

The following exam will test you on components of the integumentary, muscular, and skeletal systems. Please note that there are three case studies throughout this exam that may require more time to work through. Good luck!

1. (4.00 pts) Which of the following statements is incorrect?

- ☐ A) Mucosal surfaces are better than skin surfaces at supporting colonization by commensal microorganisms
- ☒ B) The skin provides a larger surface area than mucosal surfaces for commensal microorganisms.
- ☐ C) Ceruminous glands open directly onto the surface of the ear canal or into sebaceous gland ducts.
- ☐ D) Gray hair results from a decline in tyrosinase

2. (4.00 pts) All of the following are associated with the skin except:

- ☐ A) blood vessels
- ☐ B) a low surface density of putative pathogens
- ☒ C) specialized lymphoid tissues
- ☐ D) lymphatics
- ☐ E) an impenetrable physical barrier to microorganisms

3. (6.00 pts)

Vijay Kumar, a 19-year-old male who had emigrated to the United States from South India two years before, developed lesions in his nasal mucosa, and nodular skin lesions on his cheeks and buttocks. Examination of a stained biopsy of a skin lesion revealed numerous clumps of mycobacteria. T cells in the skin lesions were secreting IL-4, IL-5, and IL-10. What would be the most likely diagnosis?

- ☐ A) tuberculosis
- ☒ B) lepromatous leprosy
- ☐ C) basal cell carcinoma
- ☐ D) vitiligo

4. (3.00 pts) Arrector pili extends from the dermis to the side of hair follicle

- ☒ True
- ☐ False

5. (3.00 pts) Eccrine sweat glands secrete sweat that is referred to as "cold sweat."

- ☐ True
- ☒ False

**6. (3.00 pts)** Earwax is the combination of secretion of ceruminous and oil glands

☒ True ☐ False

**7. (3.00 pts)** Eponychium is a narrow band of epidermis associated with growth of nails

☒ True ☐ False

**8. (3.00 pts)** Streptococcus is a bacterial infection

☒ True ☐ False

**9. (3.00 pts)** Excessive or chronic exposure to UV radiation, x-rays, radiation chemicals, or long-term physical trauma are predisposing factors to contact dermatitis.

☐ True ☒ False

**10. (3.00 pts)** Squamous cell carcinoma consist of 1% of all skin cancers (very rare).

☐ True ☒ False

**11. (4.00 pts)** Name all of the skin lesions that affect humans.

(Mark **ALL** correct answers)

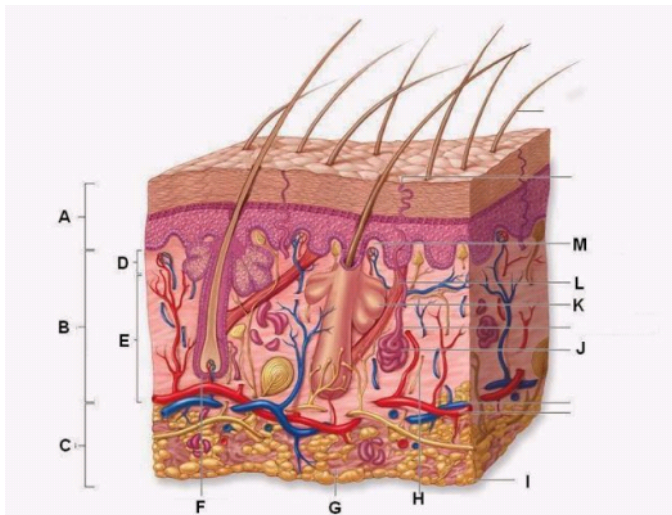
- ☒ A) Depressed
- ☒ B) Elevated
- ☐ C) Ceruminous
- ☐ D) Acne
- ☐ E) Sudoriferous
- ☒ F) Flat

**12. (9.00 pts)** Name the skin Structures A, C, and J (give SCIENTIFIC terms, not casual ones)

A.)

C.)

J.)

