

# Biomedical Laboratory Science



***New for 2016-2017***

Updates to Skill VII rating sheet have been made to clarify steps for judges

- Purpose:** To provide HOSA members with an opportunity to develop and demonstrate knowledge and skills in medical laboratory and biotechnology careers.
- Description** This event will consist of two rounds of competition. Round One will be a written, multiple choice test. Written test will measure knowledge and understanding at the recall, application or analysis levels. Higher-order thinking skills will be incorporated as appropriate. The top scoring competitors will advance to Round Two for the performance of selected skill(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, written test and skill(s)– jeans and shorts are not acceptable. Bonus points will be awarded for [proper dress](#).
- Rules and Procedures**
1. Competitors in this event must be active members of HOSA-Future Health Professionals in good standing in the division in which they are registered to compete (Secondary or Postsecondary/Collegiate).
  2. Competitors must be familiar with and adhere to the "[General Rules and Regulations of the National HOSA Competitive Events Program](#) (GRR)."
  3. The test will consist of 50 multiple choice items.
 

**Round One: Written Test Plan**

|  |     |
|--|-----|
| Biotechnology industry, equipment and products ..... | 10% |
| Raw materials of biotechnology .....                 | 8%  |
| Lab safety and infection control .....               | 10% |
| DNA structure and function .....                     | 8%  |
| Proteins and enzymes .....                           | 10% |
| Genetic engineering .....                            | 8%  |
| Biotechnology in Health .....                        | 10% |
| DNA synthesis, sequencing and genomics.....          | 8%  |
| Clinical Chemistry .....                             | 8%  |
| Hematology and Serology .....                        | 10% |
| Careers in medical lab and biotechnology .....       | 10% |
  4. 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.**

5. Test Instructions: There will be a maximum of **60 minutes** to complete the test. There will be a verbal announcement when there are 15 minutes remaining.

NOTE: *States/regions may use a different process for testing, to include but not limited to pre-conference testing, online testing, and testing at a computer. Check with your Area/Region/State for the process you will be using.*

6. All official references, including websites, are used in the development of the written test. The specific reference selected for each skill is listed in the Facilities, Equipment and Materials section of these guidelines.

- [Estridge and Reynolds. Basic Clinical Laboratory Techniques. Cengage Learning. Latest edition.](#)
- [Daugherty, Ellyn. Biotechnology: Science for the New Millennium. Paradigm Publishing. Latest edition.](#)
- Biotechnology Innovation Organization <http://www.bio.org/>

7. The test score from Round One will be used to qualify the competitor for the Round Two skills, and will be used as a part of the final score for the event. The skills approved for Round Two for this event are:

Skill I: Identifying Laboratory Instruments *(Including name of instrument and purpose or use.)*

Skill II: Infection control and transmission-based precautions

Skill III: Inoculate and streak an agar plate

Skill IV: Using a microscope

Skill V: ABO Grouping

Skill VI: Gram Stain

Skill VII: Preparing a Laboratory Solution

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

8. States and National HOSA have the option of including Skill I: Identification of laboratory equipment, at the same time as the Round One written test.
9. The selected skill(s) for Round Two, in the form of a written scenario, will be presented to the competitor at the start of the skill(s) to be performed. One, two or three skills will be selected and may be evaluated as stand-alone skills, or in combination. 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.
10. 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.
11. In case of a tie, the highest test score will be used to determine the rank.
12. Competitors must complete all steps of the skill listed in the guidelines even if the steps must be simulated/verbalized. Steps may not be simulated/verbalized when the equipment/materials are available.
13. The competitor must earn a score of 70% or higher on the combined skill(s) of the event (excluding the test and ID lab equipment) in order to be recognized as an award winner at the ILC.

14. Competitors will be stopped at the end of the time allowed for a selected skill(s).

**Competitors must provide:**

- |  |   |
|--|---|
| <input type="checkbox"/> Event guidelines (orientation)      | <input type="checkbox"/> Safety glasses, face shield or goggles |
| <input type="checkbox"/> Pens and #2 pencil with eraser      | <input type="checkbox"/> Disposable gown                        |
| <input type="checkbox"/> Watch with second hand (optional)   | <input type="checkbox"/> Disposable gloves                      |
| <input type="checkbox"/> Disposable masks with ties or loops | <input type="checkbox"/> Sterile surgical gloves                |

**Required Personnel**

1. One Event Manager per event
2. One Section Leader per section
3. One judge per skill selected per section (with expertise in the specific skill area)
4. Proctors for testing
5. One-two event assistants per section
6. Timekeepers
7. One QA to provide quality assurance for the event by ensuring that the guidelines are followed and all event documents are complete.

