

# Mr.Epithelium's Anatomy and Physiology Test SSSS 2020 **KEY**

One 8.5 x 11 notes sheet is allowed, along with 1 non-programmable calculator dedicated to computation.

**Good luck!**

Name(s): \_\_\_\_\_ , \_\_\_\_\_

**Points: 180**

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## Instructions:

- **You have 40 minutes to complete this test packet.**
  - o There are 9 stations, with **5 minutes per station** allotted.
- One 8.5 x 11 notes sheet is allowed, along with 1 non-programmable calculator dedicated to computation per person.
- Point values are denoted using brackets [ ] in front of each question.
- Tiebreakers are the total score of the following stations, in order: 6, 8, 1
- **Good luck! Have fun, feedback is greatly appreciated** (PM *Mr.Epithelium* on Scioly).

# Station 1 Figures (18 points)

Figure 1.0

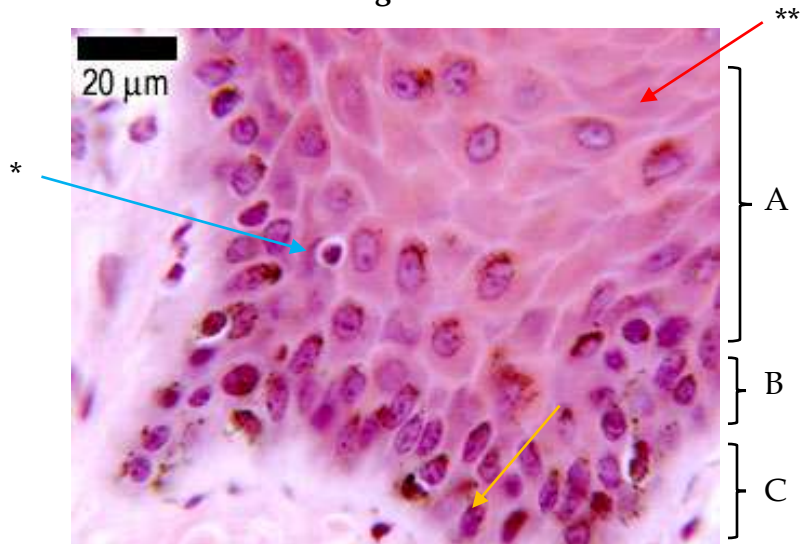
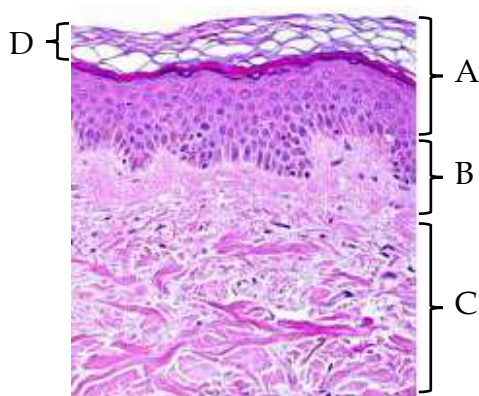


Figure 1.1



Figure 1.2



## Station 1 (18 points)

Questions 1-7 refer to Figure 1.0.

1. [1] What type of cell is indicated by the blue arrow (\*)? **Melanocyte**
2. [1] What type of cell is indicated by the red arrow (\*\*)? **Keratinocyte**
3. [1] What does label A indicate? **Stratum spinosum**
4. [1] What does label B indicate? **Stratum basale**
5. [1] What does label C indicate? **Papillary layer (of dermis)**
6. [1] What type of connection occurs between layers B and C? **Hemidesmosomes**
7. [1] Using the measurement given, estimate the width of the cell labeled with the blue arrow. **5-7  $\mu\text{m}$**

Questions 8-9 refer to Figure 1.1.

8. [1] What skin receptor is shown in the picture? **Meissner/tactile corpuscle**
  - a. [1] What type of touch does this receptor sense? **Light touch (accept similar)**
  - b. [1] What type of skin are these receptors most concentrated in? **Thick**
9. [1] What type of tissue makes up the layer indicated by the bracket? **Areolar tissue**

Questions 10-13 refer to Figure 1.2.

10. [1] What type of epithelium makes up label A? **Keratinized stratified squamous epithelium**
11. [1] What type of tissue makes up label C? **Dense irregular connective tissue**
12. [1] What does label D indicate? **Stratum corneum**
  - a. [1] An acidic secretion sometimes covers label D. What is this called? **Acid mantle**
  - b. [1] What is the function of this secretion? **(up to 1 point) \*(+1) Create acidic environment \*(+1) Slows microbial (bacterial) growth**
13. [1] What are the finger-like projections in label B called? **Dermal papillae**
  - a. [1] Name one function of these projections. **(up to 1 point) \*(+1) Increases surface area for exchange of nutrients, gases, and wastes \*(+1) Creates strong connection between the papillary dermis and epidermis.**

## Station 2 Figures (20 points)

*Figure 2.0*



### **Word Bank**

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Anagen	Club	Spinosum
Basale	Granulosum	Telogen
Catagen	Lanugo	Terminal
Corneum	Lucidum	Vellus

## Station 2 (20 points)

Questions 14-18 refer to Figure 2.0.