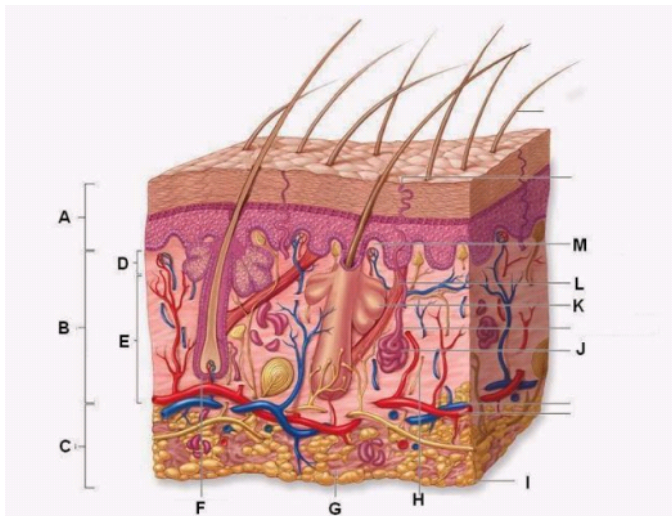


Epidermis

Hypodermis

Sudoriferous Gland

13. (9.00 pts) B.)  
F.)  
M.)

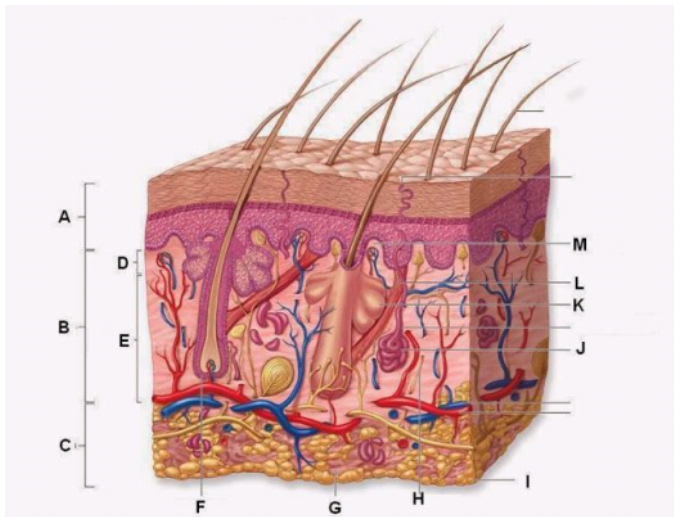


Dermis

Hair follicle

Dermal Papilla

14. (9.00 pts) Match the following terms with the Structures (i.e. Papillary layer is D)
- 1.) Adipose Connective Tissue is
  - 2.) Sensory Nerve Fiber is
  - 3.) Reticular Layer is



I  H  E

**15. (3.00 pts)** Identify the following skin condition (become a med student!). Just type the name of the condition, that's it,



Squamous Cell Carcinoma

**16. (3.00 pts)** Identify the following skin condition (become a med student!). Just type the name of the condition, that's it.



Contact Dermatitis

**17. (5.00 pts)**

Identify the following skin condition (become a med student!). Just type the name of the condition in the first blank. In the second blank, provide the generic name of the drug that you would prescribe as a first-line treatment.



Scabies

Permethrin

**18. (3.00 pts)** Pacinian corpuscles react to light touch and are located in the skin of your palms, soles, lips, eyelids, external genitals and nipples

☐ True ☒ False

**19. (3.00 pts)** A third - degree burn additionally involves injury to deeper tissues, such as muscle or bone

☐ True ☒ False

**20. (3.00 pts)**

Thermoreceptors are found all over the body, but cold receptors are found in greater density than heat receptors – most of the time our environment is colder than our body temperature

☒ True ☐ False

**21. (10.00 pts)**

Case study: A teenaged patient arrives in your office presenting with moderate acne vulgaris on his face. The teenager is upset about it, and asks you what causes this. In terms that the teenager can understand, explain how the lesions on his face (pustules, whiteheads, and blackheads) most likely arose, and how they differ from each other. What is one medication that you would prescribe as a first-line treatment?