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

**General**

Checklist

- Clinical and/or laboratory stations for selected skills
- Holding rooms or areas for competitors (if off-site)
- Written scenario
- Patient and judge scripts as needed
- Calculators, note pads, pencils for judges
- Stopwatch
- Hand sanitizer (for hand hygiene)
- Rating sheets – one per judge per competitor
- Evaluation Forms – competitor, judge, and personnel
- #2 lead pencils with eraser to complete evaluations

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

Checklist

- One test copy per competitor
- Scantron / answer forms

**Round Two**

**Skill I Identification of laboratory equipment (Estridge & Reynolds)**

15 instruments or photos from the following list:

Checklist

- |   |   |
|---|---|
| <input type="checkbox"/> Agar plate               | <input type="checkbox"/> Erlenmeyer flask   |
| <input type="checkbox"/> Agar slant tube          | <input type="checkbox"/> Florence flask     |
| <input type="checkbox"/> Autoclave                | <input type="checkbox"/> Forceps            |
| <input type="checkbox"/> Automatic pipet          | <input type="checkbox"/> Full-face shield   |
| <input type="checkbox"/> Beaker                   | <input type="checkbox"/> Fume hood          |
| <input type="checkbox"/> Bottle                   | <input type="checkbox"/> Funnel             |
| <input type="checkbox"/> Buret clamp, coated jaws | <input type="checkbox"/> Gloves             |
| <input type="checkbox"/> Centrifuge               | <input type="checkbox"/> Graduated cylinder |
| <input type="checkbox"/> Concave microscope slide | <input type="checkbox"/> Graduated pipet    |
| <input type="checkbox"/> Disposable pipet         | <input type="checkbox"/> Hot water bath     |

- |  |  |
|--|--|
| <input type="checkbox"/> Hot plate                 | <input type="checkbox"/> Laboratory balance              |
| <input type="checkbox"/> Incubator                 | <input type="checkbox"/> Magnetic stir bar               |
| <input type="checkbox"/> Inoculating loop          | <input type="checkbox"/> Medicine dropper                |
| <input type="checkbox"/> Microcentrifuge           | <input type="checkbox"/> Safety glasses                  |
| <input type="checkbox"/> Microcentrifuge tube rack | <input type="checkbox"/> Scalpel                         |
| <input type="checkbox"/> Microcentrifuge tubes     | <input type="checkbox"/> Serological pipet               |
| <input type="checkbox"/> Micropipetter             | <input type="checkbox"/> Stirring rod                    |
| <input type="checkbox"/> Micropipet tips           | <input type="checkbox"/> Stoddard clamp test tube holder |
| <input type="checkbox"/> Monocular microscope      | <input type="checkbox"/> Swab                            |
| <input type="checkbox"/> Peg rack                  | <input type="checkbox"/> Test tube                       |
| <input type="checkbox"/> Petri dish                | <input type="checkbox"/> Test tube brush                 |
| <input type="checkbox"/> pH paper                  | <input type="checkbox"/> Test tube rack                  |
| <input type="checkbox"/> Pipet-aids                | <input type="checkbox"/> Transfer pipet (Beral pipet)    |
| <input type="checkbox"/> Pipet filler-dispenser    | <input type="checkbox"/> Thermometer                     |
| <input type="checkbox"/> Pipet pump, blue          | <input type="checkbox"/> Volumetric flask                |
| <input type="checkbox"/> Pipet pump, green         | <input type="checkbox"/> Volumetric pipet                |
| <input type="checkbox"/> Pipetting device          | <input type="checkbox"/> Weighing dishes/boats           |
| <input type="checkbox"/> Pipetting bulbs           |  |

**Skill II Infection control and transmission-based precautions** (Estridge & Reynold)

Checklist

- Sink
- Antiseptic soap
- Disposal receptacle for used items
- Biohazard bags or other plastic bags with materials for labeling

**Skill III Inoculate and streak an agar plate** (Estridge & Reynolds)

Checklist

- Pre-inoculated (simulated) swabs stored in capped culture tube or swab packaging
- Blood agar plates
- Sterile disposable inoculating loops, 3 per competitor
- Incubator set at 35° - 37° C (may be simulated)
- Waterproof marker (fine point Sharpie)
- Biohazard container

**Skill IV Using a microscope** (Estridge & Reynolds)

Checklist

- Microscope with low power, high power, and oil-immersion lenses
- Lens paper
- Prepared slides
- Immersion oil
- Materials for cleaning microscope
- Lens cleaner

**Skill V ABO Grouping** (Estridge & Reynolds)

Product Available: Ward's Natural Science Simulated ABO Blood Typing Lab Activity 36W0022