14. [1] What condition relating to skin color is shown in (a)? **Cyanosis**
  - a. [1] What pigment is responsible for this condition?  
**Hemoglobin/deoxyhemoglobin**
15. [1] What condition relating to skin color is shown in (b)? **Jaundice**
  - a. [1] What organ is affected in people with this condition? **Liver**
16. [1] What condition relating to skin color is shown in (c)? **Erythema**
  - a. [1] **Bonus!** What condition results in the hallmark symptom shown in (c)?  
**Lyme disease**
17. [1] Which condition(s) above activate thermoreceptors? **Cyanosis and Erythema**
18. [1] What receptor could sense the environment related to condition (a)? **Krause end bulbs, cold receptors**









Use the **Word Bank** to answer questions 19-30. Some questions may have multiple answers.

19. [1] The “peach fuzz” hairs covering much of the body. **Vellus**
20. [1] The hair is not growing in what phase(s)? **Catagen, Telogen**
21. [1] The shortest phase of hair growth. **Catagen**
22. [1] Sensible perspiration occurs in this layer. **Corneum**
23. [1] This layer includes Merkel cells. **Basale**
24. [1] Layer(s) of the epidermis that have live keratinocytes. **Basale, Granulosum, Spinosum**
25. [1] Layer of skin exclusively found in thick skin. **Lucidum**
26. [1] Type(s) of hair that include(s) eyebrows and eyelashes. **Terminal**
27. [1] Layer(s) of the epidermis found in thin skin. **Basale, Corneum, Granulosum, and Spinosum**
28. [1] Layer(s) of the skin that contain(s) the protein eleidin. **Lucidum**
29. [1] Hair that is attached to an inactive follicle. **Club**
30. [1] Layer(s) of the epidermis secrete lamellar granules. **Granulosum, Lucidum**

## Station 3 Figures (22 points)

*Table 3.0*

*Slides 1-8 are shown in Table 3.0*

<p>1.</p>  A photograph of a forearm showing a large, well-demarcated, erythematous (red) patch with a slightly raised, central area, characteristic of erythema multiforme.	<p>2.</p>  A photograph of a skin lesion on an arm, showing a large, irregular, dark brown to black pigmented area with a central area of alopecia (hair loss) and surrounding erythema, characteristic of subacute cutaneous lupus erythematosus.
<p>3.</p>  A photograph of a face showing multiple erythematous, target-like lesions, characteristic of erythema multiforme.	<p>4.</p>  A photograph of an arm showing multiple erythematous, target-like lesions, characteristic of erythema multiforme.
<p>5.</p>  A photograph of a face showing a large, erythematous, target-like lesion, characteristic of erythema multiforme.	<p>6.</p>  A photograph of a face showing a large, erythematous, target-like lesion with a central area of crusting, characteristic of erythema multiforme.
<p>7.</p>  A photograph of an elbow showing a large, erythematous, target-like lesion, characteristic of erythema multiforme.	<p>8.</p>  A photograph of a face showing multiple erythematous, target-like lesions, characteristic of erythema multiforme.

## Station 3 (22 points)

Questions 31-40 refer to Table 3.0.

*Note: Disease, disorder, and injuries are used synonymously in this section*

31. [1] What disease is shown in slide 1? **2<sup>nd</sup> degree burn**
  - a. [1] What layers of the skin are affected by this disease? **Epidermis and dermis**
32. [1] Does slide 2 show malignant melanoma? **Yes**
  - a. [2] Use one letter of the ABCD's of melanoma to back up your answer. **+2 for any ONE of the following: A- the melanoma is asymmetrical; B- the border of the melanoma is irregular (some parts are patchy, faded, etc); C- the color varies throughout (red, black, lighter shades, etc); D- the diameter of the melanoma is greater than 6 mm.**
33. [1] What disease is shown in slide 3? **Impetigo**
  - a. [1] Who is most at risk for this disease? **Children**
34. [1] What disease is shown in slide 4? **Poison ivy allergy (Poison ivy rash)**
  - a. [1] What is the primary cause of this disease? Be specific! **Contact with the oily resin urushiol (Note: on any object or from the plant itself)**
35. [1] What disease is shown in slide 5? **Basal cell carcinoma**
  - a. [1] Name a prevention method for this disease. **Use sunscreen (SPF > 30), avoid tanning beds, wear protective clothing, other acceptable answers**
36. [1] What disease is shown in slide 6? **Carbuncle**
  - a. [1] What pathogen can be a cause of this disease? **Staphylococcus aureus / Streptococcus pyogenes**
37. [1] What disease is shown in slide 7? **1<sup>st</sup> degree burn**
  - a. [2] What layers of the dermis are affected by this disease, if any at all? **None**
38. [1] What disease is shown in slide 8? **Eczema**
  - a. [1] What specific type of this disease is shown in the slide? **Nummular eczema**
39. [2] Which slide(s) can be caused by bacteria? **Slides 3 and 6**
40. [2] Which slide(s) can be caused by overexposure to sunlight? **Slides 2, 5, and 7**

