Biology 231
Anatomy and Physiology I

Sylvania Laboratory Survival Guide

Lab Objectives and Worksheets to accompany Fundamentals of Human Anatomy and Physiology, By Frederic Martini, 7th Edition

Fall 2007 Update
### Table of Contents

<table>
<thead>
<tr>
<th>Lab Topic</th>
<th>Martini</th>
<th>PCC Lab Guide Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Guidelines</td>
<td>----</td>
<td>2</td>
</tr>
<tr>
<td>Disposal Guidelines</td>
<td>----</td>
<td>3</td>
</tr>
<tr>
<td>Project Instructions</td>
<td>----</td>
<td>4</td>
</tr>
<tr>
<td>1. Language of Anatomy</td>
<td>Chapter 1</td>
<td>5</td>
</tr>
<tr>
<td>2. Organ Systems &amp; Rat Dissection</td>
<td>Chapter 1</td>
<td>11</td>
</tr>
<tr>
<td>3. The Microscope</td>
<td>-----</td>
<td>19</td>
</tr>
<tr>
<td>4. Classification of Tissues</td>
<td>Chapter 4</td>
<td>21</td>
</tr>
<tr>
<td>5. Integumentary System</td>
<td>Chapter 5</td>
<td>29</td>
</tr>
<tr>
<td>6. Body Membranes</td>
<td>Pages 129-131</td>
<td>34</td>
</tr>
<tr>
<td>7. Bone Histology</td>
<td>Chapter 6</td>
<td>35</td>
</tr>
<tr>
<td>8. Axial Skeleton</td>
<td>Chapter 7</td>
<td>38</td>
</tr>
<tr>
<td>9. Appendicular Skeleton</td>
<td>Chapter 8</td>
<td>53</td>
</tr>
<tr>
<td>10. Articulations and Body Movements</td>
<td>Chapter 9</td>
<td>63</td>
</tr>
<tr>
<td>11. Muscles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 1</td>
<td>Chapter 11</td>
<td>65</td>
</tr>
<tr>
<td>Group 2</td>
<td>Chapter 11</td>
<td>72</td>
</tr>
<tr>
<td>Group 3</td>
<td>Chapter 11</td>
<td>78</td>
</tr>
<tr>
<td>12. Histology of Nervous Tissue</td>
<td>Chapter 12</td>
<td>87</td>
</tr>
<tr>
<td>Evaluation Form</td>
<td>----</td>
<td>90</td>
</tr>
</tbody>
</table>

### Lab PowerPoint slides can be viewed at:
http://spot.pcc.edu/anatomy/lab.htm
PCC-Sylvania BI 231 Laboratory Supplement

1. Upon entering the laboratory, please locate the exits, fire extinguisher, eyewash station, and clean up materials for chemical spills. Your instructor will demonstrate the location of fire blanket, safety kit, and showers.

2. Read the general laboratory directions and any objectives before coming to lab.

3. Food and drink, including water, are prohibited in laboratory. This is per Federal laboratory guidelines and per College Safety Policy. Do not chew gum, use tobacco products of any kind, store food or apply cosmetics in the laboratory. No drink containers of any kind may be on the benches.

4. Please keep all personal materials off the working area. Store backpacks and purses at the rear of the laboratory, not beside or under benches. Some laboratory spaces have shelving in rear for this purpose.

5. For your safety, please restrain long hair, loose fitting clothing and dangling jewelry. Hair ties are available, ask your instructor. Hats and bare midriffs are not acceptable in the laboratory. Shoes, not sandals, must be worn at all times in laboratory. You may wear a laboratory apron or lab coat if you desire, but it is not required.

6. We do not wish to invade your privacy, but for your safety if you are pregnant, taking immunosuppressive drugs or who have any other medical conditions (e.g. diabetes, immunological defect) that might necessitate special precautions in the laboratory must inform the instructor immediately. If you know you have an allergy to latex or chemicals, please inform instructor.

7. Decontaminate work surfaces at the beginning of every lab period using Amphyl solution. Decontaminate bench following any practical quiz, when given, and after labs involving the dissection of preserved material.

8. Use safety goggles in all experiments in which solutions or chemicals are heated or when instructed to do so. Never leave heat sources unattended: hot plates or Bunsen burners.

9. Wear disposable gloves when handling blood and other body fluids or when touching items or surfaces soiled with blood or other body fluids such as saliva and urine. (NOTE: cover open cuts or scrapes with a sterile bandage before donning gloves.) Wash your hands immediately after removing gloves.

10. Keep all liquids away from the edge of the lab bench to avoid spills. Immediately notify your instructor of any spills. Keep test tubes in racks provided, except when necessary to transfer to water baths or hot plate. You will be advised of the proper clean-up procedures for any spill.

11. Report all chemical or liquid spills and all accidents, such as cuts or burns, no matter how minor, to the instructor immediately.

12. Use mechanical pipetting devices only. Mouth pipetting is prohibited.

Students who do not comply with these safety guidelines will be excluded from the Laboratory
Safe Disposal of Contaminated Materials

- Place disposable materials such as gloves, mouth pieces, swabs, toothpicks and paper towels that have come into contact with blood or other body fluids into a disposable Autoclave bag for decontamination by autoclaving. This bucket is not for general trash.

- Place glassware contaminated with blood and other body fluids directly into a labeled bucket of 10% bleach solution. ONLY glass or plastic-ware is to be placed in this bucket, not trash.

- Sharp’s container is for used lancets only. It is bright red. When using disposable lancets do not replace their covers.
  
  1. Properly label glassware and slides, using china markers provided.
  
  2. Wear disposable gloves when handling blood and other body fluids or when touching items or surfaces soiled with blood or other body fluids such as saliva and urine. (NOTE: cover open cuts or scrapes with a sterile bandage before donning gloves.) Wash your hands immediately after removing gloves.
  
  3. Wear disposable gloves when handling or dissecting specimens fixed with formaldehyde or stored in Carosafe/Wardsafe.
  
  4. Wear disposable gloves when handling chemicals denoted as hazardous or carcinogenic by your instructor. Read labels on dropper bottles provided for an experiment, they will indicate the need for gloves or goggles, etc. Upon request, detailed written information is available on every chemical used (MSDS). Ask your instructor.
  
  5. No pen or pencil is to be used at any time on any model or bone. The bones are fragile, hard to replace and used by hundreds of students every year. To protect them and keep them in the best condition, please use pipe cleaners and probes provided instead of a writing instrument.
    
    a. Probes may be used on models as well. The bones are very difficult and costly to replace, as are the models and may take a long time to replace.
  
  6. At the end of an experiment:
    
    a. Clean glassware and place where designated. Remove china marker labels at this time.
    
    b. Return solutions & chemicals to designated area. Do not put solutions or chemicals in cupboards!
  
  7. You cannot work alone or unsupervised in the laboratory.
  
  8. Microscopes should be cleaned before returning to numbered cabinet. Be sure objectives are clean, use lens paper. Place objectives into storage position, and return to the storage cabinet. Be sure cord has been coiled and restrained. Your instructor may require microscope be checked before you put it away. Be sure it is in assigned cupboard.
  
  9. Please replace your prepared slides into the box from which they came (slides and boxes are numbered), so students using them after you will be able to find the same slide. Before placing slides in box, clean it with Kimwipes if it is dirty or covered with oil. If you break a slide, please, inform your instructor so the slide can be replaced. Please be aware that there is hundreds of dollars worth of slides in each box and handle the boxes with care when carrying to and from your workbench.
  