Checklist

- Antiseptic
- EDTA anticoagulated blood specimen (simulated)
- Lab Timer
- Pen or pencil for labeling slides
- Applicator sticks or stirrers
- Disposable plastic pipets
- Anti-A

- Anti-B
- Cell typing slides
- ABO worksheet (one for each competitor)
- Biohazard container

**Skill VI Gram Stain** (Estridge & Reynolds)

Checklist

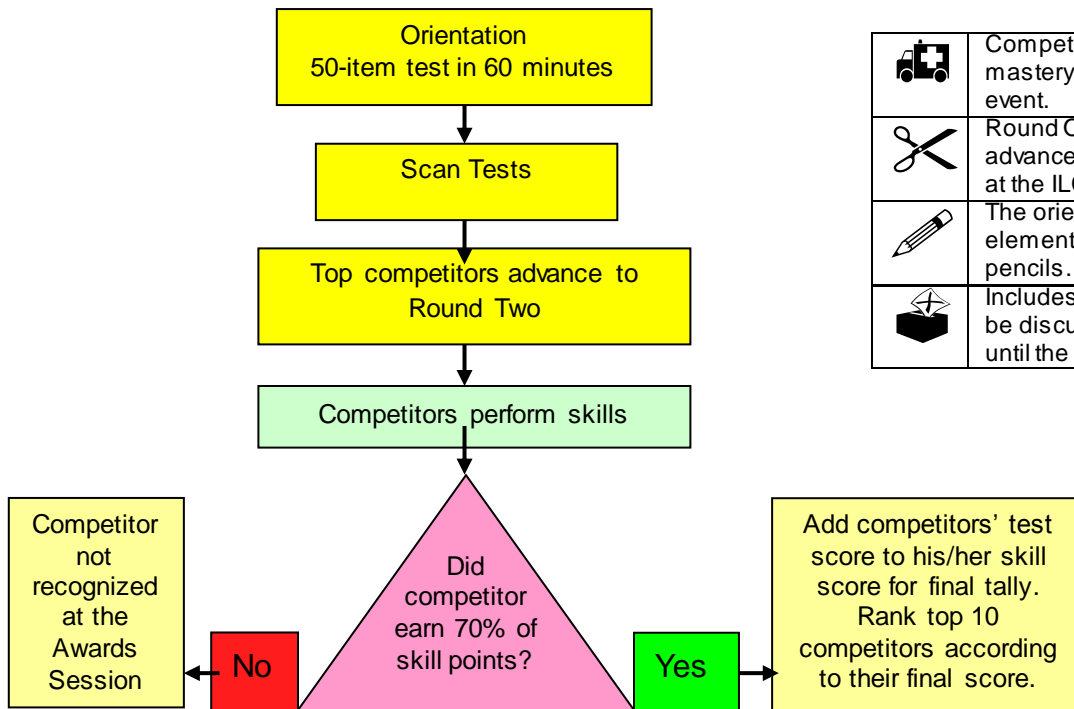
- Sink with tap water and/or distilled water from beaker or plastic squeeze bottle
- Gram's stain kit or individual gram stain reagents
- Microscope
- Staining rack
- Lens paper/gauze or soft tissue
- Bibulous paper
- Lab timer
- Saline
- Biohazard container
- Sharps container
- Forceps or spring clothespin
- Prepared smear (1 per competitor)

**Skill VII Preparing a Laboratory Solution** (Estridge & Reynolds)





Checklist

- Hand antiseptic
- Full-face shield
- Pipets, volumetric and serological
- Pipet-aids
- Pipet filler-dispenser
- Beakers
- Graduated cylinders
- Distilled water or saline solution (solvent)
- Solute
- Lab tissue or paper towels
- Surface disinfectant
- Biohazard container
- "Storage Area" – with equipment to choose from, labeled solvents and solutes, and a cleaning solution in a container (as indicated in the scenario)
- Scenario with Volume/Volume solution problem – *Sample problem: Prepare 50 mL of 10% bleach solution. Answer: A 10% (v/v) solution of bleach contains 10 mL bleach per 100 mL of solution. The competitor would measure 45 mL of water and add 5 mL of bleach to make 50 mL of a 10% bleach solution.*
- Pens or pencils for competitors to write the answer to the solution problem
- Towels

## Event Flow Chart



## Icon Key

|  |  |
|--|--|
|  | Competitors must meet a 70% mastery score on skills in this event.                                     |
|  | Round One scores are used to advance competitors to Round Two at the ILC                               |
|  | The orientation includes an event element. Competitors must bring pencils.                             |
|  | Includes a secret topic that may not be discussed or revealed to others until the event has concluded. |

## Sample Round One Test Questions

- The step in the scientific method in which the researcher predicts the results of experimentation based on past research/experiences is:
  - conducting an experiment.
  - developing a hypothesis.
  - formulating the question.
  - planning the experiment.
- Escherida coli*, commonly used by biotechnology companies to produce selected human proteins, is a/an:
  - amino acid.
  - bacterium.
  - enzyme.
  - virus.
- The biotechnology discipline which designs mathematical models for analyzing and relating sequential data is:
  - analytic scientists.
  - bioinformatics.
  - industrialists.
  - research analyst.