**Expected Answer:** Acne in general results from dead skin cells and oil secreted from the skin plug up and clog hair follicles. Its presentation in teenagers is largely influenced by their increased hormone production, causing their skin to produce more oil. This oil increase causes the dead skin cells that fall into the hair follicles to stick together, and not exit the pore as easily. When this plug is formed very deep in the hair follicle and is covered by skin, it forms what is called a whitehead. When it forms near the surface of the open pore, the dead skin cells darken as they are exposed to air, and this forms a blackhead instead. A pustule is formed when the pore of the follicle becomes infected and begins to develop pus through the resulting immune response. The first-line treatment for moderate acne vulgaris is typically benzoyl peroxide and either a topical retinoid or a topical antibiotic (erythromycin or clindamycin). Either of these combinations (or a combination of all 3) are acceptable.

**22. (5.00 pts)**

A 21-year-old man falls from the attic and is brought to the emergency room. Examination and radiogram reveal that the lateral longitudinal arch of his foot is flattened. Which of the following bones is displaced?

- ☐ A) Talus
- ☐ B) Medial three metatarsals
- ☐ C) Navicular
- ☐ D) Cuneiform
- ☒ E) Cuboid

**23. (5.00 pts)** A 78-year-old woman receives knee surgery because her lateral meniscus is torn. Before injury, the normal lateral meniscus of the knee joint:

- ☐ A) Is C-shaped or forms a semicircle
- ☐ B) Is attached to the fibular collateral ligament
- ☐ C) Is larger than the medial meniscus
- ☒ D) Lies outside the synovial cavity
- ☐ E) Is more frequently torn in injuries than the medial meniscus

**24. (5.00 pts)**

A 17-year-old boy is involved in a group fight, and a stab wound lacerates a ventral root of his thoracic spinal nerve. Cell bodies of the injured nerve fibers are located in which of the following nervous structures?

- ☐ A) Lateral horn of spinal cord and dorsal root ganglia
- ☐ B) Dorsal root ganglia and sympathetic trunk
- ☒ C) Anterior horn and lateral horn of spinal cord
- ☐ D) Sympathetic trunk and lateral horn of spinal cord
- ☐ E) Anterior horn of spinal cord and sympathetic trunk

**25. (3.00 pts)** Smooth muscles produce movement by bending the skeleton at movable joints. Muscles work in antagonistic pairs.

- ☐ True
- ☒ False

**26. (3.00 pts)** Appositional cartilage occurs when lacunae-bound chondrocytes inside the cartilage divide and secrete new matrix, expanding the cartilage from within

- ☐ True
- ☒ False

**27. (0.00 pts)**

Spongy bone helps by filling the interior of the organ is the spongy bone tissue which is composed of a network of rod- and plate-like elements that make the overall organ lighter and allowing room for blood vessels and marrow

- ☒ True
- ☐ False

**28. (3.00 pts)** Rheumatoid arthritis usually arises between the ages of 20 to 40, but may occur at any age

☐ True ☒ False

**29. (3.00 pts)** Which of the following does NOT describe gouty arthritis?

- ☒ A) The end result, ankylosis, produces bent, deformed fingers
- ☐ B) Deposition of uric acid crystals in joints and soft tissues, followed by an inflammation response
- ☐ C) Typically affects the joint at the base of the great toe
- ☐ D) If untreated, bone ends fuse and immobilize the joint

**30. (3.00 pts)** Which of the following is a treatment for OA? (you must know this abbreviation)

- ☐ A) Conservative Therapy
- ☒ B) Magnetic Therapy
- ☐ C) Progressive treatment
- ☐ D) Subluxation
- ☐ E) SAM-e

**31. (3.00 pts)** Identify the following fracture:



- ☐ A) Compound
- ☐ B) Shattered
- ☐ C) Spiral
- ☒ D) Comminuted
- ☐ E) Compressed

**32. (9.00 pts)** Name the following Structures 1,2,3.

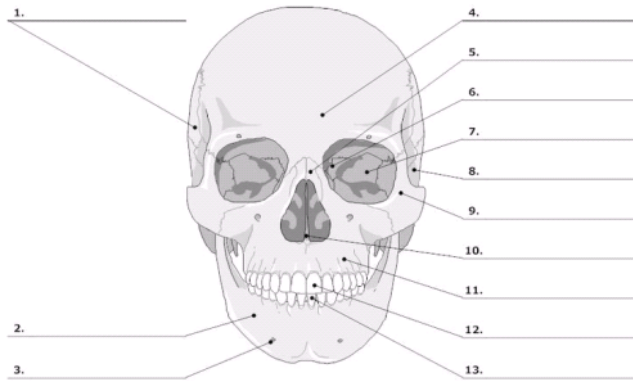
1.)