  10. Be sure all paper towels used in cleaning lab benches and washing hands are disposed of in trash container provided.

Students who do not comply with these safety guidelines and directions will be excluded from the Laboratory
Lab Presentation Instructions

- **Objective:** To work as a group to create an educational presentation.
- Your project is an *8-10 minute PowerPoint presentation* on a *special topic* of your choosing related to 231 topics. Often, presentations focus on diseases, but that is not necessary.
- **You will work in a group of 3 students.** The project will be graded on six criteria
- All group members receive the same grade.

1. **Overall cohesiveness of the presentation** 3 points

2. **Evidence of good planning and teamwork:**
   - **4 points:** groups who coordinate and share their roles equally among members
   - **2 points:** those groups whose members contribute unequally
   - **0 points:** those who clearly have members that do not contribute or students who work alone
   If a group member does not contribute to the project, the other group members have the right to “expel” the person from the group.

3. **Demonstrated insight and understanding of the material:**
   - **6 points:** mastery of the material beyond expectation
   - **4 points:** a solid understanding - but with a limited lapse
   - **2 points:** a fair understanding but who fail to demonstrate a thoughtful understanding, or who lapses in a significant area of the topic presentation
   - **0 points:** those who clearly do not understand significant aspects of the topic

4. **Clarity and organization of the presentation:**
   - **4 points:** if the entire presentation is presented in a clear, organized verbal and visual fashion,
   - **3 points:** if there are some areas that appear somewhat unclear or without thoughtful organization
   - **1 point:** if it is difficult to understand because the presentation was not thoughtfully considered
   - **0 points:** if it is extremely difficult to understand

5. **Quality of the graphics, text and pictures**
   - **4 points:** high quality graphics (with good resolution) and pictures that help explain the topic.
   - **3 points:** graphics are average
   - **2 points:** graphics are kept at a minimum or are very poor quality or are not appropriate
   - **0 points:** if there are no graphics

6. **Creativity and Audience Engagement:**
   - **4 points:** The presentation demonstrates exceptional creativity that helps to captivate and educate the audience
   - **2 points:** The presentation shows some creativity, but it is merely entertaining, and not helpful in teaching the audience
   - **1 point:** The presentation is in an “encyclopedia report” format
   - **0 points:** The presentation is clearly not geared to the audience. Remember, your audience is the other students, not the instructor.
Lab Activity 1: Language of Anatomy  
Martini Chapter 1

Define these terms:
1. Gross anatomy
2. Histology
3. Anatomical position.
4. Be able to describe, define, and locate the following regions:

<table>
<thead>
<tr>
<th>Abdominal</th>
<th>Acromial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antebrachial</td>
<td>Antecubital</td>
</tr>
<tr>
<td>Axillary</td>
<td>Brachial</td>
</tr>
<tr>
<td>Buccal</td>
<td>Calcaneal</td>
</tr>
<tr>
<td>Carpal</td>
<td>Cephalic</td>
</tr>
<tr>
<td>Cervical</td>
<td>Deltoid</td>
</tr>
<tr>
<td>Digital</td>
<td>Dorsum</td>
</tr>
<tr>
<td>Femoral</td>
<td>Frontal</td>
</tr>
<tr>
<td>Term</td>
<td>Term</td>
</tr>
<tr>
<td>------------</td>
<td>----------</td>
</tr>
<tr>
<td>Gluteal</td>
<td>Hallux</td>
</tr>
<tr>
<td>Inguinal</td>
<td>Lumbar</td>
</tr>
<tr>
<td>Mammary</td>
<td>Mental</td>
</tr>
<tr>
<td>Nasal</td>
<td>Occipital</td>
</tr>
<tr>
<td>Olecranal</td>
<td>Oral</td>
</tr>
<tr>
<td>Orbital</td>
<td>Otic</td>
</tr>
<tr>
<td>Palmar</td>
<td>Patellar</td>
</tr>
<tr>
<td>Pedal</td>
<td>Pelvic</td>
</tr>
<tr>
<td>Perineal</td>
<td>Plantar</td>
</tr>
<tr>
<td>Pollex</td>
<td>Popliteal</td>
</tr>
<tr>
<td>Pubic</td>
<td>Sacral</td>
</tr>
<tr>
<td>Scapular</td>
<td>Tarsal</td>
</tr>
<tr>
<td>Vertebral</td>
<td>Thoracic</td>
</tr>
</tbody>
</table>
5. Define the following terms:

Superior       Caudal
Inferior       Dorsal
Anterior       Ventral
Posterior      Superficial
Medial         Deep
Lateral        Proximal
Cephalic / Cephalad   Distal
6. Describe the following anatomical planes; give alternate terms if possible.
   a. Frontal
   b. Midsagittal
   c. Parasagittal
   d. Transverse

   i. Which plane could never cut through the kidneys?

   ii. Which plane would slice you like a loaf of bread?

7. Define these serous membranes:
   a. Visceral
   b. Parietal

8. Locate the following body cavities.
   a. Dorsal
      i. What organs are located within this cavity?

   b. Ventral: subdivided into thoracic and abdominopelvic. (The thoracic cavity contains smaller cavities inside: Name three. Here are your hints:)
      i. Which cavity is in between the lungs and contains the heart, trachea, and esophagus?

      ii. Which cavity surrounds the heart, and is located in between the parietal and visceral pericardium?
iii. Which cavity surrounds the lungs, and is located in between the parietal and visceral pleura?

iv. Which cavity is in the abdominal cavity, and is in between the parietal and visceral peritoneum?

v. Is the liver actually in this cavity, or is it better to say that the liver is surrounded by this cavity? Look at the balloon. Is the fist in the balloon (the cavity containing the air) or does the balloon surround it?

9. Abdominal quadrants
   a. Right upper quadrant
   b. Right lower quadrant
   c. Left upper quadrant
   d. Left lower quadrant

10. Abdominal regions.
   a. Epigastric region
   b. Right and left hypochondriac regions
   c. Umbilical region
   d. Right and left lumbar regions
   e. Hypogastric region
   f. Right and left inguinal regions
1. Human organ systems
   ▪ List the chief functions of each.
   ▪ List two or three organs of each system.

   a. Integumentary

   b. Skeletal

   c. Muscular

   d. Nervous

   e. Endocrine

   f. Cardiovascular

   g. Lymphatic/immunity

   h. Respiratory

   i. Digestive

   j. Urinary

   k. Reproductive
2. Identify the following organs and structures on models and/or rats:

a. Thymus
b. Heart
c. Lungs
d. Trachea
e. Esophagus
f. Diaphragm
g. Stomach
h. Small Intestine
i. Mesentery
j. Large Intestine
   i. Cecum (first part of large intestine)
k. Pancreas
l. Spleen
m. Liver
n. Kidneys
o. Adrenal glands
p. Ureter
q. Urinary Bladder
r. Male
   i. Scrotum
   ii. Testes
   iii. Vas deferens
   iv. Penis
s. Female
   i. Ovaries
   ii. Fallopian tubes
   iii. Uterine horns in rat
   iv. Uterus in human
Rat Dissection

1. Lay the rat on the dissection tray.
2. Using forceps, grasp the skin and pull upwards.
3. Using the sharp point of the scissors, pierce the skin to start the cut. Only cut skin, do not puncture into the deeper tissues.
4. Using the scissors, cut the skin along the midline from the pelvis to the chin.
5. Make horizontal cuts at the top and bottom. (Indicated by dashed lines)
6. Peel the skin back with the scalpel as shown above.
7. Once the skin is peeled back, grasp the abdominal wall with the forceps and pull upward.
8. Using the scissors, carefully puncture the abdominal wall and cut along the midline. Be very careful not to cut the underlying structures.
9. Expose the abdominal, pelvic and thoracic cavities to identify the organs.
Trachea
Thymus
Heart
Lung
Diaphragm
Lab Activity 3: The Microscope