# Station 4 Figures (20 points)

Figure 4.0

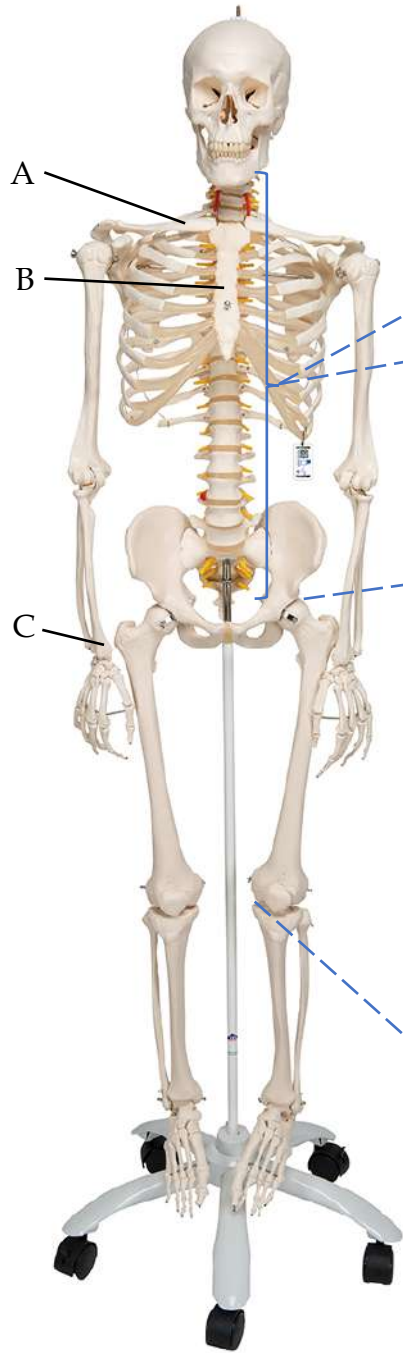


Figure 4.1

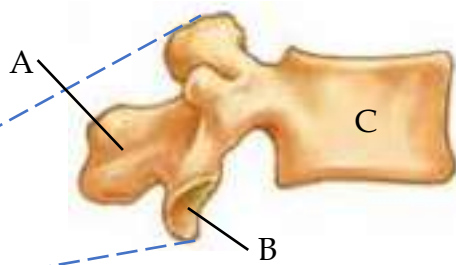
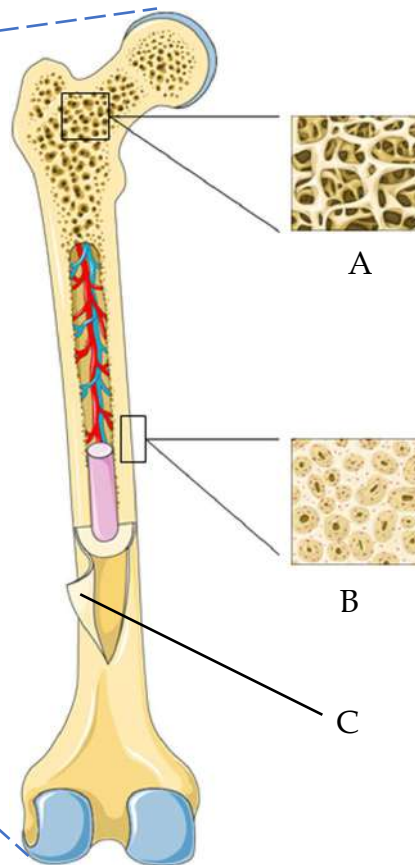


Figure 4.2





## Station 4 (20 points)

Questions 41-45 refer to Figure 4.0.

41. [1] What bone is shown by label A? **Clavicle**
  - a. [1] What type of bone is the clavicle? **Long bone**
42. [1] What bone is shown by label B? **Sternum**
  - a. [1] What are the three parts of this bone? **Head, body, xiphoid process**
43. [1] What bone is shown by label C? **Radius**
44. [1] Is this skeleton most likely male or female? **Male**
45. [1] Which label(s) point to bones in the axial skeleton? **Label B**

Questions 46-49 refer to Figure 4.1.

46. [1] What type of vertebra is shown? **Lumbar**
  - a. [1] How many of this type of vertebra are in an adult human skeleton?  
**Five**
47. [1] What does label A identify? **Spinous process**
48. [1] What does label B identify? **Inferior articular facet**
49. [1] What does label C identify? **Body**

Questions 50-53 refer to Figure 4.2.