2.) NOTE: General structure

3.) NOTE: The tiny dot on the jaw



### Bones of the Skull Anterior View



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Parietal Bone

Mandible

Mental Foramen

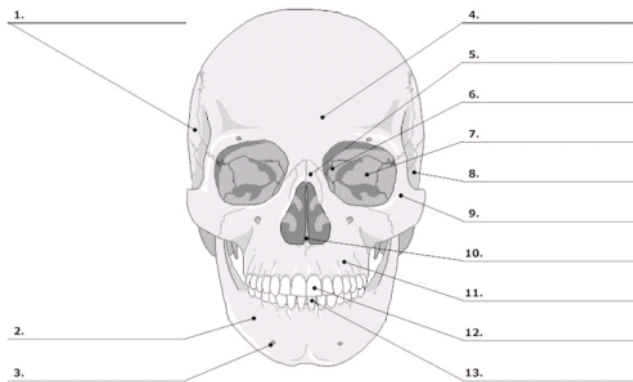
**33. (9.00 pts)** Label Structures 4, 9, and 10.

4.)

9.)

10.)

### Bones of the Skull Anterior View



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Frontal Bone

Zygomatic Bone

Vomer

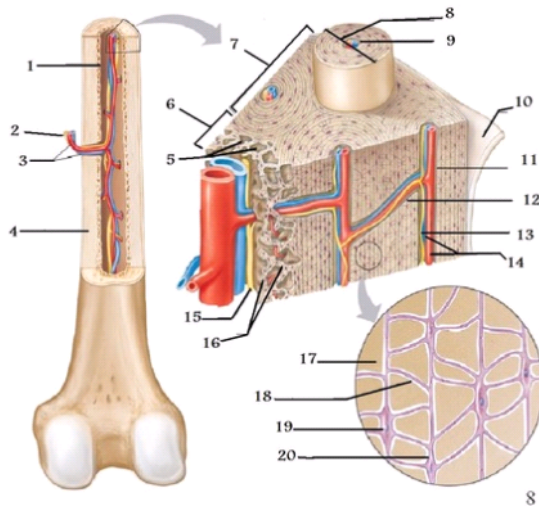
**34. (9.00 pts)** Label the following structures 1, 16, and 17.

1.)

16.)

17.)





Endosteum

Trabeculae

Canaliculus

**35. (1.00 pts)** Diaphysis is composed of compact bone that surrounds the medullary cavity

☒ True ☐ False

**36. (2.00 pts)**

On the given MRI, there is a bright substance resting under a fractured spinal disc. Give the one-word medical term for the condition that appears bright on this MRI (see arrow), indicating that there is a **new** spinal fracture in this patient.



Edema

**37. (7.00 pts)**

Case study: You have a 22-year-old female come in presenting with severe chronic pain in the lower back for two years. You notice that this woman is hunching over slightly, and she states that this is a fairly recent development in her life. When asked about the pain, she indicates that it is typically worse in the mornings or after she has been sitting for extended periods of time. She has recently begun to experience pain when she breathes deeply as well. You also notice that she is blinking rapidly when she looks up, and when asked, she indicates that she's developed a bit of a sensitivity to bright light.

What is this patient's most likely diagnosis? Is there a way to conclusively prove this? If not, what are 3 tests that you could run that might support this diagnosis?

**Expected Answer:** This patient most likely has ankylosing spondylitis, a rare but severe form of arthritis in the lower spine. It is not a confirmable diagnosis, but patients with AS may present with inflammation at the sacroiliac joint on either an X-ray or an MRI. Blood work options include a genetic workup to test for the HLA-B27 marker, sed rate test (AS = elevated sed rates), or a CRP test (AS = elevated CRP). Students do not have to justify the test - simply listing the type of test (sed rate, MRI, etc) is acceptable.