# Biomedical Laboratory Science

## SKILL I: IDENTIFYING LABORATORY INSTRUMENTS

(Time: 15 minutes)

Competitor #: \_\_\_\_\_ Judge's Initials: \_\_\_\_\_ Total Points (45 poss.) \_\_\_\_\_

|   | Name of Instrument | Points (1 each for name & spelling) | Purpose or Use                   | Points (1 point for correct purpose/use) |
|---|--------------------|-------------------------------------|----------------------------------|--|
| 1   |                    |                                     |                                  |  |
| 2   |                    |                                     |                                  |  |
| 3   |                    |                                     |                                  |  |
| 4   |                    |                                     |                                  |  |
| 5   |                    |                                     |                                  |  |
| 6   |                    |                                     |                                  |  |
| 7   |                    |                                     |                                  |  |
| 8   |                    |                                     |                                  |  |
| 9   |                    |                                     |                                  |  |
| 10  |                    |                                     |                                  |  |
| 11  |                    |                                     |                                  |  |
| 12  |                    |                                     |                                  |  |
| 13  |                    |                                     |                                  |  |
| 14  |                    |                                     |                                  |  |
| 15  |                    |                                     |                                  |  |
| <b>TOTAL: ID &amp; Spelling (30 poss)</b> |                    |                                     | <b>TOTAL: Purpose (15 poss.)</b> |  |

# Biomedical Laboratory Science

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

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

| <b>Skill II:</b> | <b>Infection Control and Transmission-Based Precautions (Time: 5 minutes)</b>  | <b>Possible</b> |   | <b>Awarded</b> |
|------------------|--|-----------------|---|----------------|
| 1.               | Assembled equipment and PPE (Personal Protective Equipment - including gloves, mask and gown).   | 1               | 0 |                |
| 2.               | Washed hands using antiseptic soap   |                 |   |                |
|                  | a. Turned on warm water using a paper towel to turn the faucet handle, then discarded the towel.   | 1               | 0 |                |
|                  | b. Dispensed soap into hands, then rubbed fronts and backs of hands and between fingers vigorously for 15 – 30 seconds.                      | 2               | 0 |                |
|                  | c. Rinsed hands, fingertips downward, under warm running water.  | 1               | 0 |                |
|                  | d. Used clean towel to dry hands and turn off faucet.  | 1               | 0 |                |
|                  | e. Disposed of towel, touching only the clean side.  | 1               | 0 |                |
| 3.               | Used waterless antiseptic handrub  |                 |   |                |
|                  | a. Applied handrub to palm of hand and rubbed hands together vigorously for at least 15 seconds, covering all surfaces of hands and fingers. | 2               | 0 |                |
|                  | b. Continued skill until all alcohol has evaporated and hands are completely dry.  | 1               | 0 |                |
|                  | <i>* Steps for donning PPE must be performed in the order listed below.</i>  | 1               | 0 |                |
| 4.               | Slipped arms into the sleeves of a gown, being careful to touch only the inside of the gown.   |                 |   |                |
| 5.               | Secured gown at neck and back of waist, covering clothing completely.  | 1               | 0 |                |
| 6.               | Donned mask  |                 |   |                |
|                  | a. Picked up mask and place it over the mouth and nose, being careful not to touch the face with the fingers.                                | 1               | 0 |                |
|                  | b. Secured the mask by tying or looping over the ears  | 1               | 0 |                |
| 7.               | Donned sterile gloves  |                 |   |                |
|                  | a. Opened the package of gloves, avoiding touching the outside of the gloves   | 1               | 0 |                |
|                  | b. Picked up the right glove by the cuff and inserted the right hand   | 2               | 0 |                |
|                  | c. Picked up and held the left glove by inserting the fingertips of the gloved right hand under the cuff of the left glove                   | 2               | 0 |                |
|                  | d. Inserted the left hand into the glove   | 1               | 0 |                |



