

## 2016 SUPERVISOR GUIDE - CELL BIOLOGY (C)

### EVENT INFORMATION

**DESCRIPTION** – Cell Biology integrates content knowledge and process skills in the areas of cell biology and cellular biochemistry.

#### **RULES** –

- Rules are available from your Tournament Director.
- **2016** should appear at the bottom by the page number.
- BE SURE TO CHECK THE RULES for Event Parameters and suggested topics.
- At [www.soinc.org](http://www.soinc.org) see the **Event Information** and **Event Supervisor** sections
- Rules clarifications are available at [www.soinc.org](http://www.soinc.org) under event information.

**ROTATION** – Cell Biology is in for 2 years of a 6 year rotation- other events in 2 yr. rotation are Designer Genes and Microbe Mission.

**FORMAT** – Cell Biology is best run as timed stations with enough stations to accommodate the number of teams competing per session.

### **EVENT NEEDS**

**ROOM TYPE** – a lab with electricity, water, and sinks is best or at least a room with tables and electricity for the microscopes.

**HELPERS** – 2 or 3 helpers are needed to time stations, rotate students and proctor

**EQUIPMENT** – microscopes, stereoscopes, triple beam and electronic balances, probes, and other equipment and glassware for the lab practical stations

**TIME NEEDED FOR SETUP** – Be sure you have at least an hour before your competition with no event in your room so you can set up the stations.

### **PREPARATION FOR COMPETITION**

**TIME-LINE FOR PLANNING** - **You will need to know the number of teams competing.**

Teams consist of two students so plan accordingly. Be sure you have enough time to prepare the questions, answer keys, answer sheets, and assemble needed equipment

**ORGANIZING CONTENT** – See page 3 for suggested station topic and types of questions.

#### **WRITING QUESTIONS** –

- The philosophy of Science Olympiad is that the competition be inquiry- based to emphasize process skills and mental challenges using suggested content.
- Care should be taken to design the each station to require about the same amount of time.
- If there are a large number of teams per session, consider using 2 complete station setups.
- Balance the station content so that it reflects the content described in the rules. Students are expecting to see all of the topics listed in the rules to be reflected in the competition.
- Develop questions which are easy to grade.
- Develop appropriate questions so that **all** ties can be broken.
- Be sure that all teams experience the same testing conditions.

**VARIING DIFFICULTY FOR SUCCESS OF MANY** - To allow most students to be successful, it may be a good idea to vary the difficulty of questions at each station!

**ANSWER SHEET ORGANIZATION** – Set up the answer sheet so it is easy for students to use and easy for your team to grade. Include team name, team number, student names, as well as a place to record raw score, rank, and points. Be sure you have enough answer sheets for each team. It may be a good idea to put team names and numbers on the answer sheets ahead of time.

**ANSWER KEY AND SCORING RUBRICS** - Questions will be assigned point values. Students will be ranked from highest to lowest score. Ties will be broken by pre-determined tie-breaker questions. Have extra answer keys so your helpers can help you to grade the competition. Be sure each section is grade by the same person.

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### ***RUNNING THE EVENT***

#### **SET UP TIPS**

- It may help to have questions laminated or put in sheet protectors. This procedure eliminates damage or tampering during competition.
- Be certain that equipment and questions are placed at the station for easy access of the students.
- Taping questions to the table helps to keep stations organized and undisturbed.
- Using arrow may help students move from station to station.
- Bring extra items needed at stations as rulers. If one is needed, put three there.
- A quick supervisor checklist of useful items to include:  
answer keys, answer sheets, calculator , extra mm rulers, extra pencils  
extra set of questions, highlighter, masking tape, red pens, scotch tape  
stapler, stop watches or timers.

#### **CHECK IN TIPS– if possible, allow all teams to compete even if one or both members are late. They may need to miss some stations but they can do part of the competition.**

- Check each team member for wrist bands or approved ID before giving teams their answer sheet. Have extra pencils and direct students print their names on sheet.
- Direct student to turn off all non-permitted electronic devices. You may wish to have them put in a designated spot, given to someone outside the room, or placed in the student back packs and stored at a designated spot in the room .
- Allow each team to have only what is permitted in the Event Parameters.
- Keep students away from the stations until you are ready to begin the competition.
- Give all directions and safety information to all teams before beginning.
- Explain the station setup scheme and rotation pattern to the students.

