



1. **DESCRIPTION:** Participants will be assessed on their understanding of the anatomy and physiology for the human **Nervous, Sense Organs, and Endocrine** 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 a 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:** This Event may be administered as a written test or as series of lab-practical stations which can include but are not limited to experiments, scientific apparatus, models, illustrations, specimens, data collection and analysis, and problems for students to solve. Content topics will include:

a. **Nervous System:**

- i. The Brain - major regions and their functions
- ii. Identification of simple encephalographic wave forms and why they occur
- iii. Neural Impulses - cellular anatomy and physiology of neurons and supporting cells, synapses and neurotransmitters, action potential generation and propagation, ionic basis of the cellular membrane potential, types of neural synapses
- iv. Central Nervous System - organization of the spinal cord, brainstem and cranial nerves, purpose/functions of sleep
- v. Peripheral Nervous System – neural ganglia, action and physiology of sensory and motor neurons, action and physiology of sympathetic and parasympathetic neurons, understand differences in and purposes of parasympathetic, sympathetic, somatic, and sensory systems, reflex arcs and proprioception, nerve structure
- vi. Disorders: Epilepsy, Alzheimer's Disease, Multiple Sclerosis, Parkinson's Disease, Cerebral Palsy, Shingles (herpes zoster), Stroke, Amyotrophic Lateral Sclerosis (ALS)
- vii. Effects of the drugs: alcohol, caffeine, nicotine, and marijuana on the nervous system
- viii. **National Tournament Only:**

(1) **The Brain - anatomy and physiology of brain function including function and role of specific nuclei clusters and tracts, theories of dreaming, neural impulses - retrograde signaling, purpose and principles of MRIs and EEGs**

(2) **Treatments and/or prevention (e.g.; drugs, surgery) for all conditions listed above**

b. **Sense Organs:**

- i. Types of sensory receptors, General Senses vs. Special Senses
- ii. Mechanisms for the General Senses of touch, pressure, pain, temperature, itch, and proprioception
- iii. Sense Organs – regions of each of the Special Sense Organs and their functions
- iv. Physiology of sight, hearing, balance, smell, and taste
- v. Disorders: myopia, hyperopia, presbyopia, nyctalopia, astigmatism, conjunctivitis, color blindness, otitis media, types of deafness, Anosmia/dysosmia, dysgeusia
- vi. **National Tournament Only:**

(1) Neural pathways for vision, depth perception, and hearing

(2) Additional Disorders: Diabetic Retinopathy, Macular Degeneration, Glaucoma, Otosclerosis, Presbycusis, Meniere's Disease, Pink Eye (conjunctivitis) plus treatments and/or prevention of all conditions listed above

c. **Endocrine System:**

- i. The three classes of hormones – steroids, peptides, and amines
- ii. Mechanisms of hormone action – nuclear vs. cytoplasmic
- iii. Endocrine related problems – hypersecretion, hyposecretion
- iv. Hormone producing glands, their hormones and the function of each
- v. Disorders: diabetes mellitus, hypoglycemia, Graves' disease, Hashimoto's disease, goiter, cretinism
- vi. **National Tournament Only:**

(1) Endocrine cycles and negative feedback

(2) Autonomic nervous system control of endocrine function

(3) Additional Disorders: Cushing's Syndrome, Addison's Disease, and Myxedema, acromegaly

(4) 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](http://store.soinc.org)) carries a variety of resources to purchase for this event; other resources are on the Event Pages at [soinc.org](http://soinc.org)

**This event is sponsored by Hikma Pharmaceuticals**