**38. (5.00 pts)**

A middle-aged coal miner injures his back after an accidental explosion. His magnetic resonance imaging (MRI) scan reveals that his spinal cord has shifted to the right because the lateral extensions of the pia mater were torn. Function of which of the following structures is most likely impaired?

- ☐ A) Filum terminale internum
- ☐ B) Coccygeal ligament
- ☒ C) Denticulate ligament
- ☐ D) Choroid plexus
- ☐ E) Tectorial membrane

**39. (5.00 pts)**

A 25-year-old man with congenital abnormalities at birth has a lesion of the dorsal scapular nerve, making him unable to adduct his scapula. Which of the following muscles is most likely paralyzed?

- ☐ A) Semispinalis capitis
- ☒ B) Rhomboid major
- ☐ C) Multifidus
- ☐ D) Rotator longus
- ☐ E) Iliocostalis

**40. (5.00 pts)**

A 25-year-old soldier suffers a gunshot wound on the lower part of his back and is unable to move his legs. A neurologic examination and magnetic resonance imaging (MRI) scan reveal injury of the cauda equina. Which of the following is most likely damaged?

- ☐ A) Dorsal primary rami
- ☐ B) Ventral primary rami
- ☐ C) Dorsal roots of the thoracic
- ☒ D) Ventral roots of the sacral spinal nerves
- ☐ E) Lumbar Spinal Nerves

**41. (3.00 pts)** List as many characteristics of muscle tissue below

(Mark **ALL** correct answers)

- ☒ A) Extensibility
- ☐ B) Stability
- ☒ C) Excitability
- ☒ D) Contractibility
- ☒ E) Elasticity
- ☐ F) Striatability

**42. (3.00 pts)**

The force producing the bending is always an insertion. Reversing the direction is produced by the contraction of a different set of muscles. As one group of muscles contracts, the other group stretches and then they reverse actions.

☐ True ☒ False

**43. (3.00 pts)** Only 60% of the energy released in muscle activity is useful as work

☐ True ☒ False

**44. (3.00 pts)** Atherosclerosis may block distal veins, leading to intermittent claudication and causing severe pain in leg muscles

☐ True ☒ False

**45. (3.00 pts)** Which of the following is not an effect of exercise on the muscular system?

- ☐ A) Trained muscles have better tone or state of readiness to respond
- ☐ B) Exercise promotes good posture enabling muscles to work effectively and helps prevent injury
- ☐ C) The brain also tells the heart to beat faster so that more blood is pumped to the lungs for gaseous exchange
- ☒ D) Low intensity exercise for short duration produces strength, size and power gains in muscles
- ☐ E) The lungs and heart have to work harder to supply the extra oxygen and remove the carbon dioxide.
- ☐ F) Tendons will become thicker and able to withstand greater force

**46. (3.00 pts)** Which of the following is a sex-linked disorder?

- ☐ A) Myasthenia gravis
- ☒ B) Muscular Dystrophy
- ☐ C) Tetanus
- ☐ D) Poliomyelitis
- ☐ E) Muscle fatigue
- ☐ F) Ionic imbalance

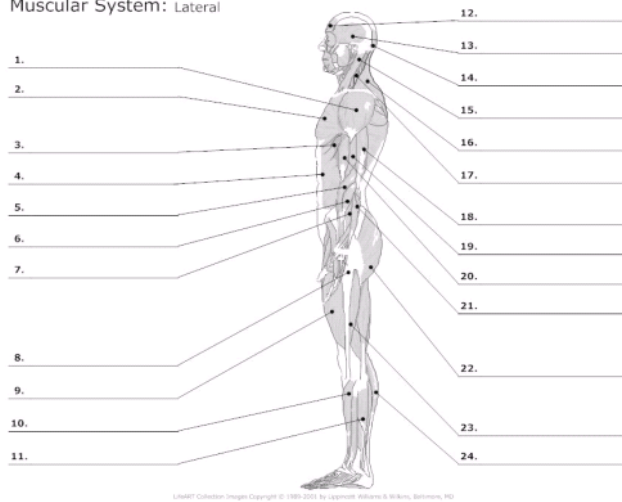
**47. (9.00 pts)** Label Structures 1, 3, and 5

1.)