| Items Evaluated  | Possible  | Awarded |
|--|-----------|---------|
| e. Positioned glove cuffs over the wrists by using gloved fingertips to push cuffs toward the elbow.                           | 1 0       |         |
| <i>* Judge instructs competitor to remove PPE.</i>   |           |         |
| 8. Removed the gloves by folding them down and turning them inside out, avoiding touching the outside of the gloves.           | 2 0       |         |
| 9. Discarded gloves in biohazard container.  | 1 0       |         |
| 10. Untied gown ties at neck and waist.  | 1 0       |         |
| 11. Removed gown by pulling down from the neck and slipping hands back into gown sleeve, touching only the inside of the gown. | 2 0       |         |
| 12. Folded the gown down over the arms inside-out and discarded in biohazard container.  | 1 0       |         |
| 13. Removed mask, touching only the ties.  | 1 0       |         |
| 14. Held the mask by the ties and discarded in biohazard receptacle.   | 1 0       |         |
| 15. Used antiseptic handrub for hand hygiene   | 1 0       |         |
| <b>TOTAL POINTS - SKILL II</b><br><b>70% Mastery for Skill II = 21.7</b>   | <b>31</b> |         |

*\*\*If a student jeopardizes the patient's or his/her own safety and does not take immediate action to correct the error, the total points for the skill or specific subpart(s) of the skill will be deducted.*

# Biomedical Laboratory Science

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

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

| <b>Skill III: Inoculate and streak agar plate (Time: 5 minutes)</b> |   | <b>Possible</b> |   | <b>Awarded</b> |
|---|---|-----------------|---|----------------|
| 1.  | Assembled materials and equipment.  | 1               | 0 |                |
| 2.  | Used alcohol-based handrub and put on gloves and face protection  | 1               | 0 |                |
| 3.  | Selected an agar plate to be inoculated and labeled the bottom with a marker.   | 1               | 0 |                |
| 4.  | Selected an inoculated swab.  | 1               | 0 |                |
| 5.  | Placed package of sterile disposable loops within reach.  | 1               | 0 |                |
| 6.  | Removed pre-inoculated swab from package.   | 1               | 0 |                |
| 7.  | Opened the lid of the agar plate just enough to insert the swab.  | 1               | 0 |                |
| 8.  | Spread the inoculum over the surface of one quadrant of the agar plate.   | 1               | 0 |                |
| 9.  | Replaced the lid on the agar plate.   | 1               | 0 |                |
| 10.   | Disposed of swab in biohazard container.  | 1               | 0 |                |
| 11.   | Picked up a sterile disposable loop and lifted the lid of the agar plate just enough to be able to insert the inoculating loop.                     | 1               | 0 |                |
| 12.   | a. Streaked the second quadrant of the plate by touching the loop into the first quadrant and streaking all the way across the second quadrant, and | 2               | 0 |                |
|   | b. Made six to eight strokes.   | 2               | 0 |                |
| 13.   | Disposed of loop in biohazard container.  | 1               | 0 |                |
| 14.   | Picked up a sterile disposable loop and lifted the lid of the agar plate just enough to be able to insert the inoculating loop.                     | 1               | 0 |                |
| 15.   | a. Streaked the third quadrant by touching the loop into the second quadrant and streaking into the third quadrant, and                             | 2               | 0 |                |
|   | b. Made six to eight strokes.   | 2               | 0 |                |
| 16.   | Disposed of loop in biohazard container.  | 1               | 0 |                |
| 17.   | Picked up a sterile disposable loop and lifted the lid of the agar plate just enough to be able to insert the inoculating loop.                     | 1               | 0 |                |

| Items Evaluated  | Possible  |   | Awarded |
|--|-----------|---|---------|
| 18. a. 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.<br>b. Decreased the width of the streaks horizontally and increased the distance between the streaks vertically. | 1         | 0 |         |
|  | 1         | 0 |         |
| 19. Replaced the lid on the plate.   | 1         | 0 |         |
| 20. Disposed of loop in biohazard container.   | 1         | 0 |         |
| 21. Placed the agar plate upside down in the 35-37°C incubator.  | 1         | 0 |         |
| 22. Cleaned reusable equipment and returned to proper storage; put disposables in biohazard containers.  | 1         | 0 |         |
| 23. Cleaned work area with surface disinfectant.   | 1         | 0 |         |
| 24. Removed gloves and face protection.  | 1         | 0 |         |
| 25. Used alcohol-based handrub for hand hygiene.   | 1         | 0 |         |
| <b>TOTAL POINTS - SKILL III</b>  | <b>32</b> |   |         |
| <b>70% Mastery for Skill III = 22.4</b>  |           |   |         |

