

# MY SO STEM SHOWDOWN

## CONTENT, RECOMMENDED MATERIALS & SCORING

### STEM SHOWDOWN CONTENT

The STEM Showdown will consist of a series of online multiple-choice questions. Participants at both levels will be expected to demonstrate their understanding of the anatomy and physiology for the human Integumentary, Skeletal, and Muscular systems. A Showdown participant will have 55-minutes to login and answer as many questions as possible.

***The Anatomy & Physiology content and skills covered by the Showdown this month are as follows:***

#### 1. INTEGUMENTARY SYSTEM:

- a. Functions of the Integumentary System
- b. Anatomy of the layers of the skin, the component parts of the skin and sensory receptors
- c. Skin Color and Texture, Hair and Nails, Integumentary Glands and the effects of aging on the skin
- d. The diseases on each level from the cell to the whole person as listed: allergies to allergens (i.e., poison ivy, metals), infections (i.e., boils, carbuncles, athlete's foot, impetigo, acne, human papilloma virus (HPV), other types of dermatitis) and skin cancer
- e. Injuries to the skin: burns, bedsores, calluses, and scars
- f. Additional disorders: Psoriasis, scabies, ringworm, herpes, yeast infection, eczema & albinism
- g. Treatments and/or prevention for all conditions listed above (drugs, surgery, etc.)
- h. Aspects of wound healing including, but not limited to: inflammation, necrosis, apoptosis, vasodilation, and clotting

#### 2. SKELETAL SYSTEM:

- a. Bones of the axial and appendicular skeleton; label the basic surface anatomy of a bone as shown on a diagram and/or normal X-ray, CT and MRI
- b. Name, structure and function of joint types and muscle and ligament attachments that surround the joints and the ranges of motion allowed by each type (e.g., ball and socket)
- c. Structures of bones in cross-section
- d. Cellular composition, structure and function of bones, bone marrow and cartilage
- e. Development and maturation of bones at the cellular and gross anatomical levels
- f. How to distinguish between types of vertebrae (e.g., cervical, thoracic and lumbar)
- g. Characteristics and radiological features of bone diseases/disorders from the cell level to the whole person as listed: osteoarthritis, osteoporosis, fractures, disc herniation, scoliosis, anterior cruciate ligament tears, medial collateral ligament damage, spinal fractures
- h. The effects of exercise and aging on the skeletal system and the diseases mentioned above
- i. Growth plate injuries - how they occur and the long-term effects
- j. Additional diseases/disorders: spinal stenosis, achondroplasia, juvenile rheumatoid arthritis, ankylosing spondylitis, osteosarcoma, Paget's disease, fibrous dysplasia, and osteogenesis imperfecta
- k. Treatments and/or prevention for all conditions listed above (drugs, surgery, etc.)
- l. Label the bones of the skull. Know the foramina of the skull and what passes through each
- m. Salter-Harris fracture classification system

### 3. MUSCULAR SYSTEM

- a. The interaction of the skeletal and muscular systems to allow movement
- b. Muscle fibers - the cellular and gross anatomy of skeletal muscle, cardiac muscle & smooth muscle
- c. Physiology of the skeletal muscle contraction system and the neuromuscular junction
- d. How the skeletal muscles move bone, maintain posture, and produce heat
- e. Skeletal muscle actions – origin, insertion, interactions of different muscles
- f. Cardiac and smooth muscle roles in the body
- g. Location and identification, including origin, insertion, and function, of the major skeletal muscles of the body as follows:
  - i. Head and Neck
    1. Frontalis
    2. Orbicularis oris
    3. Orbicularis oculi
    4. Occipitofrontalis
    5. Zygomaticus major
    6. Masseter
    7. Sternocleidomastoid
    8. Trapezius
    9. Buccinator
  - ii. Muscles of the Trunk
    1. External Intercostals
    2. Internal Intercostals
    3. Transverse abdominis
    4. Infraspinalis
    5. Rectus abdominis
    6. Serratus anterior
    7. Diaphragm
  - iii. Move the Upper Extremities
    1. Pectoralis major
    2. Latissimus dorsi
    3. Deltoid
    4. Teres major
    5. Biceps brachii
    6. Triceps brachii
    7. Brachialis
    8. Brachioradialis
    9. Palmaris longus
    10. Flexor carpi radialis
    11. Flexor digitorum superficialis
    12. Extensor carpi radialis
    13. Extensor digitorum
    14. Extensor digiti minimi
    15. Extensor carpi ulnaris
  - iv. Move the Lower Extremities
    1. Iliopsoas
    2. Sartorius
    3. Gluteus maximus
    4. Gluteus medius
    5. Tensor fasciae latae
    6. Adductor longus

7. Gracilis
  8. Semimembranosus
  9. Semitendinosus
  10. Biceps femoris
  11. Rectus femoris
  12. Vastus lateralis
  13. Vastus intermedius
  14. Vastus medialis
  15. Tibialis anterior
  16. Gastrocnemius Soleus
  17. Peroneus longus
  18. Peroneus brevis
- h. The diseases on each level from cellular to the whole person: Muscular Dystrophy, Fibromyalgia, tendinitis, Cerebral palsy, Poliomyelitis, Myasthenia gravis, tetanus, myositis
  - i. Exercise and aging effects on the cellular and gross anatomical structures of the muscular system
  - j. Muscle and tendon injuries and their prevention (i.e., strains and sprains)
  - k. Kinds of muscle contractions
  - l. Classes of muscle fibers and their functions
  - m. Role of the nervous system in muscle function
  - n. Muscle sensory systems (e.g., spindles and Golgi tendon organs)
  - o. Muscular system involvement in: respiration, digestion, circulation and stability
  - p. Additional diseases: Carpal Tunnel Syndrome, Botulism, and Chronic fatigue syndrome, Marfan syndrome, myotonia, and rhabdomyolysis
  - q. Treatments and/or prevention for all conditions listed above (drugs, surgery, etc.)

## Recommended Materials

- Each Showdown participant will need a computer with internet access, scratch paper, something to write with, and a stand-alone calculator
- Showdown participants may use resources available to help them answer the questions asked during the Showdown. These resources could be a collection of notes on the topics listed below, copies of magazine or journal articles, a textbook, or any combination of these items.

## Scoring

- High score wins.
- Ties will be broken using:
  - a. The time it takes to complete the test; and
  - b. The number of test questions attempted.

## Additional Resources

- The Science Olympiad Store ([store.soinc.org](http://store.soinc.org)) carries the Anatomy & Physiology CD and Bio/Earth Science CD.
- Other resources can be found on the Anatomy & Physiology Event Pages at [soinc.org](http://soinc.org).