1. Care of the microscope
   a. When transporting microscope, hold in upright position with one hand on the arm and the other supporting the base
   b. Only use lens paper to clean the lens. NEVER USE KIMWIPES.
   c. Always begin the focusing process with the lowest-power objective and change to higher-power lenses as necessary.
      - Which objectives should never be used with oil?
      - Which objective can only be used with oil?
   d. Use coarse adjustment knob only with the lowest power lens
   e. Always use a coverslip with temporary preparations

2. Putting the microscope away
   a. Remove slides from stage and place in appropriate place
   b. Rotate the lowest-power objective lens into position
   c. Move stage to the lowest position
   d. Turn down light brightness
   e. Turn off power
   f. Wipe microscope (not the lens) with Kimwipes or alcohol wipe if needed
   g. Wrap the cord neatly around the base
   h. Lock the cabinet

3. Basic Parts of a Compound Light Microscope:
   a. Eyepiece (Ocular): Usually contains a 10X lens.
   b. Arm: contains the housing for the fine and coarse adjustments and connects the base of the microscope to the nosepiece and ocular.
   c. Nosepiece: A rotating head that has the objective lenses attached to it. The lens to be used should "click" into position when the wheel is gently turned so that it is directly over the specimen slide.
   d. Objective: Basically a housing for different powers of lenses (usually 4X, 10X, 40X, 100X)
   e. Stage: The specimen slides rests on this part of the microscope.
f. **Coarse adjustment knobs:** The larger of two sets of knobs located on either side of the arm, just above the base. This adjustment is used to make large adjustments in focusing by moving the lenses up and down.

g. **Fine adjustment knobs:** The smaller of two sets of knobs located on either side of the arm. This adjustment is used to make small adjustments in focusing. It has a limited amount of movement and is most efficiently used after focusing with the 4X objective and coarse focus, then increasing magnification and making final adjustments with the fine focus knob.

h. **Light source:** Located directly under the stage.

i. **Adjustable diaphragm:** This rotating wheel on the underside of the stage allows the user to adjust the amount of light that passes through the specimen. As a general rule, the lowest intensity of light that allows you to resolve the structure of the object you are viewing should be used.

4. **Calculating magnification:**
   a. Total magnification = (magnification of ocular) x (magnification of objective).

   - Example: the total magnification is 450x when using a 10x ocular is 10x and 45x objective.

5. Learn how to focus the microscope using the 10x and 40x. Do not use the 100x objective lens.
Lab Activity 4: Classification of Tissues
Martini Chapter 4

1. Rearrange the following from highest to lowest order of magnitude:
   - Atoms
   - Cells
   - Molecules
   - Organs
   - Tissues

2. What are the 4 primary tissue types?
   a.
   b.
   c.
   d.

3. Describe 5 distinguishing features of epithelial tissue.
   a.
   b.
   c.
   d.
   e.

4. Describe the way that epithelial tissues are named
   1st part of name:
   2nd part of name:

5. Two epithelial tissues do not follow the naming process in #3, and explain the meaning of their names:
   a. Pseudostratified columnar epithelium
   b. Transitional epithelium
6. Complete this table on epithelial tissues, and be able to identify these tissues from microscope slides.

<table>
<thead>
<tr>
<th>Epithelial Tissue</th>
<th>Functions this type is especially suited for and why.</th>
<th>One location that helps you remember its function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple squamous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simple cuboidal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simple columnar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ciliated simple columnar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Ciliated pseudostratified columnar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-keratinized stratified squamous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Keratinized stratified squamous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transitional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stratified Cuboidal</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7. What are the 4 types of connective tissue?
   a.
   b.
   c.
   d.

8. List the distinguishing features of connective tissue, especially focusing on how it differs from epithelial tissue:

9. Define these connective tissue terms: matrix, ground substance, and fibers.
   a. Matrix:
      i. Ground Substance:
      ii. Fibers

10. Give an example of where you can find this type of ground substance.
    a. Fluid
    b. Gel
    c. Solid

11. Define/describe these cells
    a. Fibroblasts
    b. Macrophages
    c. Adipocytes
    d. Mesenchymal cells
    e. Mast cells
    f. Lymphocytes
12. Complete this table for connective tissue fibers

<table>
<thead>
<tr>
<th>Fiber type, sketch</th>
<th>Function</th>
<th>Example of where found</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elastic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reticular</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collagen</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

13. Complete this table for connective tissues

<table>
<thead>
<tr>
<th>Connective Tissue type</th>
<th>Functions this type is especially suited for and why.</th>
<th>One location that helps you remember its function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Areolar CT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adipose CT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Category</td>
<td></td>
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<tr>
<td>----------------</td>
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<td>---</td>
</tr>
<tr>
<td>Reticular CT</td>
<td></td>
<td></td>
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<tr>
<td>Dense Regular CT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dense Irregular CT</td>
<td></td>
<td></td>
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<tr>
<td>Elastic CT</td>
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<tr>
<td>Blood</td>
<td></td>
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<tr>
<td>Bone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Hyaline Cartilage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elastic Cartilage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fibrocartilage</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
14. Complete this table on muscle tissue.

<table>
<thead>
<tr>
<th>Muscle type</th>
<th>Sketch</th>
<th># Nuclei per cell</th>
<th>Visible striations?</th>
<th>Locations</th>
<th>Voluntary or Involuntary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skeletal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiac</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smooth</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

15. Complete this table on nervous tissue.

<table>
<thead>
<tr>
<th>Nervous Tissue</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neuron</td>
<td></td>
</tr>
<tr>
<td>Glial cells</td>
<td></td>
</tr>
</tbody>
</table>
Lab Activity 5: Integumentary System
Martini Chapter 5

- Identify from microscope slide
  1. Epidermis: (Keratinized stratified squamous epithelium)
     a. Stratum corneum
     b. Stratum lucidum in palms and soles.
     c. Stratum granulosum
     d. Stratum spinosum
     e. Stratum basale.

  2. Dermis:
     a. Papillary layer
        i. What type of connective tissue is this?
     b. Reticular layer
        i. What type of connective tissue is this?
     c. Hypodermis: (not part of the skin)
        i. Adipose tissue

Draw a picture:

1. Describe/define these cells associated with the epidermis and indicate which layer they are in.
   a. Keratinocytes
      1. What is the role of keratin?
   b. Melanocytes
      1. What is the role of melanin?
   c. Langerhans’ cells
      1. Are these epithelial cells?

2. Where do they originally come from?
2. Describe these features of the dermis and which layer they are associated with.
   a. Fingerprints
   b. Dermal papilla
   c. Cleavage lines

3. Hair
   a. Root
   b. Shaft
   c. Hair follicle
   d. Hair bulb
   e. Hair papilla

   - Does cutting your hair make it grow faster? Why?

4. Arrector pili muscle
   a. What is the function?
   b. Is it smooth or skeletal muscle?
5. Sweat glands
   a. Apocrine sweat glands
   b. Eccrine (merocrine) sweat glands
   c. What is the difference between eccrine (merocrine) sweat glands and apocrine sweat glands?
   d. What are mammary glands?
   e. What are ceruminous glands?

6. Sebaceous gland
   a. What does it secrete?

7. Sebaceous follicle
   a. Where on the body are these located?
8. Pacinian (lamellated) corpuscle (look at fetal palm slide)
   a. Which layer are they located in?
   b. What is the function?