*\*\* If a student jeopardizes the patient's or his/her own safety and does not take immediate action to correct the error, the total points for the skill or specific subpart(s) of the skill will be deducted.*

# Biomedical Laboratory Science

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

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

| <b>Skill IV:</b> | <b>Using a Microscope (Time:10 minutes)</b>   | <b>Possible</b> | <b>Awarded</b> |
|------------------|---|-----------------|----------------|
| 1.               | Used alcohol-based handrub for hand hygiene.  | 1               | 0              |
| 2.               | Assembled equipment and materials.  | 1               | 0              |
| 3.               | Used lens paper to clean the eyepiece and the objectives.   | 1               | 0              |
| 4.               | Used the coarse adjustment to raise the nosepiece unit.   | 1               | 0              |
| 5.               | Raised the condenser as far as possible by adjusting the condenser knob.  | 1               | 0              |
| 6.               | Rotated the low power (10x) objective into position, so it is directly over the condenser   | 1               | 0              |
| 7.               | Turned on the microscope light.   | 1               | 0              |
| 8.               | Opened the iris diaphragm until maximum light come up through the condenser.  | 1               | 0              |
| 9.               | Placed and secured the prepared slide on the stage (specimen side up).  | 1               | 0              |
| 10.              | Positioned the condenser so it is almost touching the bottom of the slide.  | 1               | 0              |
| 11.              | Located the coarse adjustment and looked directly at the stage and low power objective and turned the coarse adjustment until the objective is as close to the slide as it will go.     | 1               | 0              |
| 12.              | Looked into the ocular(s) and slowly turned the coarse adjustment in the opposite direction to raise the objective (or lower the stage) until the object on the slide comes into focus. | 1               | 0              |
| 13.              | Changed to the fine adjustment and turned the knob until the object came into finest focus.   | 1               | 0              |
| 14.              | <i>JUDGE looked in the objective and confirmed the fine focus.</i>  | 2               | 0              |
| 15.              | a. Rotated the high power objective (40X) into position while observing the objective and the slide to see that the objective does not strike the slide.                                | 1               | 0              |
|                  | b. Looked through the ocular(s) to view the object on the slide.  | 1               | 0              |
|                  | c. Located the fine adjustment and turned it until the object is in fine focus WITHOUT using the coarse adjustment.   | 1               | 0              |
| 16.              | Rotated the oil-immersion objective slightly to the side.   | 1               | 0              |
| 17.              | Placed one drop of immersion oil on the portion of the slide that will be directly over the condenser.  | 1               | 0              |
| 18.              | a. Rotated the oil-immersion objective into position, being careful not to rotate the high-power objective through the oil.   | 1               | 0              |
|                  | b. Looked to see that the oil-immersion objective is touching the drop of oil.  | 1               | 0              |

| Items Evaluated                        |   | Possible  | Awarded |
|--|---|-----------|---------|
| 19.                                    | Looked through the ocular(s) and slowly turned the fine adjustment until the image is in fine focus.                            | 1         | 0       |
| 20.                                    | <i>JUDGE looked in the objective and confirmed the fine focus.</i>  | 2         | 0       |
| 21.                                    | Rotated the low power (10X) objective into position, making sure no other objective comes in contact with the oil on the slide. | 1         | 0       |
| 22.                                    | Removed the slide from the microscope stage, gently blotted the oil from the slide, and returned the slide to the slidebox.     | 1         | 0       |
| 23.                                    | Cleaned the oculars and low and high power objectives with clean lens paper and lens cleaner.                                   | 1         | 0       |
| 24.                                    | Cleaned the oil-immersion objective with lens paper and lens cleaner to remove all oil.   | 1         | 0       |
| 25.                                    | Cleaned all oil from the microscope stage and condenser.  | 1         | 0       |
| 26.                                    | Positioned the nosepiece in the lowest position using the coarse adjustment.  | 1         | 0       |
| 27.                                    | Turned off the microscope light and disconnected the microscope from power source.  | 1         | 0       |
| 28.                                    | Centered the stage so it does not project from either side of the microscope and covered the microscope.                        | 1         | 0       |
| 29.                                    | Cleaned the work area with disinfectant.  | 1         | 0       |
| 30.                                    | Used alcohol-based handrub.   | 1         | 0       |
| <b>TOTAL POINTS - SKILL IV</b>         |   | <b>35</b> |         |
| <b>70% Mastery for Skill IV = 24.5</b> |   |           |         |

NOTE: For the purpose of this skill performance, a monocular microscope is recommended. If a binocular microscope is used, the normal step of adjusting the oculars to fit the interpupillary distance of the user is omitted because of the need for the judge to see the image as well and to save the time the frequent adjustments would cause.