50. [1] What bone is shown in this figure? **Femur**
51. [1] What type of bone tissue is shown by label A? **Spongy (trabecular, cancellous) bone**
52. [1] What type of bone tissue is shown by label B? **Compact (cortical, dense) bone**
  - a. [1] What is the structural unit of this type of bone tissue? **Osteon**
53. [1] What is shown by label C? **Periosteum**
  - a. [1] What binds/attaches label C to the bone? **Perforating (Sharpey's) fibers**
54. [1] What chemical compound makes up most of the bone matrix? **Calcium phosphate**
55. [1] Which hormone can increase blood concentration of calcium by increasing calcium reabsorption in the small intestine? **Calcitriol**

## Station 5 Figures (22 points)

Figure 5.0

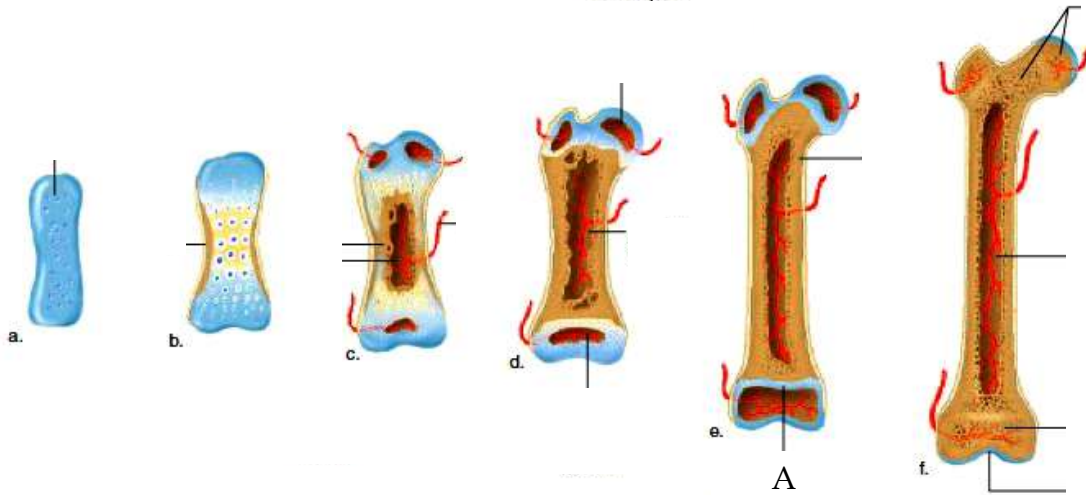
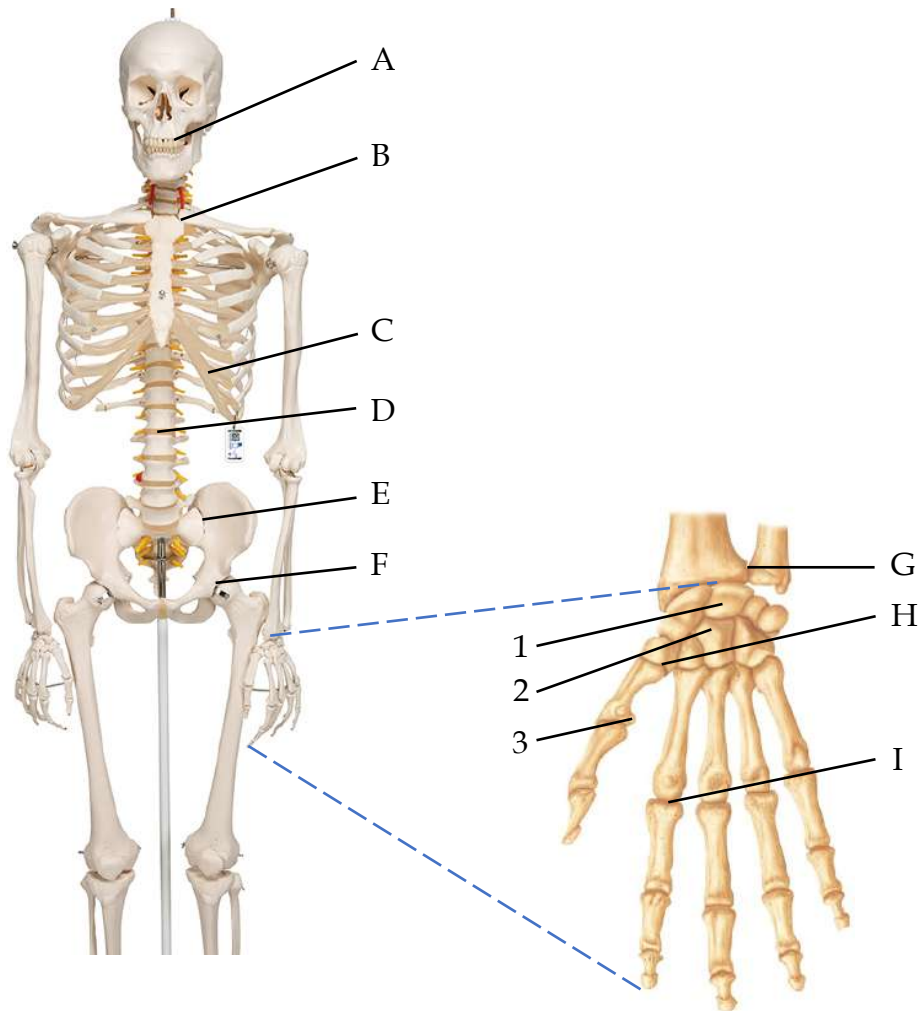


Figure 5.1



## Station 5 (22 points)

Questions 56-60 refer to Figure 5.0. Stages a-f are shown.