9. Meissner’s (tactile) corpuscle (found in dermal papillae)
   a. What is the function?

10. Merkel cells
    a. Which layer are they located in?
    b. What is the function?

11. Fingernail
    a. Free edge
    b. Body
    c. Lateral fold
    d. Lunula
    e. Cuticle
    f. Root of the nail
    g. Matrix
Epithelial membranes are simple organs consisting of an epithelial sheet bound to an underling layer of connective tissue.

1. Define these epithelial membranes
   a. Mucous membranes
      i. Do all mucous membranes secrete mucus?
   b. Serous membranes
   c. Cutaneous membrane

2. Synovial membranes are composed entirely of connective tissue; they contain no epithelial cells.
   2. Where can you find synovial membranes?
      a. What is the function of synovial membranes?
      b. What is the function of synovial fluid?
Lab Activity 7: Bone Histology
Martini Chapter 6

1. Describe these types of bone
   a. Spongy bone
      i. Where can it be located?
      ii. What are trabeculae?
   b. Compact bone
      i. Where can it be located?

2. Compact bone features: Identify on model and tissue slides.
   a. Concentric lamellae
   b. Haversian (Central) Canal
   c. Volkmann’s (perforating) Canal
   d. Interstitial lamellae
   e. Circumferential lamellae
   f. Lacunae
   g. Canaliculi

3. Cells: Describe the function of these bone cells:
   a. Osteoblasts
   b. Osteocytes
   c. Osteoclasts

3. Coverings: Describe the location of these:
   a. Periosteum
      i. Which cells are located on the periosteum?
   b. Endosteum
      i. Which cells are located on the endosteum?

4. Marrow types, where are these located in adults and what are their function?
   a. Red bone marrow
   b. Yellow bone marrow
Bone Histology Worksheet

- **Instructions: Label all of these structures.**
  - Volkmann’s canal (perforating canal)
  - Haversian canal (central canal)
  - Lacunae
  - Osteocyte in lacunae
  - Compact bone
  - Medullary cavity
  - Osteon
  - Identify where you would find:
    - Bone marrow, osteoblasts, and osteoclasts
  - Trabeculae
  - Canaliculi
  - Osteocyte in lacunae
  - Periosteum
  - Endosteum
  - Interstitial lamellae
  - Concentric lamellae
  - Circumferential lamellae
5. Describe these types of bones and give examples
   a. Short bones
   b. Flat bones
   c. Irregular bones
   d. Sesamoid bones
   e. Wormian or sutural bones
   f. Long bones

6. Long bone structure: from long bone, identify
   a. Diaphysis
   b. Epiphyses
      i. What type of bone makes up the center of the epiphyses?
   c. Epiphyseal line
   d. Epiphyseal plate (not in this picture)
      i. What type of cartilage is this?
      ii. What process happens at the diaphyseal side of the epiphyseal plate?
   e. Medullary cavity
   f. Endosteum
   g. Periosteum
   h. Articular surface
      i. What type of cartilage is this?
1. Axial skeleton components: skull, spine, thoracic cage, and hyoid bone

2. **Spine**: 33 separate bones in fetus & infant; in children & adults it's made of 26 bones:
   a. Coccyx (4 fused vertebrae)
   b. Sacrum (5 fused vertebrae)
   c. 24 individual vertebrae.

   Know number of vertebrae in each part of back (7 cervical, 12 thoracic, 5 lumbar)

   Direction of curves:
   
   d. Cervical (concave posterior)
   e. Thoracic (convex posterior)
   f. Lumbar (concave posterior)

3. **Structures of Typical Vertebra**
   a. Body
   b. Vertbral foramen
   c. Spinous process
   d. Transverse process
   e. Superior & inferior articular processes
   f. Vertbral arch: made of laminae & pedicles
   g. Intervertebral foraminae between vertebrae
   h. Transverse foraminae in cervical vertebrae
   i. Facets: on super & inferior articular processes: smooth surfaces for joints between processes
4. **Intervertebral disk:**
   i. Annulus fibrosus (fibrocartilage)
   ii. Nucleus pulposus

5. **Cervical Vertebrae**
   a. There are 7 cervical vertebrae
   b. Direction of curve: concave posterior
   c. Foraminae in transverse processes for vertebral artery to the brain
   d. Note bifid spinous processes
e. C1=atlas: superior articular facet for articulation with occipital condyle

f. C2=axis
   i. Odontoid process (dens)
6. Thoracic Vertebrae
   a. There are 12 thoracic vertebrae
   b. Direction of curve-convex posterior
   c. Long spinous processes, point inferiorly
   d. Costal facets or demi-facets

![Thoracic Vertebrae Image]

7. Lumbar Vertebrae
   a. There are 5 lumbar vertebrae
   b. Direction of curve-concave posterior
   c. Have thick bodies & spinous processes

![Lumbar Vertebrae Image]
8. Sacrum:
   a. 5 fused vertebrae
   b. Convex posterior
   c. Sacral promontory
   d. Sacroiliac joints
   e. Anterior sacral foramina
   f. Posterior sacral foramina

9. Coccyx–4 rudimentary vertebrae

10. Hyoid Bone: attachment for muscles of tongue, neck, & pharynx
   a. Greater and lesser horns
   b. Body
11. Thoracic cage = Bony Thorax
a. Sternum:
   i. Manubrium
   ii. Sternal angle: separates manubrium from body
   iii. Body
   iv. Xiphoid process (cartilage when young, ossifies about age 40)

b. Ribs:
   i. True (1st 7 pairs), cartilage of rib (costal cartilage) articulates with sternum
   ii. False
      A. Pair 8-10: cartilage of rib articulates with cartilage above
      B. Lowest 2 pairs are floating
   iii. Parts of a typical rib:
      A. Head
      B. Tubercle
      C. Angle
      D. Costal groove

c. Note how the ribs attach to the vertebrae. Looking at them from the posterior side of the back, there is an acute angle created between the 12th rib and the spine due to the downward direction of the 12th rib as it heads anteriorly. This angle is the **costovertebral angle**.
12. Cranial Bones: recognize from inside & outside
   a. Frontal
      i. Supraorbital ridge
   b. Parietal (left and right)
   c. Temporal (left and right)
      i. Mandibular fossa
      ii. External acoustic canal
      iii. Styloid process
      iv. Mastoid processes
      v. Zygomatic process
      vi. Carotid canal
      vii. Jugular foramen
      viii. Internal acoustic canal (seen on the cranial floor)
   d. Occipital
      i. Occipital Condyles
      ii. Superior and inferior nuchal lines
      iii. External occipital protuberance
      iv. Foramen Magnum
   e. Sphenoid
      i. Greater wing
      ii. Lesser wing
      iii. Medial and lateral pterygoid plates
      iv. Pterygoid processes
      v. Sella turcica
         A. Hypophyseal fossa (shallow depression in middle of sella turcica)
         B. Dorsum sella (ridge on posterior aspect of sella)
   f. Ethmoid
      i. Cribriform plate
      ii. Cristae galli (Sail of Christ)
      iii. Perpendicular plate (boney nasal septum)
      iv. Superior and middle nasal conchae

13. Cranium-Floor
   a. Fossae: Anterior, middle, and posterior cranial fossae

14. Cranium-Sutures:
   a. Sagittal
   b. Coronal
   c. Squamous
   d. Lambdoid
   e. Wormian (sutural) bones: these are small islands of bone that fill gaps in sutures; not always present.
15. Infant/fetal skull
   a. Anterior fontanel
   b. Occipital fontanel
   c. Sphenoidal fontanel
   d. Mastoid fontanel