*\*\* If a student jeopardizes the patient's or his/her own safety and does not take immediate action to correct the error, the total points for the skill or specific subpart(s) of the skill will be deducted.*

# Biomedical Laboratory Science

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

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

| <b>Skill V:</b>                       | <b>ABO Grouping (Time: 6 minutes)</b>  | <b>Possible</b> | <b>Awarded</b> |
|---------------------------------------|--|-----------------|----------------|
| 1.                                    | Assembled equipment and materials.   | 1               | 0              |
| 2.                                    | Used alcohol-based handrub for hand hygiene and put on gloves.   | 1               | 0              |
| 3.                                    | Performed slide grouping as follows:   |                 |                |
|                                       | a. Obtained a slide with two wells and labeled the slide with the patient's name.                                    | 2               | 0              |
|                                       | b. Placed three drops of the patient's blood in each of the A and B wells. Did not allow dropper to touch the slide. | 2               | 0              |
|                                       | c. Placed three drops of the anti-A serum in the A well.   | 2               | 0              |
|                                       | d. Placed three drops of the anti-B serum in the B well.   | 2               | 0              |
|                                       | e. Obtained two toothpicks (or disposable stirrers). Stirred each well with a separate clean stirrer for 30 seconds. | 2               | 0              |
|                                       | f. Stirring motion was effective. Avoided splattering the simulated blood.   | 2               | 0              |
|                                       | g. Recorded agglutination results on ABO worksheet.  | 2               | 0              |
|                                       | h. Accurately determined the agglutination, blood type, and transfusion responses on the Laboratory Report form.     | 2               | 0              |
| 4.                                    | Discarded disposable labware into appropriate biohazard container.   | 1               | 0              |
| 5.                                    | Returned simulated blood, reagents and unused equipment to proper storage.   | 1               | 0              |
| 6.                                    | Cleaned work area with surface disinfectant.   | 1               | 0              |
| 7.                                    | Removed gloves and discarded into biohazard container.   | 1               | 0              |
| 8.                                    | Used alcohol-based handrub for hand hygiene.   | 1               | 0              |
| <b>TOTAL POINTS - SKILL V</b>         |  | <b>23</b>       |                |
| <b>70% Mastery for Skill V = 16.1</b> |  |                 |                |

*\*\* If a student jeopardizes the patient's or his/her own safety and does not take immediate action to correct the error, the total points for the skill or specific subpart(s) of the skill will be deducted.*

COMPETITOR # \_\_\_\_\_

**LABORATORY REPORT**

**SKILL V: ABO Typing**

Patient Identification \_\_\_\_\_ DATE \_\_\_\_\_

**Blood Type Analysis**

---

**Agglutination Reaction**

| Patient | Anti-A Serum | Anti-B Serum | Blood Type |
|---------|--------------|--------------|------------|
|         |              |              |            |

1. If the patient needed a transfusion, what blood type(s) could this patient safely receive?  
\_\_\_\_\_
2. What blood type(s) could safely receive this patient's blood?  
\_\_\_\_\_

# Biomedical Laboratory Science

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

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

| <b>Skill VI: Gram Stain (Time: 7 minutes)</b>  | <b>Possible</b> | <b>Awarded</b> |
|--|-----------------|----------------|
| 1. Assembled equipment and materials.  | 1 0             |                |
| 2. Used alcohol-based handrub for hand hygiene and put on gloves and face shield (or equivalent PPE).  | 1 0             |                |
| 3. Obtained prepared smear and placed on staining rack.  | 1 0             |                |
| 4. Flooded the slide with crystal violet for one minute.   | 2 0             |                |
| 5. Rinsed slide with gentle stream of water from a beaker, faucet, or plastic squeeze bottle and tilted the slides to remove excess water.   | 2 0             |                |
| 6. Flooded the slides with Gram's iodine for the recommended time.   | 2 0             |                |
| 7. Rinsed slide with gentle stream of water from a beaker, faucet, or plastic squeeze bottle and tilted the slides to remove excess water.   | 2 0             |                |
| 8. Held the slide by the short edge using forceps or clothespin. Added the decolorizer by squeeze bottle or Pasteur pipette until no more purple color ran off the slide ( <i>Note: Important not to decolorize more than a few seconds to prevent over-decolorization</i> ) | 2 0             |                |
| 9. Rinsed the slides immediately to remove the decolorizer; tilted the slides to remove excess water   | 2 0             |                |
| 10. Counterstain the smears by flooding the slides with safranin for 30-60 seconds   | 2 0             |                |
| 11. Rinsed the slides, tilted to remove excess water; wiped the back of the slide with paper towel to remove stain; stood slides on end or blotted between bibulous paper to dry.  | 2 0             |                |
| 12. Judges will verify properly stained smear  | 2 0             |                |
| 13. Returned slides to storage or discarded into proper biohazard containers for disposal  | 1 0             |                |
| 14. Cleaned work surfaces with disinfectant  | 1 0             |                |
| 15. Removed and discarded gloves into biohazard container and used alcohol-based handrub for hand hygiene  | 2 0             |                |
| <b>TOTAL POINTS - SKILL VI</b><br><b>70% Mastery for Skill- = 17.5</b>   | <b>25</b>       |                |