56. [1] What type of ossification is shown? **Endochondral ossification**
57. [1] In which stage does the primary ossification center first appear? **Stage c.**
58. [1] In which stage does the secondary ossification center first appear? **Stage d.**
59. [1] What does label A indicate? **Epiphyseal plate**
60. [1] The medullary cavity is shown in Stage f. What bone cell is mainly responsible for the formation of the medullary cavity? **Osteoclasts**
  - a. [1] What ion do these cells release to aide in their main function?  
**Hydrogen ions (H<sup>+</sup>)**

Questions 61-70 refer to Figure 5.1.

Question number	Label	Structural classification	Functional classification	Bones involved
61. [2]	A	[0.5] <b>Fibrous</b>	[0.5] <b>Synarthrosis</b>	[1] <b>Maxilla</b>
62. [2]	B	[0.5] <b>Synovial</b>	[0.5] <b>Diarthrosis (gliding)</b>	[1] <b>Sternum, clavicle</b>
63. [2]	D	[0.5] <b>Cartilaginous</b>	[0.5] <b>Amphiarthrosis</b>	[1] Be specific! <b>1<sup>st</sup>, 2<sup>nd</sup> lumbar vertebrae (L1, L2)</b>
64. [2]	E	[0.5] <b>Synovial</b>	[0.5] <b>Diarthrosis (gliding)</b>	[1] <b>Ilium, sacrum</b>
65. [2]	F	[0.5] <b>Synovial</b>	[0.5] <b>Diarthrosis (ball and socket)</b>	[1] <b>Ilium, ischium, pubis, femur</b>

66. [1] What type of cartilage is shown in Label C? **Hyaline cartilage**
67. [1] What bone is Label 1 pointing to? **Lunate**
  - a. [1] What bone is Label 2 pointing to? **Capitate**
68. [1] What type of synovial joint is Label G? **Pivot**
69. [1] What type of bone is Label 3 pointing to? **Sesamoid bone**
70. [1] What Label(s) (A-I) are pointing to areas of the appendicular skeleton exclusively, if any? **Labels F, G, H, I**

## Station 6 Figures (18 points)

*Figure 6.0*



*Figure 6.1*



## Station 6 (18 points)

Questions 71-75 refer to Figure 6.0.

*Note: Disease, disorder, and injuries are used synonymously in this section*

71. [1] What type of fracture is shown? **Compression fracture**
  - a. [1] What type of imaging was used to view this fracture? **CT scan**
72. [1] What disease is a likely cause of this type of fracture? **Osteoporosis**
73. A cause of this disease can be the stimulation of RANKL.
  - a. [1] Given the functions of various skeletal hormones, what hormone stimulates the release of RANKL? **Calcitriol**
  - b. [1] Predict the bone cell that is stimulated by RANKL. **Osteoclast**
74. [1] What is one way a patient could be diagnosed with this disease? **(up to 1 point) \*(+1) Radiography (like fractures) \*(+1) Measures of bone mass density (DEXA- dual-energy x-ray absorptiometry)**
75. Another cause of this disease affects mesenchymal stem cells.
  - a. [1] Given the effect of this disease, predict which lineage of cells derived from mesenchymal stem cells that are affected by this disease. **Osteoblast**
  - b. [2] Given the types of cells in bone, what lineage of cells might mesenchymal stem cells “divert” to instead of the type of cell in the previous question? **Adipocytes**

Questions 76-80 refer to Figure 6.0.

*Note: Disease, disorder, and injuries are used synonymously in this section*

76. [1] What disease is shown? **Disc herniation**
  - a. [1] What type of imaging was used to view this fracture? **MRI**
  - b. [1] What type of this disease is shown? **Lumbar**
77. [1] The section of the figure labeled with an asterisk (\*) is between what two vertebrae? **L4 and L5**
78. [1] Would a 50 year old male who smokes and works in a warehouse be at risk for this disease? **Yes**
79. [1] What nerve is usually affected by this form of disease? **Sciatic nerve**
  - a. [1] What common symptom arises from the affection of this nerve? **+1 for any of: Radiating pain, tingling/burning feeling, numbness**
80. [2] Would corticosteroids be a viable treatment for this disease? **No**