#### **ROTATION OF STUDENTS FOR STATIONS – Using arrows taped to the table helps students. Proctors can also be stations around the room to help with rotation.**

**TIMING –** stop watches or timers are best for timing the stations. Have a person responsible for timing the event.

**PROCTORING –** Two or three people is adequate to help with rotation, check equipment at stations, and proctor the competition. You may want proctors to check microscopes, balances, and probes as the students rotate. If you train them during the first session, you can grade papers during successive sessions.

#### **DEALING WITH PROBLEM SITUATIONS – have the cell phone numbers of officials**

- DISQUALIFICATIONS OF A TEAM SHOULD BE RESTRICTED TO SAFETY ISSUES, CHEATING, OR ABUSIVE AND UNSPORTSMAN-LIKE BEHAVIOR.
- Be sure that tournament officials and coaches are notified of any disciplinary action.

#### **CHECK OUT TIPS**

- Be sure to get an answer sheet from each team before you allow them to leave the competition.
- Be sure the team number, team names and member names are present and legible.
- Remind students to take all their backpacks and other possessions as cell phones.

### ***SCORING THE EVENT – DO NOT GIVE OUT RESULTS ANY TEAM OR COACH.***

**CONSISTANCY IN GRADING –** have the same person grade the same section for all teams.

**CHECKING MATH AND RANKING –** Be sure to check the math and ranking for all teams so they are accurate. Scoring worksheets or computer programs may be available to help with ranking.

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**BREAKING TIES** – Break all ties and indicate on the student answer sheets and score sheet how the tie was broken. The **DECIMAL METHOD** is a good way to indicate the winner of ties.  
Example: If two teams have the raw score tie of 83 for, the winner of the tie gets 83.1 while the other teams gets 83.0. If several ties are broken, you have .1 to .9 to use. This also points out scores where ties were broken.

**SCORE SHEET** – Fill in all information on the score sheet. Indicate how the raw scores are ranked – high score, low score or some other method. Be sure to include raw score, rank and points for each team. Explain how ties are broken.

### SCORE COUNSELING

- Have your score sheet completed and signed before going to score counseling
- Arrange student score sheets in rank order for quick checking.
- Turn in answer sheets, a copy of the test and an answer sheet to the Score Counselor

### *Exam Format - Sample Stations For Content Areas - 2016*

<b>At the regional and state level:</b>	<b>At the national level:</b>
<ol style="list-style-type: none"><li>1) Biological monomers and polymers</li><li>2) Cellular homeostasis (pH, osmolarity etc.)</li><li>3) Enzymes and inhibition</li><li>4) Cell organelles/structures and their functions</li><li>5) Differences between eukaryotic and prokaryotic cells</li><li>6) Bioenergetics</li><li>7) Membrane structure and function <b>including lipid rafts, transport</b></li><li>8) <b>Extracellular vesicle formation, fusion</b></li><li>9) <b>Nucleotide triphosphates in energetics and signaling</b></li><li>10) Cell cycle and mitosis, <b>role of cyclins and kinases</b></li><li>11) Chromosome structure</li><li>12) Fermentation products and uses</li></ol>	All topics from state and regional plus: <ol style="list-style-type: none"><li>1) Cell communication, membrane receptors, <b>and signal transduction</b></li><li>2) Apoptosis <b>and cancer</b></li><li>3) <b>Cell cytoskeleton and intracellular trafficking</b></li><li>4) <b>Induced pluripotent stem cells</b></li><li>5) <b>Host/virus interactions</b></li><li>6) C<sub>3</sub> vs. C<sub>4</sub> vs. CAM plants</li><li>7) <b>Protein folding and related diseases</b></li><li>8) Cancerous vs. healthy cells</li><li>9) Genomics <b>and medicine/human health</b></li><li>10) Bioethics relating to above topics</li></ol>

**Be sure to check to rules for 2010 for Event Parameters for this event.**

### **EUKARYOTIC & PROCARYOTIC CELL STRUCTURES**

- \* Using models, photographs, or illustrations of structures such as organic molecules and cell organelles, identify the structure and describe its function or role in life processes.
- \* Identifying differences between prokaryotic & eukaryotic cells.
- \* Analyzing studies used to determine key pieces of current knowledge.
- \* Identifying types of microscopes -light vs. electron - uses, capacities, limits
- \* Identifying cell types and their functions
- \* Identifying electron micrographs of organelles - function, identification of parts, and chemical mechanisms.
- \* Understanding and interpreting the role of cell membranes structures and surface specialization.

