The Human Machine (grades ALL)

Grades: 2, 3,4, & 5 (ALL)
Team Size: 1-2 competitors
Duration: 30 minutes
Supervisors: Laoma Beck, Hoa Truong, Rahul Mannon

Summary Description

This year's system is **2026 - Immune System.**

Teams will be tested on their knowledge and understanding of basic cell anatomy as well as anatomy and physiology of the Immune system.
Students will rotate through four stations:

- Standard Patient Station
- Microscope Simulation Station
- Anatomy Practicum (ID) Station (Gross and Cell)
- Written Question Station

Concepts Covered (more detail provided in the study guides)

The goal of "The Human Machine" is for students to develop an understanding of the human body and the individual parts and systems that work together to make it function. All concepts listed below are required for ALL grade unless indicated as 2nd/3rd grade only in the study guide.

I. General Anatomy (Simplified)

A. Basic Structure Overview

1. Fluids
2. Cells
3. Tissues (connective, epithelial, muscle, nervous)
4. Organs
5. Organ Systems

B. System Review - function and major components of each as outlined in the study guide

1. Skeletal
2. Muscular
3. Nervous
4. Digestive
5. Endocrine
6. Circulatory (Cardiovascular)
7. Respiratory
8. Immune/Lymphatic
9. Reproductive
10. Integumentary
11. Excretory (Urinary)

II. Cell Anatomy and Physiology
- **A.** Structure of a cell
- **B.** Organelles and their functions **(Fx:4th/5th Grade Only)**
- **C.** Cell membrane

2026 System Focus - Immune System (details in the study guide)

III. Function and Function of the Immune System
- **A.** Innate vs Adaptive
- **B. Anatomy of the Immune System**
  1. **Organs**
     - **a)** Skin
     - **b)** Bone marrow
     - **c)** Thymus
     - **d)** Spleen
  2. **Glands**
     - **a)** Adenoid
     - **b)** Tonsil
     - **c)** Peyer Patches
     - **d)** Lymph nodes

IV. Blood
- **A. Four Components**
  1. Plasma
  2. Red Blood Cells-RBC
  3. Platelets
  4. White Blood Cells-WBC
- **B. White Blood Cells**
  1. Innate
     - **a)** Neutrophils
     - **b)** Macrophages
  2. Adaptive
     - **a)** Lymphocytes
     - **b)** T-Cells
     - **c)** B-cells
     - **d)** Plasma Cells (Adapted B-cells)
     - **e)** Platelets

V. Antibodies and Immunity
- **A.** Form and Function
  1. Types of Immunity (Active and Passive)
- **B.** 5 Types of Antibodies
  1. IgG

2. IgM
3. IgA
4. IgE
5. IgA

VI. Inflammation–The Immune system at work

- **A.** 4 Signs
- **B.** Acute vs Chronic
- **C.** Disorders of the Immune System
  1. Auto-Immune
  2. Immuno-deficiencis
  3. Immuno-related Malignancies

VII. The Immune System in Patients

- **A.** Microscopes and Slides
- **B.** The Blood Smear
- **C.** Case Studies
  1. Bacterial Infections
  2. Viral Infections
  3. Fungal Infections
  4. Acute Leukemia
  5. Allergic Reactions

VIII. Standard Patient

- **A.** Greeting
- **B.** History and Physical (H&P)
- **C.** Differential Diagnosis
- **D.** Choosing a Test **(4th/5th grade only)**
- **E.** Diagnosis **(4th/5th grade only)**
- **F.** Treatment **(4th/5th grade only)**

Rules/Competition Format

Each team of 1 to 2 participants will have 30 minutes for the competition.

The students will be given a brief introduction and provided with specific instructions needed for the event.

Each team will be give one (1) Competition Packet with sections for each station.

The competition will consist of 4 stations that will cover all sections of the Detailed Event Description and Coaches Study Guide.

- Standard Patient Station
- Microscope Simulation Station
- Anatomy Practicum (ID) Station (Gross and Cell)
- Written Question Station

Students will have seven (7) minutes at each stations and two (2) minutes allocated for switching stations. All teams will be given exactly the same amount of time to complete the Competition.

Teammates may quietly discuss the questions, but each team must come up with only one answer to each question. Correct spelling is not required as long as words are phonetically recognizable.

Practical Station for 2026: Immune System

- This stations will use the Torso model, Immune System images (gross) and Cell Model images
- Only the SCIENTIFIC NAMES of the organs will be accepted. (For example,“head” is not acceptable – the correct answer is “**brain”,** or “backbones” is incorrect -- the correct answer is “**vertebrae”**). A list of the specific organs that the teams should know and their acceptable scientific names can be found in the study guide.
- Organs and their individual parts must be identified on a human body model. The organ structures may be removed from the human body model for identification, or may be left intact.

Standard Patient Station for 2026: Immune System

- At this station, students will interact with a “Standard Patient”. These will be volunteers with a background in healthcare (in the past we have used medical/nursing students and pre-health college students) who have been trained to help us assess students.
- This station will assess appropriate patient interaction as laid out in the study guide: including pleasant greeting, taking a simple history, performing a physical exam (proper hygiene and gloves) and making a differential diagnosis.
- For 4th and 5th Grade Only- they will be asked to select an appropriate diagnostic test, get the result, and then be asked to select a diagnosis and treatment recommendation.

Microscope Simulation Station for 2026: Immune System

- This station will use images of microscopes, a model of microscope, printed images of magnified objects.
- Students will need to identify microscope parts and their functions as provided in the Coaches Study Guide
- Students will use printed images to simulate using a microscope to identify components of the immune system as listed in the Coaches Study Guide.

Written Question Station for 2026: Immune System

- This station will have only written questions. Question types include multiple choice, fill in the blank, compare and contrast, short answer, and True/False.

- Students may use extra time to answer questions from other stations (but NOT revisit those stations).

Scoring

- The point value of each question will be clearly marked.
- There will not be a score deduction for spelling errors (as long as phonetically recognizable).
- Completion time will not be considered in scoring.

Tie Break Criteria
There will be several marked tiebreaker questions. The tie breaker questions will only be graded in case of a tie.

Materials Distributed by WESO
2020: DK Smithsonian book: ***Human Body!*** (ISBN: 978-1-4654-6239-8)
2023: Human abdominal organ model
2026: Histology/Pathology Image Pack

It is the responsibility of the school's head coach to pick up materials distributed by WESO and transfer all new and past materials to the event coaches. If your school did not receive any of the materials (newly distributed or past materials), please contact your head coach so arrangements can be made for them to obtain the materials.

Materials to be brought to competition
- None.
- Supervisors will provide pencils and erasers for the test. No calculators are needed.
- A reference sheet will not be allowed.

Event Questions
Please go to https://wesoscience.org/events/ for information on how to submit questions about this event.