16. Orbit (Bony eye socket)
   a. Frontal bone
   b. Sphenoid bone
      i. Superior orbital fissure
      ii. Optic canal
   c. Zygomatic bone
   d. Maxillary bone
   e. Palatine bone
   f. Lacrimal bone
   g. Ethmoid bone

17. Face: Bones
   a. Maxilla
   b. Mandible
      i. Body
      ii. Ramus
      iii. Coronoid process
      iv. Mandibular condyle
      v. Angle
      vi. Mandibular foramen
      vii. Mylohyoid line
      viii. Alveolar process
      ix. Mental foramen
   c. Palatine (left and right)
   d. Zygomatic (left and right)
      i. Temporal process
   e. Lacrimal (left and right)
   f. Nasals (left and right)
   g. Vomer
   h. Superior & Middle nasal conchae (part of ethmoid bone)
      i. Inferior nasal conchae

18. Face: special structures
   a. Alveoli (tooth sockets)
   b. Sinuses:
      i. Frontal
      ii. Maxillary
      iii. Sphenoidal
      iv. Ethmoid air cells
   c. Zygomatic arch
Fetal Skull
Lab Activity 9: Appendicular Skeleton
Martini Chapter 8

1. Appendicular Skeleton: Upper & Lower extremities, Shoulder Girdle, Pelvic Girdle

Upper extremity

Humerus:

A. Head
B. Greater & lesser tubercle
C. Intertubercular groove
D. Anatomical & surgical necks
E. Deltoid tubercle
F. Radial groove
G. Trochlea
H. Capitulum
I. Olecranon fossa
J. Medial & lateral epicondyles
K. Radial fossa
L. Coronoid fossa
M. Supracondylar ridges (medial and lateral)—region proximal to each epicondyle
**Radius**

A. Radial head  
B. Radial tuberosity  
C. Ulnar notch of the radius  
D. Interosseous ridge of the radius  
E. Styloid process of the radius

**Ulna:**

A. Head of the ulna  
B. Styloid process of the ulna  
C. Olecranon  
D. Coranoid process  
E. Semilunar or trochlear notch  
F. Radial notch of the ulna  
G. Supinator crest  
H. Interosseous ridge of the ulna  
I. Ulnar tuberosity
Carpals:

A. Proximal row, lateral to medial: scaphoid, lunate, triquetrum, and pisiform  
B. Distal row, lateral to medial: trapezium, trapezoid, capitate, hamate

Metacarpals: #1-thumb, through#5=to baby finger

Phalanges: proximal & distal on thumb, proximal, middle, & distal on rest. (Toe bones also called phalanges)
**Pectoral girdle**

**Scapula:**

A. Spine  
B. Medial, lateral, & superior borders and angles (superior, lateral, inferior)  
C. Acromion or acromial process  
D. Coracoid process  
E. Fossa (supraspinous, infraspinous & subscapular)  
F. Glenoid fossa (cavity)  
G. Supraglenoid tubercle  
H. Infra glenoid tubercle  
I. Scapular notch

![Scapula Image](image)

**Clavicle**

A. Acromial end  
B. Sternal end  
C. Conoid tubercle

![Clavicle Image](image)
Lower extremity

Femur:

A. Head
B. Greater trochanter
C. Lesser trochanter
D. Neck
E. Intertrochanteric line
F. Intertrochanteric crest
G. Linea aspera
H. Fovea capitus
I. Medial and lateral condyles of the femur
J. Adductor tubercle—located proximal to medial epicondyle
K. Medial & lateral epicondyles of the femur
L. Patellar surface
M. Intercondylar notch or fossa
N. Gluteal tubercle
Tibia:

A. Medial & lateral condyles of the tibia
B. Intercondylar eminence
C. Tibial tuberosity
D. Fibular surface of the tibia
E. Medial malleolus
F. Anterior crest of the tibia
G. Fibular notch
H. Tibular articular surface for the talus

Fibula:

A. Head of the fibula
B. Styloid process (apex) of the fibula
C. Lateral malleolus
D. Fibular articular surface for the talus
Patella: a sesamoid bone.

A. Medial facet (articular surface)
B. Lateral facet (articular surface)

Tarsal bones:

A. Talus—bears body's weight
B. Calcaneus
C. Navicular
D. Cuboid
E. Lateral, Intermediate & Medial Cuneiform

Metatarsals: 1st-5th

Phalanges: two for big toe, rest have 3
Pelvic Girdle: two hipbones (os coxae)
Unite anteriorly at pubic symphysis
A. Ilium:
   a. Iliac crests
   b. Anterior superior iliac spine
   c. Anterior inferior iliac spine
   d. Posterior superior iliac spine
   e. Posterior inferior iliac spine
   f. Greater sciatic notch
   g. Iliac fossa
   h. Body of the ilium
   i. Auricular surface
   j. Sacroiliac joint
   k. Arcuate line
   l. Inferior gluteal line

B. Ischium
   a. Ischial tuberosity
   b. Ischial Spine
   c. Body of the ischium
   d. Ischial ramus
   e. Lesser sciatic notch

C. Pubic bone
   a. Pubic crest
   b. Body of the pubis
   c. Pubic symphysis: What kind of cartilage is it?
   d. Superior & inferior rami
   e. Pectineal line
   f. Pubic tubercle
   g. Pubic arch
   h. Pubic angle (calculate this)
D. Other regions:
   a. Obturator foramen
   b. Pelvic brim
   c. Lesser (true) pelvis below pelvic brim &
   d. Greater (false) pelvis above pelvic brim
   e. Acetabulum
E. Male pelvis:
   a. Vertical iliac bones
   b. Pubic arch <90 degrees
   c. Deep iliac fossa
   d. Heart shaped pelvic inlet

F. Female pelvis:
   a. Less vertical iliacs
   b. Arch >90, shallow iliac fossa
   c. Round pelvic brim (inlet)
Lab Activity 10: Articulations and Body Movements
Martini Chapter 9

1. Knee
   a. Medial & lateral collateral ligaments (=tibial & fibular collaterals)
   b. Anterior & posterior cruciates
   c. Medial & lateral menisci
   d. Quadriceps tendon, patellar ligament
2. Define these movements
   a. Flexion

   b. Extension

   c. Hyperextension

   d. Adduction

   e. Abduction

   f. Circumduction

   g. Rotation

   h. Pronation & supination

   i. Inversion & eversion

   j. Dorsiflexion

   k. Plantar flexion
**GROUP I**

### Muscles of the Head

<table>
<thead>
<tr>
<th>MUSCLES OF THE HEAD</th>
<th>ORIGIN</th>
<th>INSERTION</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frontalis</td>
<td>Epicranial aponeurosis</td>
<td>Skin over forehead</td>
<td>Elevates eyebrows and wrinkles skin of forehead</td>
</tr>
<tr>
<td>Occipitalis</td>
<td>Occipital and temporal bones</td>
<td>Epicranial aponeurosis</td>
<td>Fixes epicranial aponeurosis and pulls scalp posteriorly</td>
</tr>
<tr>
<td>Orbicularis oculi</td>
<td>Medial orbital margin and zygomatic bone</td>
<td>Skin surrounding eye</td>
<td>Closes eyelids and depresses skin of forehead</td>
</tr>
<tr>
<td>Temporalis</td>
<td>Temporal fossa</td>
<td>Coronoid process of mandible</td>
<td>Elevates and retracts mandible</td>
</tr>
<tr>
<td>Masseter</td>
<td>Zygomatic process and arch</td>
<td>Angle and ramus of mandible</td>
<td>Elevates mandible</td>
</tr>
<tr>
<td>Orbicularis oris</td>
<td>By muscular skips to surround muscles</td>
<td>Muscles interlace to surround mouth</td>
<td>Closes and purses lips</td>
</tr>
<tr>
<td>Zygomaticus major</td>
<td>Zygomatic arch</td>
<td>Corner of mouth</td>
<td>Elevates corner of mouth</td>
</tr>
<tr>
<td>Risorius</td>
<td>Fascia of masseter</td>
<td>Corner of mouth</td>
<td>Draws corner of mouth laterally</td>
</tr>
</tbody>
</table>