### **CELL FUNCTION AND CELL CLASSIFICATION**

- \* Comparing surface area to volume ratio of various cells.
- \* Using a light microscope, estimate cell size and determine the 3-dimensional shape of cells. Relate the size and shape of a cell to its function.
- \* Making measurements to calculate surface area to volume relationships. Relate SA/VOL relationships to cell structure and function.

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- \* Analyzing or making predictions concerning osmosis, diffusion and cell transport.
- \* Using mechanisms that control of cell size to explain shapes modifications in cells
- \* Analyzing cell cultures
- \* Using photographs or microscope slides, identify various types of cells such as muscle, nerve, epithelial, and leaf epidermis and relate the structure of the cell to its function.
- \* Identifying tissue types - structure, function, chemical mechanisms

### **CHEMICAL REACTIONS AND BONDING**

- \* Using the protocol and data derived from an experiment such as one on the effect of pH on enzyme activity, determine (1) the independent and dependent variables, (2) variables that must be kept constant, (3) a control, (4) the most appropriate measure of central tendency to use in analyzing the data, (5) if the data are quantitative or qualitative, (6) the type of graph to use and how to label the X and Y axes, and (7) an appropriate conclusion.

### **ORGANIC MOLECULES**

- \* Determining the most appropriate reagent test for identifying substances such as gelatin, vitamin C, glucose, butter, and cornstarch.
- \* Identifying key organic chemicals and their role in cell operation.

### **PHOTOSYNTHESIS AND CELLULAR RESPIRATION**

- \* Calculating the energy content of food from data obtained from calorimeters. Relating the energy content of food molecules to the flow of energy and the cycling of matter that occur during photosynthesis and cellular respiration in ecosystems.
- \* Drawing conclusions about the relationship between photosynthesis and cellular respiration from data collected on the production/uptake of oxygen and carbon dioxide by green plants and animals. Predict how changing the environment of a plant or animal might affect the rate of photosynthesis or respiration.
- \* Interpreting photosynthesis & cellular respiration experiments or their data.
- \* Understanding and interpreting data concerning enzymes and their role in cell activities
- \* Analyzing and comparing the ATP production in aerobic and anaerobic respiration

### **CELL REPRODUCTION**

- \* Using photographs or illustrations of mitosis and meiosis, identify major events that occur in these processes and relate these events to cell and organism continuity.
- \* Comparing & analyzing data - stages of mitosis & meiosis their similarities and differences
- \* Analyzing cell cycle data—timing for normal vs. abnormal cells
- \* Understanding and interpreting information on prokaryotic cell reproduction and DNA operation

### **CELL DIFFERENTIATION**

- \* Interpreting and analyzing cell differentiation processes and data relative to their study.

### **IMMUNOLOGY**

- \* Analyzing immunology mechanisms and studies related to their operation.

### **VIRUSES**

- \* Understanding and interpreting mechanisms of viruses – their structure, reproduction, genetics, and retroviruses
- \* Analyzing the effects of viruses on other cells

### **PROTEIN PROFILES AND EVOLUTIONARY RELATIONSHIPS**

- \* Using the results of gel electrophoresis, compare the protein profiles of different species to infer evolutionary relationships

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***Process Skills and Tasks Which Might Be Tested***

