

1. **DESCRIPTION:** This event integrates content knowledge and process skills in the areas of cell biology and biochemistry.

A TEAM OF UP TO: 2

APPROXIMATE TIME: 50 minutes

2. **EVENT PARAMETERS:** Students will bring and wear safety goggles where needed and non-programmable calculators. Reference materials are not allowed during the competition.

3. **THE COMPETITION:**

- a. The competition **may** be administered at a series of **lab-practical** stations that **may** include demonstrations, experiments, scientific apparatus, models, illustrations, specimens, data collection and analysis, and problems for students to solve. Content topics will include:

<i>At the regional and state level:</i>	<i>At the national level:</i>
1) Biological monomers and polymers	1) All topics from state and regional plus:
2) pH	2) Cell communication and membrane receptors
3) Enzymes	3) Apoptosis
4) Cell organelles/ structures and their functions	4) Enzyme inhibition
5) Differences between eukaryotic and prokaryotic cells	5) Fermentation
6) Qualitative aspects of photosynthesis & respiration	6) Viral replication
7) Membrane structure and function	7) C ₃ vs. C ₄ vs. CAM plants
8) Movement across membranes	8) Consequences of changes in protein shape
9) Importance of ATP	
10) Structure of viruses	
11) Cell cycle	

- b. Process skills may include writing hypotheses, determining independent and dependent variables, controlling variables, graphing, analyzing data, interpreting results as well as using and applying technologies.
 - c. Questions pertaining to the exact amount of ATP produced during cellular respiration must not be used (note: this is because the amount of ATP produced varies within a cell).
4. **SAMPLE QUESTIONS:**
 - a. 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.
 - b. 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.
 - c. Make measurements to calculate surface area to volume relationships. Relate surface area to volume relationships to cell structure and function.
 - d. Contrast viruses and cells.
 - e. Using the results of gel electrophoresis, identify and compare the different proteins.
 - f. 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-axes and y-axes, and (7) an appropriate conclusion.
 - g. Using photographs or illustrations of mitosis, identify major events that occur in these processes and relate these events to cell and organism continuity.
 - h. Identify substances such as protein, carbohydrates, lipids and vitamin C using **reagent tests** or data provided.
 - i. Calculate the energy content of food from data either **given or** obtained from calorimeters. Relate the energy content of food molecules to the flow of energy and the cycling of matter that occur during photosynthesis and cellular respiration.
 5. **SCORING:** Each correct response will be assigned a point value. The highest score wins. Selected questions may be used as tiebreakers.