### Superficial Musculature of the Neck

<table>
<thead>
<tr>
<th>SUPERFICIAL MUSCULATURE OF THE NECK</th>
<th>ORIGIN</th>
<th>INSERTION</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Omohyoid</td>
<td>Medial tip of suprascapular notch</td>
<td>Body of hyoid bone</td>
<td>Depresses hyoid bone</td>
</tr>
<tr>
<td>Sternohyoid</td>
<td>Posterior surface of manubrium, and medial clavicle</td>
<td>Hyoid bone</td>
<td>Depresses hyoid bone</td>
</tr>
<tr>
<td>Mylohyoid</td>
<td>Mylohyoid line of mandible</td>
<td>Hyoid bone</td>
<td>Elevates hyoid bone and floor of mouth, depresses mandible</td>
</tr>
<tr>
<td>Digastric - Anterior belly</td>
<td>Anterior: Lower border of mandible near midline</td>
<td>Intermediate tendon</td>
<td>Ant.: Elevates hyoid bone and base of tongue, depresses mandible</td>
</tr>
<tr>
<td>- Posterior belly</td>
<td>Posterior: Mastoid notch of temporal bone</td>
<td>Intermediate tendon</td>
<td>Post: Moves hyoid bone back</td>
</tr>
<tr>
<td>MUSCLES OF THE NECK &amp; BACK</td>
<td>ORIGIN</td>
<td>INSERTION</td>
<td>ACTION</td>
</tr>
<tr>
<td>----------------------------</td>
<td>--------</td>
<td>-----------</td>
<td>--------</td>
</tr>
<tr>
<td>Sternocleidomastoid</td>
<td>Manubrium and medial third of clavicle</td>
<td>Mastoid process</td>
<td>Rotates head to opposite side, extends head, and flexes vertebral column</td>
</tr>
<tr>
<td>Trapezius</td>
<td>External occipital protuberance, superior nuchal line, and spinous process of C7-T12</td>
<td>Anterior border of scapular spine, acromion process, lateral third of clavicle</td>
<td>Elevates, adducts, and depresses scapula</td>
</tr>
<tr>
<td>Latissimus dorsi</td>
<td>Spinous processes of lower 6 thoracic vertebrae, thoracolumbar fascia, crest of ilium</td>
<td>Intertubercular groove of humerus</td>
<td>Extends, rotates humerus medially, draws shoulder down and backward</td>
</tr>
<tr>
<td>Levator scapula</td>
<td>Transverse processes of C1-4</td>
<td>Superior angle spine of scapula</td>
<td>Elevates scapula</td>
</tr>
<tr>
<td>Rhomboid major</td>
<td>Spinous process of T1-5 and supraspinous ligament</td>
<td>Medial border below spine of scapula</td>
<td>Adducts scapula and performs downward rotation</td>
</tr>
<tr>
<td>Rhomboid minor</td>
<td>Spinous process of C7-T1</td>
<td>Medial border of scapula at base of spine</td>
<td>Adducts scapula and performs downward rotation</td>
</tr>
<tr>
<td>Serratus anterior</td>
<td>Lateral surface of upper 8 ribs</td>
<td>Anterior lip of medial border of scapula</td>
<td>Holds scapula to chest wall, medially rotates scapula in abducting or extending humerus</td>
</tr>
<tr>
<td>Erector Spinae</td>
<td>Sacrum, iliac crest, spinous processes of lumbar vertebrae and T11,12</td>
<td>Angles of the ribs Spinous &amp; Transverse processes of vertebrae</td>
<td>Extension of vertebral column</td>
</tr>
<tr>
<td>Quadratus lumborum</td>
<td>Iliolumbar ligament and crest of ilium</td>
<td>Lower border of 12th rib, transverse process of upper lumbar vertebrae</td>
<td>Depresses rib cage inferiorly and laterally flexes trunk</td>
</tr>
<tr>
<td>Scalenæ</td>
<td>Transverse processes of C3-C6</td>
<td>1st rib</td>
<td>Ant. and middle: elevates 1st rib, flexes neck forward and laterally, rotates neck Post: elevates 2nd rib, flexes neck laterally, slightly rotates neck</td>
</tr>
<tr>
<td>- Anterior</td>
<td>Transverse processes of C2-C7</td>
<td>1st rib</td>
<td></td>
</tr>
<tr>
<td>- Middle</td>
<td>Transverse processes of C4-C6</td>
<td>2nd rib</td>
<td></td>
</tr>
<tr>
<td>- Posterior</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MUSCLES OF THORACIC WALL</td>
<td>ORIGIN</td>
<td>INSERTION</td>
<td>ACTION</td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------</td>
<td>-----------</td>
<td>--------</td>
</tr>
<tr>
<td>External intercostal</td>
<td>Inferior border of rib above</td>
<td>Superior border of rib below</td>
<td>Elevates rib cage during inspiration</td>
</tr>
<tr>
<td>Internal intercostal</td>
<td>Superior border of rib below</td>
<td>Inferior border of rib above</td>
<td>Depresses rib cage during expiration</td>
</tr>
<tr>
<td>Pectoralis major</td>
<td>Medial half of clavicle, sternum, costal cartilages, aponeurosis of external abdominal oblique</td>
<td>Intertubular groove of humerus</td>
<td>Flexes, adducts, and medially rotates humerus, draws body upward in climbing</td>
</tr>
<tr>
<td>Pectoralis minor</td>
<td>Anterior surface of ribs 3 to 5</td>
<td>Coracoid process of scapula</td>
<td>Draws scapula down and forward and elevates ribs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MUSCLES OF THE ANTERIOR ABDOMINAL WALL</th>
<th>ORIGIN</th>
<th>INSERTION</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rectus abdominus</td>
<td>Pubis symphysis and crest of pubis</td>
<td>Xiphoid process and cartilages of ribs 5 to 7</td>
<td>Tenses abdominal wall and flexes vertebral column</td>
</tr>
<tr>
<td>External abdominal oblique</td>
<td>External surface of lower 8 ribs</td>
<td>Anterior half of iliac crest and linea alba</td>
<td>Compresses abdomen, contralaterally rotates and flexes vertebral column</td>
</tr>
<tr>
<td>Internal abdominal oblique</td>
<td>Lateral half of inguinal ligament, anterior iliac crest and thoracolumbar fascia</td>
<td>Lower four ribs, linea alba and by conjoined tendon to pubis</td>
<td>Compresses abdomen, ipsilaterally rotates and flexes vertebral column</td>
</tr>
<tr>
<td>Transverse abdominis</td>
<td>Lateral third of inguinal ligament, anterior iliac crest, and thoracolumbar fascia</td>
<td>Linea alba, and by conjoined tendon to pubis</td>
<td>Compresses abdomen</td>
</tr>
</tbody>
</table>
**GROUP II**

