

1. **DESCRIPTION:** This event encompasses the anatomy and physiology of the **skeletal** and circulatory systems and the effects of **aging** and disease on them.

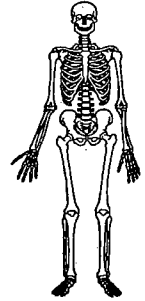
**A TEAM OF UP TO: 2**

**APPROXIMATE TIME:** 50 Minutes

2. **EVENT PARAMETERS:** Teams may bring non-programmable calculators. No resources are allowed.
3. **THE COMPETITION:** Students should know the basic anatomy and physiology of the skeletal and circulatory 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.
- 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.
- v. How to distinguish between types of vertebrae (e.g., cervical, thoracic and lumbar)
- vi. The diseases on each level from the cell to the whole person as listed (also know radiological features of each disease): 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 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.

b. **CIRCULATORY SYSTEM** - All competition levels should:

- i. Know the heart- chambers and valves of the heart, **electrical conduction system** and **excitation-contraction coupling** cellular anatomy: pacemaker cells, myocytes.
- ii. Know blood vessels - arteries, arterioles, veins, venules, and capillaries.
- iii. Interpret ECG (EKG) readings.
- iv. Measure the pulse rate and blood pressure.
- v. Be able to calculate mean arterial pressure, stroke volume and cardiac output.
- vi. Understand blood components and function - hemoglobin, oxygen transport, platelets and blood clotting, regulation of blood plasma volume and acidity, MN-bloodtyping, basic genetics of ABO, Rh, and MN blood types (ONLY) including paternity mysteries.
- vii. **Describe and be able to label** flow of blood through the heart and body.
- viii. **Define/describe anatomy and physiology of the lymphatic vessels.**
- ix. **Understand disorders:** arteriosclerosis, **atherosclerosis**, high blood pressure, high cholesterol, **stroke**, **myocardial infarction**.



**National Level Only:**

- x. Blood Vessels - continuous vs. fenestrated capillaries, blood-brain-barrier and its regulation
- xi. Lymphatics - white blood cells, lymph nodes, lymph ducts, lymphatic capillaries, lymphoid organs (spleen, thymus).
- xii. **Understand the role of aspirin in myocardial infarction and stroke.**
- xiii. **Autonomic regulation of heart function.**
- xiv. **Additional Disorders:** leukemia, heart block, thalassemia, mononucleosis, Kawasaki's disease.
- xv. **Treatments and/or prevention for all conditions listed above (drugs, surgery, etc.)**

4. **SCORING:** Points are awarded for correct answers. Ties are broken based on selected questions and/ or quality of free-response answers.

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