulated)
8. Waterproof marker (fine point Sharpie)
9. Biohazard container
10. Paper towels

**Procedure IV Using a microscope** (Reference: Simmers)

1. Alcohol-based handrub
2. Microscope with low power, high power, and oil-immersion lenses
3. Lens paper
4. Prepared slides
5. Immersion oil
6. Surface disinfectant
7. Paper towels
8. Cloth for cleaning microscope
- \*\*\* 9. Gloves
10. Scenario – must indicate the type of slides to be viewed so the competitor can determine if gloves should be worn.
11. Sink with running water

\*\*\* Must be provided by student competitor

Event Flow Chart



# BIOTECHNOLOGY

**PROCEDURE I: IDENTIFYING LABORATORY INSTRUMENTS**

**Time = 10 minutes**

Competitor #: \_\_\_\_\_

Judge's Signature: \_\_\_\_\_

<b>NAME OF INSTRUMENT</b>	<b>Points for Identification (1 point each)</b>	<b>Points for Spelling (1 point each)</b>
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
<b>SUBTOTAL POINTS</b>		
<b>TOTAL AWARDED</b> (Points Possible = 30)		

## BIOTECHNOLOGY

Competitor #: \_\_\_\_\_

Judge's Signature: \_\_\_\_\_

Procedure II:	Infection Control and Transmission-Based Precautions (5 minutes)	Possible	Allocated
1.	Assembled equipment and PPE (Personal Protective Equipment including gloves, mask and gown).	2	
2.	Washed hands using antiseptic soap <ul style="list-style-type: none"> <li>a. Turned on warm water using a paper towel to turn the faucet handle, then discarded the towel.</li> <li>b. Dispensed soap into hands, then rubbed fronts and backs of hands and between fingers vigorously. Verbalized the duration of handwashing as 1 – 2 minutes. (Actual event time approx. 15 seconds.)</li> <li>c. Rinsed hands, fingertips downward, under warm running water.</li> <li>d. Used clean towel to dry hands and turn off faucet.</li> <li>e. Disposed of towel, touching only the clean side.</li> </ul>	2  4  2  2  2	
3.	Used alcohol-based handrub <ul style="list-style-type: none"> <li>a. Applied handrub to palm of hand and rubbed hands together vigorously for at least 15 seconds, covering all surfaces of hands and fingers.</li> <li>b. Continued procedure until all alcohol has evaporated and hands are completely dry.</li> </ul>	3  1	
4.	Slipped arms into the sleeves of a gown, being careful to touch only the inside of the gown.	2	
5.	Secured gown at neck and back of waist, covering clothing completely.	2	
6.	Donned mask <ul style="list-style-type: none"> <li>a. Picked up mask and place it over the mouth and nose, being careful not to touch the face with the fingers.</li> <li>b. Tied the ends of the mask around the head and neck.</li> </ul>	2  1	
7.	Donned gloves <ul style="list-style-type: none"> <li>a. Put on gloves, avoiding touching the outside of the gloves</li> <li>b. Pulled the glove cuffs over the sleeves of the gown.</li> </ul>	2  1	
* Judge instructs competitor to remove PPE.			
8.	Removed the gloves by folding them down and turning them inside out, then discarded them in receptacle for contaminated materials.	3	

Items Evaluated	Possible	Allocated
9. Untied ties at neck and waist.	1	
10. Removed gown by pulling down from the neck and slipping hands back into gown sleeve, touching only the inside of the gown.	2	
11. Folded the gown down over the arms inside-out and discarded in appropriate receptacle.	2	
12. Removed mask, touching only the ties.	2	
13. Held the mask by the ties and discarded in proper receptacle.	2	
14. Used alcohol-based handrub for hand hygiene	2	
<b>TOTAL POINTS - PROCEDURE II</b>	<b>42</b>	

*\*\*If a competitor jeopardizes the patient's or his/her own safety or fails to perform a critical step and does not take immediate action to correct the error, the total points for the procedure or specific subpart(s) of the procedure will be deducted by the judge(s).*