<table>
<thead>
<tr>
<th>MUSCLES OF THE SHOULDER AND ARM</th>
<th>ORIGIN</th>
<th>INSERTION</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deltoid</td>
<td>Anterior surface of clavicle, acromion process and spine of scapula</td>
<td>Deltoid tubercle of humerus</td>
<td>Abducts humerus; aids in flexion, extension, and internal and external rotation</td>
</tr>
<tr>
<td>Supraspinatus</td>
<td>Suprascapular fossa</td>
<td>Greater tubercle of humerus</td>
<td>Abducts humerus</td>
</tr>
<tr>
<td>Infraspinatus</td>
<td>Infraspinous fossa</td>
<td>Greater tubercle of humerus</td>
<td>Rotates humerus laterally</td>
</tr>
<tr>
<td>Teres minor</td>
<td>Axillary border of scapula</td>
<td>Greater tubercle of humerus</td>
<td>Rotates humerus laterally</td>
</tr>
<tr>
<td>Teres major</td>
<td>Axillary border at inferior angle of scapula</td>
<td>Intertubular groove of humerus</td>
<td>Extends, adduction and medial rotates humerus.</td>
</tr>
<tr>
<td>Subscapularis</td>
<td>Subscapular fossa</td>
<td>Lesser tubercle of humerus</td>
<td>Rotates humerus medially</td>
</tr>
<tr>
<td>Biceps brachii</td>
<td>Long head, supraglenoid tubercle; Short head, coracoid process scapula</td>
<td>Radial tuberosity of the radius</td>
<td>Flexes radius and humerus, and supinates forearm</td>
</tr>
<tr>
<td>Coracobrachialis</td>
<td>Coracoid process of scapula</td>
<td>Middle third of humerus</td>
<td>Flexes and adducts humerus</td>
</tr>
<tr>
<td>Triceps brachii</td>
<td>Long head, infraglenoid tubercle; Lateral head, proximal portion of posterior humerus; Medial head, distal half of posterior humerus</td>
<td>Olecranon process of ulna</td>
<td>Extends humerus and ulna</td>
</tr>
<tr>
<td>Brachialis</td>
<td>Anterior distal two-thirds of humerus</td>
<td>Coronoid process of ulna</td>
<td>Flexes ulna</td>
</tr>
<tr>
<td>Anconeus</td>
<td>Lateral epicondyle of humerus</td>
<td>Olecranon process, posterior surface of ulna</td>
<td>Weak extensor of ulna, stabilizes elbow joint in extension</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MUSCLES OF THE PALM</th>
<th>ORIGIN</th>
<th>INSERTION</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abductor pollicis brevis</td>
<td>Scaphoid and trapezium</td>
<td>Proximal phalanx of thumb</td>
<td>Abducts thumb and aids in flexion</td>
</tr>
<tr>
<td>Flexor pollicis brevis</td>
<td>Trapezium</td>
<td>Proximal phalanx of thumb</td>
<td>Flexes thumb</td>
</tr>
<tr>
<td>Flexor digiti minimi</td>
<td>Hook of hamate</td>
<td>Proximal phalanx of fifth digit</td>
<td>Flexes fifth digit</td>
</tr>
<tr>
<td>Abductor digiti minimi</td>
<td>Pisiform and tendon of flexor carpi ulnaris</td>
<td>Proximal phalanx of fifth digit</td>
<td>Abducts fifth digit</td>
</tr>
<tr>
<td>MUSCLES OF ANT. FOREARM</td>
<td>ORIGIN</td>
<td>INSERTION</td>
<td>ACTION</td>
</tr>
<tr>
<td>-------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>Pronator teres</td>
<td>Medial epicondyle of humerus and coronoid process of ulna</td>
<td>Middle portion of radius</td>
<td>Pronates and flexes forearm</td>
</tr>
<tr>
<td>Flexor carpi radialis</td>
<td>Medial epicondyle of humerus</td>
<td>Base of second metacarpal</td>
<td>Flexes wrist &amp; elbow; abducts wrist</td>
</tr>
<tr>
<td>Palmaris longus</td>
<td>Medial epicondyle of the humerus</td>
<td>Palmar aponeurosis</td>
<td>Weak flexion of wrist</td>
</tr>
<tr>
<td>Flexor carpi ulnaris</td>
<td>Medial epicondyle of humerus, olecranon process, &amp; posterior ulna</td>
<td>Pisiform, hamate, and fifth metacarpal</td>
<td>Flexes and adducts wrist</td>
</tr>
<tr>
<td>Flexor digitorum superficialis</td>
<td>Medial epicondyle of humerus and coronoid process of ulna</td>
<td>Middle phalanges of fingers</td>
<td>Flexes fingers and wrist</td>
</tr>
<tr>
<td>Flexor digitorum profundus</td>
<td>Anterior and medial surfaces of ulna and interosseous membrane</td>
<td>Distal phalanges of fingers</td>
<td>Flexes fingers and wrist</td>
</tr>
<tr>
<td>Flexor pollicis longus</td>
<td>Middle half of radius, interosseous membrane, coronoid process of ulna</td>
<td>Distal phalanx of thumb</td>
<td>Flexes thumb and wrist</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MUSCLES OF POSTEROLATERAL FOREARM</th>
<th>ORIGIN</th>
<th>INSERTION</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brachioradialis</td>
<td>Lateral supracondylar ridge</td>
<td>Styloid process of radius</td>
<td>Flexes forearm</td>
</tr>
<tr>
<td>Extensor carpi radialis longus</td>
<td>Lateral supracondylar ridge of humerus</td>
<td>Second metacarpal</td>
<td>Extends and abducts hand</td>
</tr>
<tr>
<td>Extensor carpi radialis brevis</td>
<td>Lateral epicondyle of humerus</td>
<td>Third metacarpal</td>
<td>Extends and abducts hand</td>
</tr>
<tr>
<td>Extensor digitorum</td>
<td>Lateral epicondyle of humerus</td>
<td>Into distal phalanx by 4 tendons</td>
<td>Extends fingers and hand</td>
</tr>
<tr>
<td>Extensor carpi ulnaris</td>
<td>Lateral epicondyle of humerus and posterior border of ulna</td>
<td>Fifth metacarpal</td>
<td>Extends and adducts hand</td>
</tr>
<tr>
<td>Extensor digiti minimi</td>
<td>Lateral epicondyle of humerus</td>
<td>Extensor expansion of little finger</td>
<td>Extends 5th digit and hand</td>
</tr>
<tr>
<td>Supinator</td>
<td>Lateral epicondyle of humerus, supinator crest of ulna</td>
<td>Lateral surface and posterior border of radius</td>
<td>Supinates forearm</td>
</tr>
<tr>
<td>Abductor pollicis longus</td>
<td>Posterior surface of ulna and radius, and interosseous membrane</td>
<td>First metacarpal</td>
<td>Abducts thumb and hand</td>
</tr>
<tr>
<td>Extensor pollicis brevis</td>
<td>Middle third of radius and interosseous membrane</td>
<td>Base of proximal phalanx of thumb</td>
<td>Extends thumb</td>
</tr>
<tr>
<td>Extensor pollicis longus</td>
<td>Middle third of ulna and interosseous membrane</td>
<td>Base of distal phalanx of thumb</td>
<td>Extends thumb</td>
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**GROUP III**

