

1. **DESCRIPTION:** Participants will be assessed on their understanding of the anatomy and physiology for the human Cardiovascular, Lymphatic, and Excretory 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 that may contain information on both sides in any form and from any source along with two **stand-alone** non-programmable, non-graphing calculators.

3. **THE COMPETITION:**

Participants will complete a written test limited to the following topics. Topics listed in *italics* will only be assessed at the National Tournament.

a. **CARDIOVASCULAR SYSTEM:**

- i. Anatomy and **physiology** of the cardiovascular system
- ii. The Heart - chambers and valves of the heart, electrical stimulation of myocardial tissue, pacemaker tissue, interpreting ECG (EKG) readings **on strips**
- iii. Blood Vessels – **structure and function** of arteries, arterioles, veins, venules, capillaries, **including the functionality of Starling's forces in the capillaries**
- iv. Blood - plasma, hematocrit, red blood cells, oxygen transport, hemoglobin **and cooperative binding of oxygen**, platelets and blood clotting, regulation of blood plasma volume and acidity, blood typing & basic genetics of ABO, Rh, blood types
- v. Measurement of the pulse rate and blood pressure **with appropriate instrumentation**
- vi. Calculations include systolic and diastolic pressure, mean arterial pressure, stroke volume & cardiac output
- vii. Effects of exercise, smoking, alcohol, caffeine, and drugs on the cardiovascular system
- viii. Understand disorders: Congestive Heart Failure, Atrial Fibrillation, Myocardial Infarction, Atherosclerosis, Bradycardia, and Tachycardia
- ix. *Treatments and/or prevention for all disorders listed above as well as disseminated intravascular coagulation and capillary leak syndrome*
- x. **Lethal & non-lethal cardiac strip (EKG) pattern interpretation:**
 - (1) **Division B only: Atrial Fibrillation, Pulseless Electrical Activity, Ventricular Tachycardia**
 - (2) **Division C only: Torsades, Premature Ventricular Contractions, Supraventricular Tachycardia**

b. **LYMPHATIC SYSTEM:**

- i. Anatomy and **physiology** of the lymphatic system
- ii. **Similarities and differences between Primary, Secondary, and Tertiary lymphoid tissues**
- iii. **General Lymphatic structures** - lymph nodes, lymph ducts, lymphatic capillaries, tissue fluid
- iv. **Structure and function of the Thymus**
- v. **Structure and function of the Spleen**
- vi. **Understand disorders: Lymphedema, Hodgkin lymphoma, non-Hodgkin lymphoma, Lymphadenopathy**
- vii. **GI Contributions to Immune Function and Absorption of Fats/Lipids in the tract**
- viii. *Treatments and/or prevention for all disorders listed above*

c. **EXCRETORY SYSTEM:**

- i. Anatomy and **physiology** of the excretory system
- ii. Basic anatomy of the urinary system including kidneys, ureters, bladder, and urethra
- iii. Structure and function of the nephron
- iv. Formation of urine, **Gross Filtration Rate** calculation, tubular secretion, and tubular absorption
- v. Understand disorders: **Kidney stones, Urinary Tract Infections, Glomerulonephritis, Renal failure, Incontinence**
- vi. *Additional diseases: Prostatitis, and BPH (Benign Prostatic Hyperplasia), Glomerulosclerosis*
- vii. *Treatments and/or prevention for all disorders listed above*

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 **updated** Anatomy and Physiology CD and Bio/Earth Science CD; other resources are on the event page at soinc.org.