

## " Brain Meets Brawn"

**Exercise physiology** is the study of the acute responses and chronic adaptations to a wide-range of physical exercise conditions. An exercise physiologist's area of study may include biochemistry, bioenergetics, cardiopulmonary function, hematology, biomechanics, skeletal muscle physiology, neuroendocrine function, and central and peripheral nervous system function.

This event will consist of 25 lab stations. Teams will rotate from station to station in 1 minute intervals. At each station, teams will have to answer two questions. Stations may have diagrams, graphs, pictures, physical models or objects, or even (possibly) animations and/or video footage to watch. Questions may be application, analysis, mathematical, or just basic knowledge. Math questions will be basic enough so that calculators will NOT be allowed.

The topics that might be covered in the event include:

- Structure and function of the heart and circulatory systems
- Heart rate (resting, max, during exercise, and other factors influencing)
  - Ways to calculate maximum Heart Rate, Heart Rate reserve and "target heart rates"
- Stroke Volume, Cardiac Output,  $VO_{2max}$  (absolute and relative), Blood pressure
- Structure and function of the Pulmonary system
- Aerobic and Anaerobic energy systems (and engagement of during types of exercises)
  - Fuel sources (carb's, lipids, proteins) utilized before, during, and after types of exercise.
- Basal Metabolic Rates
- Body Fat % vs. BMI (and ways to calculate)
- Scaromere
- Motor unit
- Specific Muscle Groups: Biceps brachii, Triceps brachii, Brachialis, Brachioradialis, Teres minor, Teres major, Deltoid, Trapezius, Latissimus dorsi, Pectoralis minor, Pectoralis major, External/Internal Obliques, Rectus abdominis, Transversus abdominis, Gluteus maximus and minimus, Biceps femoris, Rectus femoris, Gastrocnemius, Soleus, Tibialis anterior
  - Examples of exercises that target various muscle groups above
- The Overload Principle
- Hypertrophy
- Sequence of physical adaptations of untrained individuals to resistance training
- Sequence of physical adaptations of untrained individuals to cardiovascular training
- Types of bones and their structure
- Tendons vs. Ligaments
  - Ligaments of the ankle joint and common injuries
- Six types of Synovial Joints
  - Structure of the knee joint
  - Effects of gender on risk for knee injuries in high school athletes
- Aspects of Training Programs
  - Duration vs. Frequency vs. Load vs. Volume
  - Open vs. closed chain weight training
  - Periodization
  - High Intensity Interval training vs. continuous aerobic exercise
- Energy budgets (calorie content of types of food, calories in vs. calories out for weight gain/loss)