3.)

5.)

# Muscular System: Lateral



Deltoid

Serratus Anterior

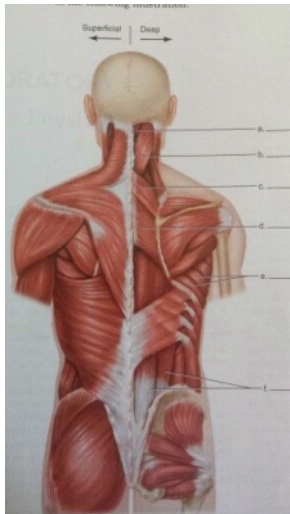
Brachioradialis

48. (6.00 pts) Label Structures D, E, and F

D.)

E.)

F.)



Rhomboideus Major

Serratus Anterior

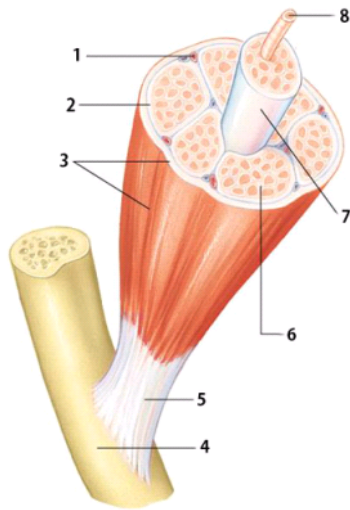
Erector Spinae

49. (6.00 pts) Match the following terms with the Structures (i.e. Muscle Fiber is 8)

1) Bone is

2) Perimysium is

3) Endomysium is



4

2

6

50. (3.00 pts) Which of the following is not true?

- ☐ A) There are nearly 650 muscles attached to the skeleton. See muscle list for competitions
- ☐ B) Most muscles extend from one bone across a joint to another bone with one bone being more stationary than another in a given movement.
- ☐ C) When muscles contract the movable bone, the muscle's insertion moves toward the immovable bone – the muscle's origin
- ☐ D)

The basic functional unit of the muscle fiber is the sarcomere which consists of thick filaments with myosin (protein) molecules and thin filaments with actin (protein) molecules plus smaller amounts of troponin and tropomyosin

- ☐ E) Muscle fibers from a motor unit are spread throughout the muscle; therefore, contraction of a single motor unit causes weak contraction of the entire muscle
- ☒ F) There are nearly 750 muscles attached to the skeleton. See muscle list for competitions

51. (4.00 pts) Briefly (2-3 sentences) describe how the botulinum toxin causes paralysis.

**Expected Answer:** The botulinum toxin inhibits the release of acetylcholine from presynaptic neurons in neuromuscular junctions. Without acetylcholine, an action potential cannot be generated along the sarcolemma towards the T-tubule. Calcium from the sarcoplasmic reticulum cannot be released, and no muscle contraction can be generated in the associated myofibrils.

52. (3.00 pts) By age 50, 80% of muscle mass is lost (sarcopenia)

- ☐ True
- ☒ False

53. (6.00 pts)

Case study: You are taking the history of a patient that is new to your clinic. He does not know the name of the condition that he has, but he can tell you the following about his medical history:

He wears glasses for myopia. He was diagnosed with pectus excavatum as a teenager, as well as stretch marks of an unknown source. Ever since he can remember, he has been unusually flexible - his previous primary care physician told him he exhibited hypermobility. He has suffered from joint pain for many years, something that he chalked up to his flat feet.

You also notice that this patient is unusually tall and thin, with a noticeable curvature to his back. When you ask him to wrap his fingers around his wrist, you notice that his pinky and thumb overlap comfortably.

He has never seen a specialist before. What is this patient's most likely diagnosis (blank #1), and to which specialty should you refer him for long-term management of this condition's most serious complications (blank #2)?

Marfan syndrome

Cardiology

If you have any questions, please feel free to contact any event supervisor or SciOly administrator.