## Station 7 Figures (20 points)

Figure 7.0  
Slides A-C are shown below

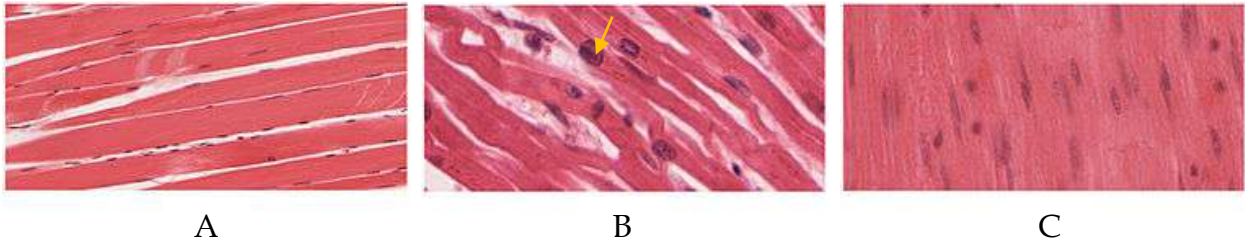
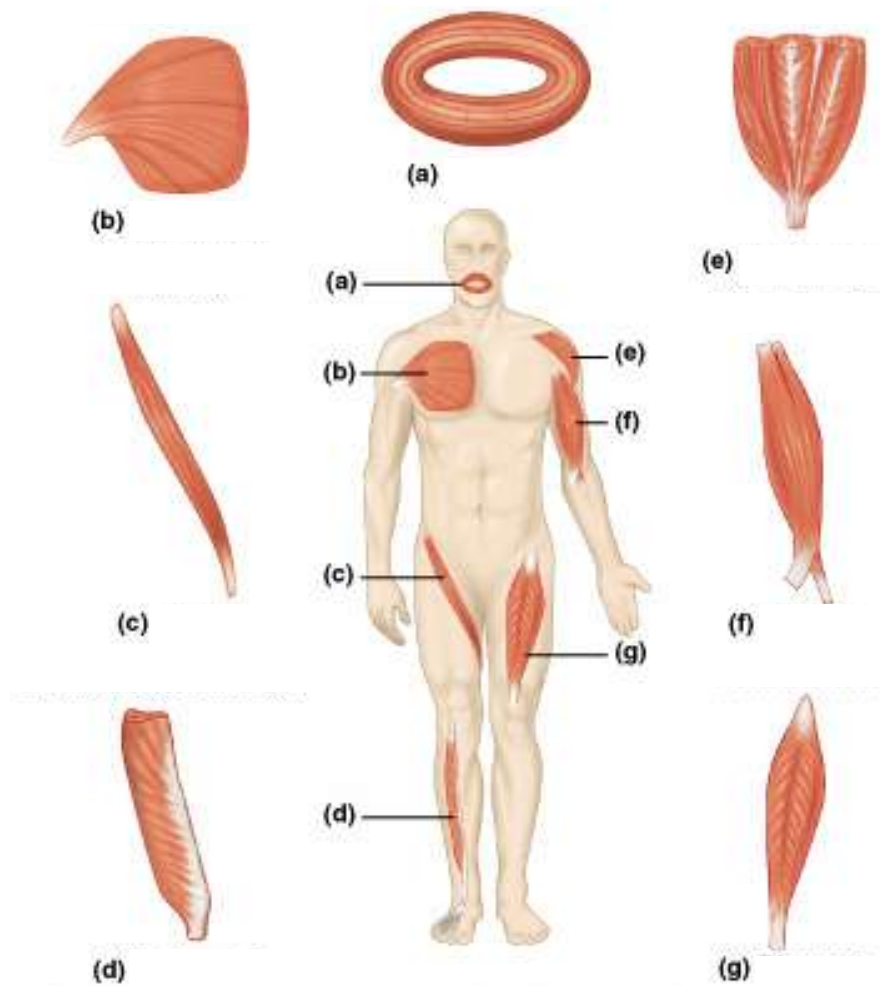


Figure 7.1  
Muscles (a)-(g) are shown below



## Station 7 (20 points)

Questions 81-90 refer to Figure 7.0.

81. [1] What type of muscle tissue is shown in Slide A? **Skeletal**
82. [1] What type of muscle tissue is shown in Slide B? **Cardiac**
83. [1] What type of muscle tissue is shown in Slide C? **Smooth**
84. [1] What structure is the arrow in Slide B pointing to? **Nucleus**
85. [1] In cardiac muscle, what protein does calcium bind to initiate contraction?  
**Troponin**
86. [1] In smooth muscle, what protein does calcium bind to initiate contraction?  
**Calmodulin**
87. [1] Which Slide(s) have terminal cisternae? **A**
88. [1] Which Slide(s) can be controlled by pacemaker cells? **B, C**
89. [1] Which Slide(s) is/are striated? **A, B**
90. [1] Which Slide(s) can undergo tetanus? **A, C**

Questions 91-100 refer to Figure 7.1.

