CELL BIOLOGY

DESCRIPTION: Contestants will rotate from station to station, integrating content knowledge and process skills in the areas of cell biology and biochemistry.
A TEAM OF UP TO: 2
APPROXIMATE TIME: 50 minutes
EVENT PARAMETERS: Non-programmable calculators may be used, but no reference materials may be used during the competition.

THE COMPETITION:
1. The competition will be administered at a series of stations that may include demonstrations, experiments, scientific apparatus, models, illustrations, specimens, data collection and analysis, and problems for students to solve. The team will complete and submit one answer sheet.
2. Content topics may include: eukaryotic and prokaryotic cell structure and function, biological molecules, enzymatic reactions, cellular respiration, photosynthesis, cell cycle, meiosis, DNA replication, and protein synthesis.
3. 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.
SAMPLE QUESTIONS:
1. 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.
2. 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.
3. Make measurements to calculate surface area to volume relationships. Relate SANOL relationships to cell structure and function.
4. Using a mRNA codon chart, determine amino acid sequences when given DNA nucleotide base sequences. Relate base sequences to protein structure, genotype, and phenotype and recognize that changes in DNA base sequences (mutations) may alter genotype and phenotype.
5. Using the results of gel electrophoresis, identify and compare the different proteins.
6. 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.
7. 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.
8. Identify substances such as gelatin, vitamin C, glucose, butter, and cornstarch using reagent tests.
9. Calculate the energy content of food from data 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 in ecosystems.
10. Draw 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.

SCORING: Each correct response will be assigned a point value. The highest score wins. Selected questions may be used as tiebreakers.