## BIOTECHNOLOGY

Competitor #: \_\_\_\_\_

Judge's Signature: \_\_\_\_\_

<b>Procedure III:</b>	<b>Inoculate and streak agar plate (Time: 5 minutes)</b>	<b>Possible</b>	<b>Allocated</b>
1.	Assembled materials and equipment.	2	
2.	Used alcohol-based handrub and put on gloves.	2	
3.	Selected an agar plate to be inoculated and labeled the bottom with a marker.	1	
4.	Selected an inoculated swab	1	
5.	Placed package of sterile disposable loops within reach.	1	
6.	Removed pre-inoculated swab from package.	2	
7.	Opened the lid of the agar plate just enough to insert the swab and spread the inoculum over the surface of one quadrant of the agar plate	2	
8.	Replaced the lid on the Petri dish	1	
9.	Disposed of swab in biohazard container.	1	
10.	Picked up a sterile disposable loop and lifted the lid of the Petri dish just enough to be able to insert the inoculating loop.	1	
11.	Streaked the second quadrant of the plate by touching the loop into the first quadrant and streaking all the way across the second quadrant, making six to eight strokes	2	
12.	Disposed of swab in biohazard container.	1	
13.	Picked up a sterile disposable loop and lifted the lid of the Petri dish just enough to be able to insert the inoculating loop.	1	
14.	Streaked the third quadrant by touching the loop into the second quadrant and streaking into the third quadrant, making six to eight strokes	2	
15.	Disposed of swab in biohazard container.	1	
16.	Picked up a sterile disposable loop and lifted the lid of the Petri dish just enough to be able to insert the inoculating loop.	1	
17.	Streaked the fourth quadrant in a manner to produce isolated colonies: Touched the loop to the third quadrant and spread the organism into the fourth quadrant using a continuous streak in a "tornado" pattern. Decreased the width of the streaks horizontally and increased the distance between the streaks vertically	2	
18.	Replaced the lid on the Petri dish	1	
19.	Disposed of swab in biohazard container.	1	

Items Evaluated	Possible	Allocated
20. Placed the agar plate upside down in the 35-37°C incubator.	2	
21. Cleaned reusable equipment and returned to proper storage; put disposables in biohazard containers	1	
22. Cleaned work area with surface disinfectant	1	
23. Removed gloves	2	
24. Used alcohol-based handrub for hand hygiene	2	
<b>TOTAL POINTS - PROCEDURE III</b>	<b>34</b>	

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## BIOTECHNOLOGY

Competitor #: \_\_\_\_\_

Judge's Signature: \_\_\_\_\_

<b>Procedure IV: Using a Microscope (10 minutes)</b>		<b>Possible</b>	<b>Allocated</b>
1.	Assembled equipment and materials.	1	
2.	Used alcohol-based handrub for hand hygiene.	1	
3.	Donned gloves and observed standard precautions if the specimen is contaminated by blood or body fluids, or while examining pathogenic organisms.	1	
4.	Obtained the correct prepared slide to examine.	1	
5.	Used lens paper to clean the eyepiece and the objectives.	1	
6.	Turned on the illuminating light and opened the iris diaphragm so that the largest hole is located directly under the hole in the stage platform.	2	
7.	Turned the revolving nosepiece until the low-power objective clicks into place.	1	
8.	Placed the slide on the stage and fastened it with slide clips while avoiding getting fingerprints or smudges on the slide.	2	
9.	While watching the stage and slide, turned the coarse adjustment so that the objective moved down close to the slide.	2	
10.	Used the coarse adjustment to raise the nosepiece unit.	1	
11.	Changed to the fine adjustment and turned the knob until the object came into finest focus.	1	
12.	<i>JUDGE looked in the objective and confirmed the fine focus.</i>	2	
13.	Without moving the body tube, turned the revolving nosepiece until the high power objective was in placed and focused with the fine adjustment only.	2	
14.	Watched the slide while turning the objectives and avoided breaking the slide and objectives.	1	
15.	Turned the revolving nosepiece until the oil-immersion objective is in position, and focused by properly repeating coarse and fine adjustment steps.	2	
16.	Rotated the oil-immersion objective slightly to the side.	1	
17.	Placed one drop of immersion oil on the portion of the slide that will be directly under the objective.	1	
18.	Rotated the oil-immersion objective into position, being careful not to rotate the high-power objective through the oil. Looked to see that the oil-immersion objective is touching the drop of oil.	2	
19.	Looked through the eyepiece and slowly turned the fine adjustment until the image is in focus.	1	
20.	Moved the diaphragm as necessary to adjust the amount of light for viewing the slide.	1	

Items Evaluated	Possible	Allocated
21. JUDGE looked in the objective and confirmed the fine focus.	2	
22. Turned the revolving nosepiece until the low-power objective was in position, making sure no other objective comes in contact with the oil on the slide.	2	
23. Cleaned the oil-immersion objective with lens paper.	1	
24. Removed the slide from the microscope stage and gently cleaned off the oil with lens paper.	2	
25. Cleaned the eyepiece and objectives with lens paper.	1	
26. Used a damp, soft cloth to wipe the other parts of the microscope.	1	
27. Positioned the nosepiece in the lowest position using the coarse adjustment.	1	
28. Turned off the microscope light and unplugged the microscope.	1	
29. Covered the microscope and returned it to storage.	1	
30. Cleaned the work area and returned slides to storage.	1	
31. Removed gloves (if applicable) and used alcohol-based handrub.	1	
<b>TOTAL POINTS - PROCEDURE IV</b>	<b>41</b>	

*\*\*If a competitor jeopardizes the patient's or his/her own safety or fails to perform a critical step and does not take immediate action to correct the error, the total points for the procedure or specific subpart(s) of the procedure will be deducted by the judge(s).*