91. [1] What muscle is shown in (a)? **Orbicularis oris**
92. [1] What muscle fiber organization is shown in (a)? **Circular**
93. [1] What muscle is shown in (b)? **Pectoralis major**
94. [1] What muscle fiber organization is shown in (b)? **Convergent**
95. [1] What muscle is shown in (c)? **Sartorius**
96. [1] What muscle fiber organization is shown in (c)? **Parallel**
97. [1] What muscle is shown in (e)? **Deltoid**
98. [1] What muscle is shown in (f)? **Biceps brachii**
99. [1] What muscle is shown in (g)? **Rectus femoris**
100. [1] How many muscles in Figure 7.1 have an origin within the axial skeleton? **2**

## Station 8 Figures (21 points)

Figure 8.0

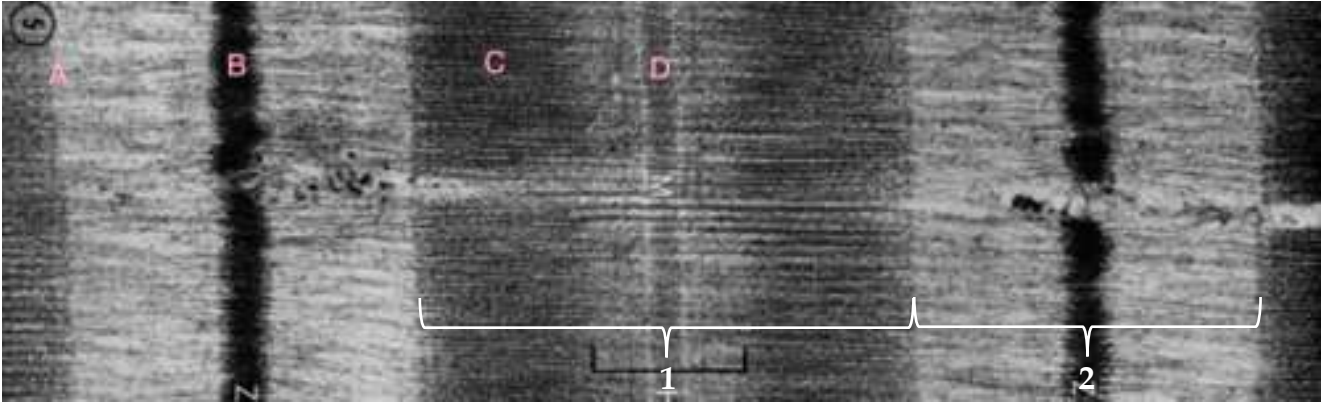
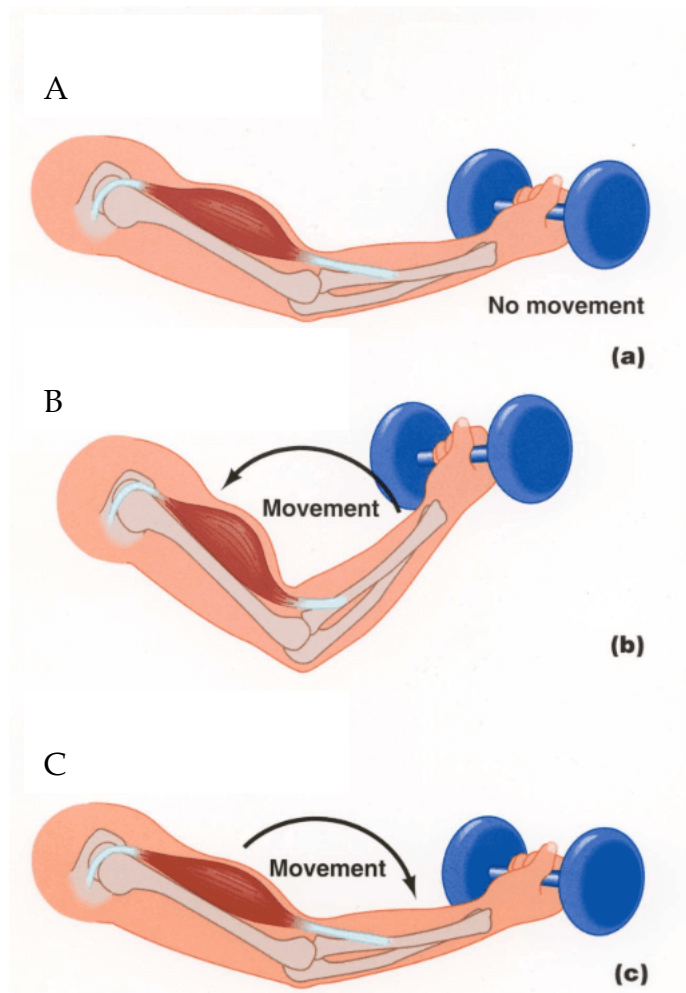


Figure 8.1

Three different scenarios (A-C) are shown below.





## Station 8 (21 points)

Questions 101-105 refer to Figure 8.0.

