ANATOMY & PHYSIOLOGY

See General Rules, Eye Protection & other Policies on www.soinc.org as they apply to every event.

1. **DESCRIPTION:** Participants will be assessed on their understanding of the anatomy and physiology for the human **Integumentary, Skeletal, and Muscular** systems.

   A TEAM OF UP TO: 2 **APPROXIMATE TIME:** 50 minutes

2. **EVENT PARAMETERS:**

   Each team may bring one 8.5" x 11" sheet of paper, **which may be in** sheet protector **sealed by tape** or laminated, that may contain information on both sides in any form and from any source without any annotations or labels affixed along with two stand-alone non-programmable, non-graphing calculators.

3. **THE COMPETITION:**

   Participants will complete a written test limited to the following topics.

   a. **INTEGUMENTARY SYSTEM**:

      i. Functions of the Integumentary System
      ii. Anatomy of the layers of the skin, the component parts of the skin and sensory receptors
      iii. Skin Color and Texture, Hair and Nails, Integumentary Glands and the effects of aging on the skin
      iv. The diseases on each level from the cell to the whole person as listed: burns, allergies to allergens (i.e., poison ivy, metals), infections (i.e., boils, carbuncles, athlete's foot, impetigo) and skin cancer
      v. **National Tournament Only:**
         (1) Additional disorders: Psoriasis, human papilloma virus (HPV), other types of dermatitis & scabies
         (2) Treatments and/or prevention for all conditions listed above (drugs, surgery, etc.)

   b. **SKELETAL SYSTEM:**

      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 joint types and 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. Development and maturation of bones at the cellular and gross anatomical levels
      vi. How to distinguish between types of vertebrae (e.g., cervical, thoracic and lumbar)
      vii. 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
      viii. The effects of exercise and aging on the skeletal system and the diseases mentioned
      ix. **National Tournament Only:**
         (1) Additional diseases/disorders: spinal stenosis, achondroplasia, juvenile rheumatoid arthritis, spinal fractures, ankylosing spondylitis, and osteosarcoma
         (2) Treatments and/or prevention for <u>all</u> conditions listed above (drugs, surgery, etc.)
         (3) Label the bones of the skull. Know the foramina of the skull and what passes through each
         (4) Salter-Harris fracture classification system

   c. **MUSCULAR SYSTEM:**

      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, including origin, insertion, and function, of the major skeletal muscles of the body listed on the **2020 Science Olympiad Major Skeletal Muscle List**
      vii. Exercise and aging effects on the cellular and gross anatomical structures 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: Poliomyelitis, Muscular Dystrophies, Myasthenia gravis, tetanus, myositis

x. **National Tournament Only:**
   (1) Kinds of muscle contraction
   (2) Classes of muscle fibers and their functions
   (3) Cardiac and smooth muscle roles in the body
   (4) Role of the nervous system in muscle function
   (5) Muscle sensory systems (e.g., spindles and Golgi tendon organs)
   (6) Additional diseases: Carpal Tunnel Syndrome, Botulism, Fibromyalgia, and Chronic fatigue syndrome
   (7) Treatments and/or prevention for all conditions listed above (drugs, surgery, etc.)

4. **SCORING:**
   a. High score wins.
   b. Selected questions will be used to break ties.

Recommended Resources: The Science Olympiad Store (store.soinc.org) carries the Anatomy and Physiology CD and Bio/Earth Science CD; other resources are on the event page at soinc.org.

2020 Science Olympiad Major Skeletal Muscles

Head and Neck
- Frontalis
- Orbicularis oris
- Orbicularis oculi
- Occipitofrontalis
- Zygomaticus major
- Masseter
- Sternocleidomastoid
- Trapezius
- Buccinator

Move the Upper Extremities
- Pectoralis major
- Latissimus dorsi
- Deltoid
- Teres major
- Biceps brachii
- Triceps brachii
- Brachialis
- Brachioradialis
- Palmaris longus
- Flexor carpi radialis
- Flexor digitorum superficialis
- Extensor carpi radialis
- Extensor digitorum
- Extensor digiti minimi
- Extensor carpi ulnaris

Muscles of the Trunk
- External Intercostals
- Internal Intercostals
- Transverse abdominis
- Infraspinatus
- Rectus abdominis
- Serratus anterior
- Diaphragm

Move the Lower Extremities
- Iliopsoas
- Sartorius
- Gluteus maximus
- Gluteus medius
- Tensor fasciae latae
- Adductor longus
- Gracilis
- Semimembranosus
- Semitendinosus
- Biceps femoris
- Rectus femoris
- Vastus lateralis
- Vastus intermedium
- Vastus medialis
- Tibialis anterior
- Gastrocnemius
- Soleus
- Peroneus longus
- Peroneus brevis