

1. **DESCRIPTION:** This event encompasses the anatomy and physiology of selected body systems.
A TEAM OF UP TO: 2 **APPROXIMATE TIME:** 50 Minutes
2. **EVENT PARAMETERS:** Each team member may bring a non-programmable calculator. **Each team may bring one 8.5" x 11" two-sided page of notes that contain information in any form from any source.**
3. **THE COMPETITION:** Students should know the basic anatomy and physiology of the skeletal, muscular and endocrine systems and how aging and specific diseases affect them. Process skills expected may include data collection, making observations, inferences, predictions, calculations, analyses and conclusions. The test may include various formats (e. g., timed stations, written test, PowerPoint slides, anatomical specimens, etc.) for the following topics:

- a. **SKELETAL SYSTEM** All competition levels should know:
 - i. Bones of the axial and appendicular skeleton; label the basic surface anatomy of a bone as shown on a diagram and/or normal X-ray, **CT and MRI**.
 - ii. Name, structure and function of types of joints and the muscle and ligament attachments that surround the joints and the ranges of motion allowed by each type (e.g., ball and socket).
 - iii. Structures of bones in cross-section.
 - iv. Cellular composition, structure and function of bones, bone marrow and cartilage.
(Development and maturation of bones at the cellular and gross anatomical levels)
 - v. How to distinguish between types of vertebrae (e.g., cervical, thoracic and lumbar).
 - vi. **Characteristics** and radiological features of bone diseases/disorders from the cell level to the whole person as listed: osteoarthritis, osteoporosis, fractures, disc herniation, scoliosis, anterior cruciate ligament tears, medial collateral ligament damage.
 - vii. The effects of exercise on the skeletal system and the diseases mentioned.
- National Level Only:**
 - viii. Additional diseases/disorders to know: spinal stenosis, achondroplasia, juvenile rheumatoid arthritis, spinal fractures, and ankylosing spondylitis, osteosarcoma.
 - ix. Treatments and/or prevention for all conditions listed above (drugs, surgery, etc.).
 - x. Label the bones of the skull.
 - xi. Salter-Harris fracture classification system.
 - xii. **Know the foramina of the skull and what passes through each.**
- b. **MUSCULAR SYSTEM - All levels should know:**
 - i. The interaction of the skeletal and muscular systems to allow movement.
 - ii. Muscle fibers -the cellular and gross anatomy of skeletal muscle, cardiac muscle & smooth muscle.
 - iii. Physiology of the skeletal muscle contraction system and the neuromuscular junction.
 - iv. How the skeletal muscles move bone, maintain posture, and produce heat.
 - v. Skeletal muscle actions – origin, insertion, interactions of different muscles.
 - vi. Location and identification of the major skeletal muscles of the body including origin, insertion, and function. See www.soinc.org for a list of the Major Skeletal Muscles.
 - vii. The effects of exercise on the cellular and gross anatomical structure of the muscular system.
 - viii. Muscle and tendon injuries and their prevention (i.e., strains and sprains)
 - ix. The diseases on each level from the cell to the whole person as listed:
 - x. Poliomyelitis, Muscular Dystrophies, Myasthenia gravis, Torricellis.

National Level Only: Kinds of muscle contraction, Classes of muscle fibers and their functions, Understand cardiac and smooth muscle roles in the body, Understand muscle sensory systems (e.g. spindles and Golgi tendon organs). Additional diseases: Carpal Tunnel Syndrome, Fibromyalgia, and Chronic fatigue syndrome, Treatments and/or prevention for all conditions listed above (drugs, surgery, etc.), Role of the nervous system in muscle function.

- c. **ENDOCRINE SYSTEM - All competition levels should know:**

- i. The three classes of hormones – steroids, peptides, and amines
- ii. Mechanisms of hormone action – water soluble vs. fat soluble
- iii. Endocrine related problems – hypersecretion, hyposecretion
- iv. Hormone producing glands, their hormones and the function of each
- v. Understand disorders: diabetes mellitus, hypoglycemia, Graves disease, goiter

National Level Only: Endocrine cycles and negative feedback, Autonomic nervous system control of endocrine function, Additional Disorders: Cushing's Syndrome, Addison's Disease, and Myxedema, Treatments and/or prevention for all conditions listed above (drugs, surgery, etc.).

4. **SCORING:** Points are awarded for correct answers. Selected questions/quality of free-response will break ties.