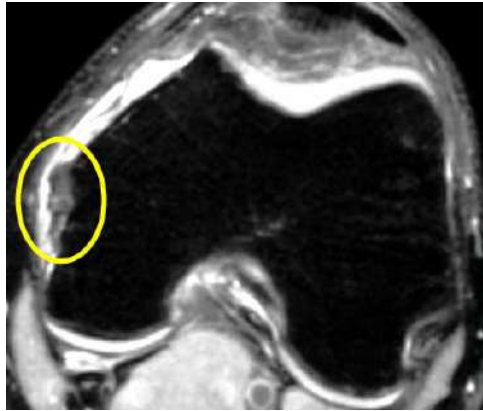
101. [1] What does Label B indicate? **Z line (disc)**
- a. [2] There are two proteins that are anchored at Label B. What are they? **+1 each: Actin and titin**
102. [1] What does Label D indicate? **M line**
- a. [1] There is one protein that is anchored at Label D. What is it? **Myosin**
103. [1] What does Label 1 indicated? **A band**
- a. [1] Does Label 1 shorten during contraction? **No**
- b. [1] Does Label 1 contain thin filaments? **Yes**
104. [1] What does Label 2 indicate? **I band**
- a. [1] Does Label 2 shorten during contraction? **Yes**
- b. [1] Does Label 2 contain thin filaments? **Yes**
105. [1] Is the H zone visible in this Figure? **Yes**

Questions 106-110 refer to Figure 8.1.

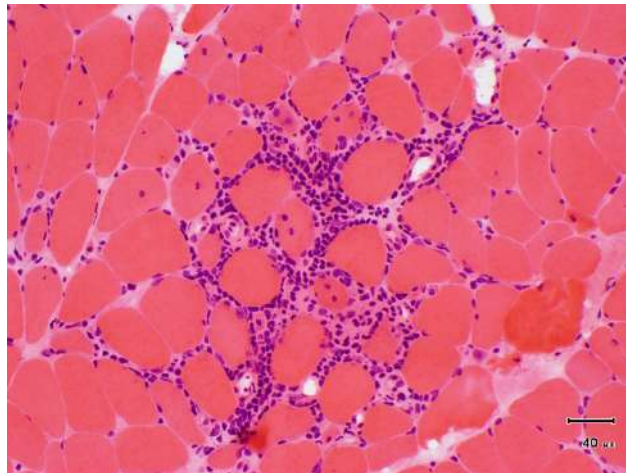
106. [1] What type of contraction is shown in scenario A? **Isometric**
- a. [1] What is the relationship between the value of tension produced by the muscle and the load? **They are equal**
107. [1] What type of contraction is shown in scenario B? **Concentric**
- a. [1] What is the relationship between the value of tension produced by the muscle and the load? **Tension produced is greater than load**
108. [1] What type of contraction is shown in scenario C? **Eccentric**
- a. [1] What is the relationship between the value of tension produced by the muscle and the load? **Load is greater than tension produced**
109. [1] What muscle is shown in this Figure? **Biceps brachii**
- a. [1] What is the origin of this muscle shown in the Figure (name a bone)? **Scapula**
110. [1] What scenarios are examples of an isotonic contraction? **Scenarios B and C**

## Station 9 Figures (19 points)

*Figure 9.0*



*Figure 9.1*



*Figure 9.2*



## Station 9 (19 points)

Questions 111-115 refer to Figure 9.0.

111. [1] Is the injury shown a strain or sprain? **Sprain**
- [1] Sprains and strains can be difficult to tell apart due to symptoms. Name one symptom that strains and sprains have in common. **+1 for ANY of: \*Pain around affected joint \*Swelling around affected joint \*Range of motion is limited**
  - [1] What structure do these injuries affect? **Ligaments**
112. [1] A special kind of fracture can arise when a bone is pulled rather sharply during the injury. What is it? **Avulsion**
113. [1] Where in the body was this Figure taken? **Knee, legs, etc.**
114. [2] What grade of this injury occurs when the affected structure has been completely torn? **Grade 3**
115. A common treatment option for mild forms of this injury is R.I.C.E.
- [2] What does R.I.C.E. stand for? **+0.5 each for: R- rest, I- ice, C- compression, E- elevation**

Questions 116-117 refer to Figure 9.1.

116. [1] What disease is shown in this Figure? **Myositis**
- [2] What specific form of this disease is shown? **Inclusion body myositis**
  - [1] What is a common symptom of this form? **Progressive muscle weakness**
117. [1] What type of diseases can be a cause of this disease? Examples include psoriasis and myasthenia gravis. **Autoimmune**

Questions 118-120 refer to Figure 9.2.

118. [1] The child shown in the figure is likely getting an oral vaccine for what disease? **Polio**
119. A symptom of this disease is flaccid paralysis.
- [2] Explain how this disease causes flaccid paralysis. **Nerve cells in the spinal cord are destroyed (+1). Lack of innervation to affected muscles causes flaccid paralysis (+1)**
  - [1] Flaccid paralysis is also present in what other 2020 disease? **Botulism**
120. [1] Do most people who contract this disease actually show symptoms? **No**