*\*\* If a student jeopardizes the patient's or his/her own safety and does not take immediate action to correct the error, the total points for the skill or specific subpart(s) of the skill will be deducted.*



# Biomedical Laboratory Science

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

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

| <b>Skill VII: Preparing a Laboratory Solution (Time: 7 minutes)</b>  | <b>Possible</b> | <b>Awarded</b> |
|--|-----------------|----------------|
| <p>1. Worked the math problem in the scenario to determine the percent solution.<br/><i>Judge: Award a point here if the competitor does the math. The points for accuracy are awarded in step #9.</i></p>   | 1               | 0              |
| 2. Washed hands with antiseptic. (may verbalize)   | 1               | 0              |
| 3. Put on gloves and face protection.  | 1               | 0              |
| <p>4. Obtained the <u>correct</u> equipment and solutions <u>as directed by the scenario</u> – solute, solvent, beaker, graduated cylinder, a TD pipet or volumetric pipet and a pipet-aid or pipet filler-dispenser.<br/><i>Judge: The setting should include a "storage" area with different types/sizes of lab equipment. Award points if the competitor selects the correct equipment for preparing the solution</i></p> | 2               | 0              |
| a. Measured the water (solvent) in a graduated cylinder and poured it into a beaker.   | 1               | 0              |
| b. Fit the pipet-aid securely to the top of a pipet.   | 1               | 0              |
| c. Kept the pipet vertical and inserted the pipet tip well below the surface of the fluid in the beaker containing the solute.   | 1               | 0              |
| d. Drew up fluid slowly into the pipet using the pipet-aid, filling the pipet slightly above the desired volume marking or fill line.  | 1               | 0              |
| e. Removed the pipet from the solute, kept in the vertical position, and wiped the outside of the pipet tip quickly with tissue to remove the excess fluid, being careful not to allow the tissue to touch the opening of the pipet tip.   | 2               | 0              |
| f. Confirmed the correct solute by checking the label name three times (prior to drawing up the solute, while removing the solute and then when finished with the solute).   | 2               | 0              |
| <p>g. Touched the pipet tip to the inner wall of the beaker and slowly lowered the fluid level using the pipet-aid, until the lower point of the meniscus touched the desired volume marking, OR, if using a volumetric pipet, until the lower point of the meniscus touched the etched line on the pipet.<br/><i>Judge verified the correct measure.</i></p>  | 2               | 0              |
| h. Moved the pipet and held it vertically over the beaker containing the solvent.  | 1               | 0              |
| i. Placed the pipet tip against the inner wall of the beaker.  | 1               | 0              |
| j. Released the suction on the pipet-aid and allowed the liquid to drain from the pipet by gravity drainage.   | 1               | 0              |
| k. Left the pipet tip in contact with the inner wall of the container 1 to 3 seconds to allow the correct volume to be delivered.  | 1               | 0              |

| Items Evaluated  | Possible  | Awarded |
|--|-----------|---------|
| I. TD pipet (nonblowout) OR volumetric pipet - Examined the pipet tip – a small drop of fluid should remain in the tip, <b>OR</b><br>TD pipet (blowout) - Used the pipet-aid to force out the last drop of solution from the pipet tip into the beaker.  | 2 0       |         |
| 5. Placed used glassware in appropriate cleaning solution as directed by the scenario and returned unused equipment to storage.<br><i>Judge: A labeled cleaning solution should be available in the “storage” area. Any equipment the competitor takes to his/her station and does not use should be returned to the storage area as noted in this step.</i> | 2 0       |         |
| 6. Cleaned work surface with disinfectant.   | 1 0       |         |
| 7. Removed gloves and discarded them into biohazard container.   | 1 0       |         |
| 8. Washed hands with antiseptic. (may verbalize)   | 1 0       |         |
| 9. Correctly calculated and measured the solution.   | 2 0       |         |
| <b>TOTAL POINTS – SKILL VII</b><br><b>70% Mastery for Skill VII = 20.3</b>   | <b>29</b> |         |

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