# ANATOMY & PHYSIOLOGY B

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 **respiratory, digestive and immune systems of the human body.**

   **A TEAM OF UP TO:** 2

   **APPROXIMATE TIME: 50 minutes**

   **CALCULATOR: Class II**

2. **EVENT PARAMETERS:**
   a. Each team may bring writing utensils.
   b. Each team may bring two Class II calculators.
   c. Each team may bring one (1) 8.5" x 11" sheet of paper that may contain information on both sides in any form and from any source. The sheet of paper may be laminated or placed in a sheet protector to increase durability. Affixed labels, as well as multiple sheets of paper (whether in a single sheet protector or not) are prohibited.
3. **THE COMPETITION:** This Event may be administered as a written test or as a 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.
   a. RESPIRATORY SYSTEM:
      i. Anatomy and functions of the respiratory system
      ii. Mechanisms and measures of pulmonary ventilation
      iii. Patterns of breathing
      iv. Ability to read a spirogram as related to pulmonary ventilation
      v. Gas exchange and $O_2$ transport including oxygen dissociation curves
      vi. Effects of exercise and high altitude on the respiratory system
      vii. Understand diseases/disorders: COPD, asthma, emphysema, pneumonia, sleep apnea and cystic fibrosis

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      viii. ***Additional diseases/disorders: tuberculosis, pulmonary edema, pleurisy, small cell and non-small cell lung cancer, pulmonary fibrosis, pneumoconiosis (silicosis, coal worker lung, asbestosis)***
      ix. ***Blood chemistry and respiratory rhythm, regulation and control of the respiratory system***
      x. ***Treatments and/or preventions (drugs, surgery, etc.) for ALL diseases/disorders listed above***

   b. DIGESTIVE SYSTEM:
      i. Anatomy and functions of the digestive system
      ii. Basic anatomy of the component parts of the alimentary canal and accessory organs of digestion
      iii. Anatomy of the four layers of the wall of the alimentary canal
      iv. Comparison of the lining of the esophagus, stomach, small intestine and large intestine
      v. Compare and contrast mechanical and chemical digestion
      vi. Physiology of chemical digestion of proteins, fats and carbohydrates
      vii. Effects of exercise and obesity on the digestive system
      viii. The diseases on each level from the cell to the whole person as listed: stomach & duodenal ulcers, cancers of the digestive system, diarrhea, lactose intolerance, hepatitis, appendicitis

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      ix. ***Additional diseases: diverticular disease, GERD, peptic ulcer disease, ulcerative colitis, Crohn's Disease and celiac disease***
      x. ***The function of the liver and pancreas in the digestive system, including Kupffer cell function***
      xi. ***Treatments and/or prevention (drugs, surgery, etc.) for ALL diseases listed above***

c. IMMUNE SYSTEM:
   i. Anatomy and functions of the immune system (bone marrow, thymus, spleen, lymph nodes, skin)
   ii. Anatomy and physiology of innate immune system (eg. anatomical barriers, complement system, Toll-like receptors, inflammation, and innate immune cells)
   iii. Anatomy and physiology of adaptive immune system
   iv. Physiology of the immune response and allergic reactions
   v. Disorders: acquired and genetic immunodeficiencies (HIV/AIDS, common variable immunodeficiency, severe combined immunodeficiency), autoimmune diseases (multiple sclerosis, rheumatoid arthritis, Hashimoto thyroiditis, Graves' Disease), and type 1-4 hypersensitivities anaphylaxis, urticaria, myasthenia gravis, Arthus reaction, serum sickness, contact dermatitis)

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   vi. ***Types of Organ Transplants and Prevention of Rejection (allograft and autograft)***
   vii. ***Cancer Immunotherapies (Antibody therapies, CAR-T cell therapy)***
   viii. ***Additional disorders: systemic lupus erythematosus, dermatomyositis, scleroderma, psoriasis and psoriatic arthritis***
   ix. ***Treatments and/or prevention (drugs, surgery, etc.) for ALL disorders listed above***

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

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