Anatomy and Physiology - Division C Condensed Key

Duke University Science Olympiad Invitational

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Total Possible Score: 316

USE THIS KEY TO GRADE THE ANSWERS SHEETS ON COMPETITION DAY.

Instructions and Clarifications:

- You have **50** minutes to finish this exam.
- Each team may bring **one** 8.5" x 11" two-sided page of information in any form from any source and **two** non-programmable non-graphing calculators.
- You **may** split the exam but you are responsible for placing the exam in the proper order after the testing session.
- Anything written on the exam will **not** be graded. Only the **answer sheet** will be graded.
- Write your **team number** on every page of the exam.
- There are **5** tiebreakers in this exam. They are denoted as **TB#.**
- If you have any questions or comments about the exam, feel free to reach me at ***velasco.scienceolympiad@gmail.com*.** **Happy testing!**

I. Integumentary System

Multiple Choice: Each question is worth **one** point.

1. D
2. D
3. B
4. B
5. C
6. A
7. E
8. A
9. C
10. A
11. A
12. B
13. D
14. A
15. D
16. A
17. D
18. A
19. C
20. C

Short Answer: Each question is worth **one** point.

1. Dermal papillae
2. Keratinization
3. Melanin
4. Hemoglobin
5. Dermal root sheath
6. Papilla of the hair
7. Vellus
8. Ceruminous gland
9. Cerumen
10. Nail matrix

Pathology Part I: Each question is worth **one** point unless otherwise stated.

1. (2) Koebner phenomenon **TB#1**
2. (2) Plaque
3. (2) Erythrodermic
4. (2) Flexural psoriasis
5. Accept one of the following: steroid creams, vitamin D3 cream, UV light, immune system suppressing medications like methotrexate
6. Accept one of the following: red, purple, whitish from scales
7. True
8. True
9. False
10. True

Labeling: Each letter is worth **one** point.

1.

A. Free edge
B. Nail body/plate
C. Lunula
D. Eponychium/cuticle
E. Nail root
F. Nail root
G. Eponychium
H. Lunula
I. Nail bed
J. Nail body
K. Free edge
L. Hyponychium
M. Epidermis
N. Dermis
O. Phalanx/fingerbone
P. Nail matrix

2.

A. Epidermal ridges
B. Dermal papillae
C. Capillary loop
D. Sweat pore
E. Sebaceous (oil) gland
F. Corpuscle of touch (Meissner corpuscle)
G. Arrector pili muscle
H. Hair follicle
I. Hair root
J. Eccrine sweat gland
K. Apocrine sweat gland
L. Lamellated (pacinian) corpuscle
M. Sensory nerve
N. Adipose tissue
O. Cutaneous vascular plexus
P. Hair shaft
Q. Papillary vascular plexus
R. Free nerve ending
S. Epidermis
T. Papillary region
U. Reticular region
V. Dermis
W. Subcutaneous layer
X. Vein
Y. Artery

Diagram-based Questions: Each question is worth **one** point unless otherwise stated. **TB#2**

1. (2) *Trichophyton*
2. Tinea pedis/Athlete's Foot
3. (2) Accept one of the following: *Epidermophyton, Microsporum*
4. False
5. Between the toes
6. False
7. False
8. True
9. 15%
10. Accept one of the following: itching, scaling, redness of the foot, blisters, cracking

Pathology: Each question is worth **one** point unless otherwise stated.

1. Third- degree burn (give 0.5 points for burn)
2. Impetigo (give 0.5 points for infection)
3. Basal-cell carcinoma (give 0.5 points or skin cancer)
4. Urushiol-induced contact dermatitis/poison ivy allergy (give 0.5 points for allergy)
5. Athlete's foot/Tinea pedis (give 0.5 points for infection)
6. Carbuncle (give 0.5 points for infection)
7. Squamous cell carcinoma (give 0.5 points for skin cancer)
8. Melanoma/malignant melanoma (give 0.5 points for skin cancer)
9. Scabies
10. Dermatitis

II. Skeletal System

Multiple Choice: Each question is worth **one** point unless otherwise stated.

1. E
2. C
3. A
4. D
5. C
6. D
7. D
8. B
9. B
10. C
11. A
12. B
13. D
14. A
15. C
16. E
17. A
18. A
19. E
20. B

Short Answer: Each question is worth **one** point unless otherwise stated.

1. Synchondrosis
2. Interosseous membrane
3. Syndesmosis
4. Articular cartilage
5. Articular capsule/joint capsule
6. Bursa
7. Tendon sheaths/synovial sheaths
8. Gliding
9. Abduction
10. Adduction

Pathology Part I: Each question is worth **one** point.