<b>Methods</b>	<ul style="list-style-type: none"><li>* Understanding techniques used in studying cells as electrophoresis, DNA probes cell fractionation, radioactive tracers, spectrophotometry, centrifugation, computer imaging, photography of cells.</li></ul>
<b>Lab Safety</b>	<ul style="list-style-type: none"><li>* Distinguishing "safe" behaviors vs. "unsafe" behaviors, identifying safety symbols related to experiments , evaluating situations -- what to do "if" or what's wrong.</li></ul>
<b>Microscopy</b>	<ul style="list-style-type: none"><li>* Understanding of parts of microscope &amp; their function, magnification, appearance of images, resolution, changes in field with magnification, types of microscopes and their uses.</li><li>* Understanding the different types of microscopes, their uses, and their differences.</li><li>* Using types of light microscopes to perform a requested task.</li><li>* Determining the three dimensions of a cell</li><li>* Determining length, width, depth, area, and volume of cells.</li><li>* Interpreting electron micrographs</li></ul>
<b>Lab Equipment</b>	<ul style="list-style-type: none"><li>* Identifying pieces of lab equipment and their functions.</li><li>* Identifying appropriate pieces of equipment to perform a specific task.</li></ul>
<b>Measurement</b>	<ul style="list-style-type: none"><li>* Identifying the capacity, range, and increments of measuring devices used to study cells .</li><li>* Converting units within the metric system.</li></ul>
<b>Calculations</b>	<ul style="list-style-type: none"><li>* Using measurements to determine area, volume, percentages, probabilities.</li><li>* Using area and sample number to determine density of a sample.</li><li>* Understanding and using statistics to analyze data.</li></ul>
<b>Chemical Analysis</b>	<ul style="list-style-type: none"><li>* Using reagents for chemical analysis.</li></ul>
<b>Observations</b>	<ul style="list-style-type: none"><li>* Using senses to notice specific features.</li><li>* Identifying similarities and differences in features.</li><li>* Identifying qualitative and quantitative changes in conditions.</li><li>* Using observable properties to classify objects, organisms or events.</li></ul>
<b>Inferences</b>	<ul style="list-style-type: none"><li>* Formulating assumptions based upon observations.</li><li>* Distinguishing between observations and inferences.</li></ul>
<b>Problem</b>	<ul style="list-style-type: none"><li>* Using observations to propose a testable question.</li></ul>
<b>Hypothesis</b>	<ul style="list-style-type: none"><li>* Proposing a hypothesis for a given problem.</li><li>* Identifying statements presented along with a set of data as.<ol style="list-style-type: none"><li>1. logical hypothesis</li><li>2. illogical hypothesis of contrary to data</li><li>3. not a hypothesis, but a restatement of data</li><li>4. reasonable hypothesis, but not based on data</li></ol></li></ul>
<b>Predictions</b>	<ul style="list-style-type: none"><li>* Predicting the results for a proposed lab test or setup.</li><li>* Selecting predictions based upon previously observed patterns.</li></ul>

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- Design Analysis** \* Analyzing designs for experiments relative to problem, identifying variables & constants, procedure analysis , proper control of variables, types of data collected, basic assumptions used, time period for the test.
- Procedures**
- \* Analyzing procedures for flaws in design.
  - \* Arranging steps of procedures in the appropriate order.
  - \* Determining the repeatability of a procedure.
  - \* Identifying an appropriate procedure to test a problem.
- Graphing**
- \* Interpreting line, bar, and pie graphs.
  - \* Identifying the title, source, independent variable & dependent variables, and the legend.
  - \* Predicting data points not included in a given graph.
  - \* Preparing a line, bar or pie graph to represent a set of data.
  - \* Scaling each axis for a line graph.
  - \* Making predictions or inferences based upon the data on a graph.
- Analysis of Data**
- \* Identifying data which supports or rejects a hypothesis.
  - \* Identifying discrepancies between stated hypothesis and actual data.
  - \* Identifying types of error in the data as experimental and random.
  - \* Determining the validity of experimental data.
  - \* Interpreting charts and diagrams.
- Conclusions**
- \* Selecting the most logical conclusion for given experimental data.
  - \* Accepting or rejecting hypotheses based upon data analysis.
  - \* Proposing a new hypothesis for rejected hypotheses.

I hope these suggestions are helpful in organizing your tournament. Comments or new ideas are always welcome. Please send them to me at the following address.

Karen L. Lancour  
312 W. Bosley  
Alpena, Michigan 49707  
[karenlancour@charter.net](mailto:karenlancour@charter.net)