1. Scoliosis
2. Osteoporosis
3. ACL tear
4. Fracture
5. Herniated disk/Disc herniation
6. Osteoarthritis
7. MCL tear
8. Scoliosis

Pathology Part II: Each question is worth **one** point unless otherwise stated. **TB#3**

1. Osteosarcoma/Osteogenic sarcoma/OS/OGS
2. (2) chromosome 13q14
3. True
4. Sites of bone growth
5. Knee
6. (2) Codman triangle
7. (2) presence of osteoid (bone formation) within the tumor
8. 3
9. Stage I
10. Stage II

Labeling: Each letter is worth **one** point.

1.

A. Cranial portion
B. Facial portion
C. Clavicle
D. Scapula
E. Sternum
F. Ribs
G. Humerus
H. Ulna
I. Radius
J. Carpals
K. Metacarpals
L. Phalanges
M. Femur
N. Patella
O. Tibia
P. Fibula
Q. Tarsals
R. Metatarsals
S. Phalanges
T. Vertebral column
U. Pelvic (hip) girdle

2.

A. Compact bone
B. Spongy bone
C. Periosteum
D. Medullary cavity
E. Medullary cavity
F. Trabeculae
G. Inner circumferential lamellae
H. Interstitial lamellae
I. Outer circumferential lamellae
J. Concentric lamellae
K. Blood vessels
L. Canaliculi
M. Osteocyte
N. Lacuna
O. Periosteal vein
P. Periosteal artery
Q. Outer fibrous layer
R. Inner osteogenic layer
S. Central canal
T. Perforating canal
U. Perforating (Sharpey's fibers) fibers
V. Compact bone
W. Spongy bone
X. Osteon

III. Muscular System

Multiple Choice: Each question is worth **one** point.

1. C
2. A
3. E
4. B
5. C
6. C
7. A
8. D
9. D
10. C
11. A
12. B
13. A
14. D
15. B
16. D
17. A
18. D
19. A
20. B

Short Answer: Each question is worth **two** points. **TB#4**

1. Muscle fibers surrounding opening of mouth
2. Skin at angle of mouth and orbicularis oris
3. Elevates mandible/closing the mouth
4. Inferior border of rib above
5. Inferior angle of scapula
6. Extends forearm at the elbow joint and extends arm at shoulder joint
7. Medial epicondyle of humerus
8. Middle phalanx of each finger
9. Extends and adducts hand at wrist joint (ulnar deviation)
10. Iliac crest

Classification: Each question is worth **one** point.

1. Eccentric
2. Eccentric
3. Concentric
4. Isotonic
5. Concentric
6. Eccentric
7. Isotonic
8. Concentric
9. Eccentric
10. Isometric

Labeling

1.

A. I band
B. Z disc
C. H zone
D. M line
E. A band
F. Thick filament/myosin
G. Thin filament/actin
H. Z disc
I. I band
J. Sarcomere
K. Z disc
L. Thin filament/actin
M. Thick filament/myosin
N. M line
O. Titin filament
P. Z disc
Q. Sarcomere
R. Zone of overlap
S. H zone
T. I band
U. A band

2.

A. Axon collateral of somatic motor neuron
B. Muscle fiber
C. Myofibril in muscle fiber
D. Sarcolemma
E. Axon terminal
F. Synaptic end bulb
G. Neuromuscular junction/NMJ
H. Motor end plate
I. Sarcolemma
J. Voltage-gated Ca^{2+} channel
K. Ca^{2+}
L. Axon terminal
M. Nerve impulse
N. Synaptic vesicles containing acetylcholine (ACh)
O. Synaptic end bulb
Synaptic cleft/space

3.

A. Sarcolemma
B. Dense body
C. Intermediate filament
D. Nucleus
E. Thick filament
F. Thin filament

Diagram-based questions: Each question is worth **one** point unless otherwise stated. **TB#5**

1. (2) Golgi tendon organ/GTO/Golgi organ/tendon organ/neurotendinous organ/neurotendinous spindle
2. Senses changes in muscle tension
3. (2 total) Origins and insertions of skeletal muscle fibers (1) into the tendons of skeletal muscle (1)
4. (2) Intrafusal fasciculi
5. False
6. Compresses
7. (2) Ib afferents
8. False
9. False
10. Deformed

Pathology: Each question is worth **one** point.

Part A

1. Poliomyelitis
2. muscular dystrophy/Duchenne type muscular dystrophy
3. myasthenia gravis
4. Tetanus

Part B

5. Myositis/dermatomyositis
6. Tetanus
7. Poliomyelitis
8. Myasthenia gravis