### MUSCLES OF BACK AND GLUTEAL REGION

<table>
<thead>
<tr>
<th>MUSCLE</th>
<th>ORIGIN</th>
<th>INSERTION</th>
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<tbody>
<tr>
<td>Gluteus maximus</td>
<td>Upper portion of ilium, the sacrum and coccyx</td>
<td>Gluteal tuberosity and iliotibial tract</td>
<td>Principal extensor and lateral rotator of femur</td>
</tr>
<tr>
<td>Gluteus medius</td>
<td>Middle portion of ilium</td>
<td>Oblique ridge on greater trochanter of femur</td>
<td>Abducts femur, stabilizes contralateral hip while standing on one leg</td>
</tr>
<tr>
<td>Piriformis</td>
<td>Pelvic surface of sacrum</td>
<td>Greater trochanter of femur</td>
<td>Rotates femur laterally</td>
</tr>
<tr>
<td>Quadratus femoris</td>
<td>Ischial tuberosity</td>
<td>Greater trochanter and shaft of femur</td>
<td>Rotates thigh laterally</td>
</tr>
<tr>
<td>Psoas Major</td>
<td>Transverse processes of bodies of lumbar vertebrae</td>
<td>Lesser trochanter of femur with iliacus</td>
<td>Flexes trunk and flexes and laterally rotates thigh</td>
</tr>
<tr>
<td>Iliacus</td>
<td>Iliac fossa and lateral margin of sacrum</td>
<td>Lesser trochanter of femur with psoas major</td>
<td>Flexes and laterally rotates femur</td>
</tr>
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</table>

### POSTERIOR COMPARTMENT OF THE THIGH

<table>
<thead>
<tr>
<th>MUSCLE</th>
<th>ORIGIN</th>
<th>INSERTION</th>
<th>ACTION</th>
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</thead>
<tbody>
<tr>
<td>Biceps femoris</td>
<td>Long head, ischial tuberosity; Short head, lateral supracondylar ridge of femur</td>
<td>Head of fibula and lateral condyle of tibia</td>
<td>Extends femur and flexes leg</td>
</tr>
<tr>
<td>Semitendinosus</td>
<td>Ischial tuberosity</td>
<td>Medial condyle of tibia</td>
<td>Extends femur and flexes leg</td>
</tr>
<tr>
<td>Semimembranosus</td>
<td>Ischial tuberosity</td>
<td>Medial condyle of tibia</td>
<td>Extends femur and flexes leg</td>
</tr>
<tr>
<td>ANTERIOR AND MEDIAL THIGH</td>
<td>ORIGIN</td>
<td>INSERTION</td>
<td>ACTION</td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------</td>
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</tr>
<tr>
<td><strong>Anterior Compartment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sartorius</td>
<td>Anterior superior iliac spine</td>
<td>Medial margin of tibial tuberosity</td>
<td>Flexes both femur and tibia</td>
</tr>
<tr>
<td>Quadriceps femoris</td>
<td>Anterior inferior iliac spine and upper margin of acetabulum</td>
<td>Tibial tuberosity</td>
<td>Extends tibia and flexes femur</td>
</tr>
<tr>
<td>Rectus femoris</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vastus lateralis</td>
<td>Intertrochanteric line and linea aspera of femur</td>
<td>Tibial tuberosity</td>
<td>Extends tibia</td>
</tr>
<tr>
<td>Vastus medialis</td>
<td>Intertrochanteric line and linea aspera of femur</td>
<td>Tibial tuberosity</td>
<td>Extends tibia</td>
</tr>
<tr>
<td>Vastus intermedius</td>
<td>Upper shaft of femur</td>
<td>Tibial tuberosity</td>
<td>Extends tibia</td>
</tr>
<tr>
<td><strong>Posterior Compartment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adductor brevis</td>
<td>Inferior pubic ramus</td>
<td>Upper part of linea aspera</td>
<td>Adducts, flexes, and medially rotates femur</td>
</tr>
<tr>
<td>Adductor longus</td>
<td>Between pubic rami near symphysis</td>
<td>Middle third of linea aspera</td>
<td>Adducts, flexes &amp; medially rotates femur</td>
</tr>
<tr>
<td>Adductor magnus</td>
<td>Pubic arch and ischial tuberosity</td>
<td>Linea aspera and adductor tubercle</td>
<td>Adducts, flexes, and laterally and medially rotates femur</td>
</tr>
<tr>
<td>Gracilis</td>
<td>Inferior pubis near symphysis</td>
<td>Upper portion of tibia</td>
<td>Adducts, flexes, medially rotates tibia</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pectineus</td>
<td>Superior ramus of pubis</td>
<td>Just inferior to the lesser trochanter</td>
<td>Adducts and flexes thigh, assists with medial rotation of thigh</td>
</tr>
<tr>
<td>Tensor fasciae latae</td>
<td>Iliac crest</td>
<td>Iliotibial tract</td>
<td>Flexes thigh, stabilizes knee</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SUPERFICIAL POSTERIOR COMPARTMENT OF THE LEG</th>
<th>ORIGIN</th>
<th>INSERTION</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastrocnemius</td>
<td>Medial and lateral condyles of femur</td>
<td>With soleus into calcaneus via calcaneal tendon</td>
<td>Flexes tibia and plantar; flexes foot</td>
</tr>
<tr>
<td>Soleus</td>
<td>Upper third of fibula and soleal line of tibia</td>
<td>With gastrocnemius into calcaneus via calcaneal tendon</td>
<td>Flexes foot</td>
</tr>
<tr>
<td>Plantaris</td>
<td>Lateral supracondylar ridge of femur</td>
<td>Posterior calcaneus via calcaneal tendon</td>
<td>Weakly assists gastroc in plantar flexing ankle and flexing knee</td>
</tr>
<tr>
<td>DEEP POSTERIOR COMPARTMENT OF THE LEG</td>
<td>ORIGIN</td>
<td>INSERTION</td>
<td>ACTION</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>--------</td>
<td>-----------</td>
<td>--------</td>
</tr>
<tr>
<td>Popliteus</td>
<td>Lateral surface of lateral condyle</td>
<td>Posterior surface of tibia just below condyles</td>
<td>Flexes and unlocks knee joint</td>
</tr>
<tr>
<td>Tibialis posterior</td>
<td>Interosseous membrane and tibia and fibula on either side</td>
<td>Navicular, with slips to cuneiform; cuboid; metatarsals 2-4</td>
<td>Adducts and inverts foot and aids in plantar flexion</td>
</tr>
<tr>
<td>Flexor digitorum longus</td>
<td>Middle half of tibia</td>
<td>By four tendons into distal phalanges of lateral four toes</td>
<td>Flexes lateral four toes</td>
</tr>
<tr>
<td>Flexor hallucis longus</td>
<td>Distal two-thirds of fibula</td>
<td>Distal phalanx of great toe</td>
<td>Flexes great toe</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ANTERIOR COMPARTMENT OF THE LEG</th>
<th>ORIGIN</th>
<th>INSERTION</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tibialis anterior</td>
<td>Upper half of tibia and interosseous membrane</td>
<td>Base of first cuneiform and first metatarsal</td>
<td>Dorsiflexes and inverts foot</td>
</tr>
<tr>
<td>Extensor hallucis longus</td>
<td>Middle half of fibula and interosseous membrane</td>
<td>Distal phalanx of great toe</td>
<td>Dorsiflexes foot and extends great toe</td>
</tr>
<tr>
<td>Extensor digitorum longus</td>
<td>Tibia, proximal three-fourths of fibula, &amp; interosseous membrane</td>
<td>Tendons to middle &amp; terminal phalanges of four lateral toes by extensor expansion</td>
<td>Dorsiflexes foot and extends toes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LATERAL COMPARTMENT OF THE LEG</th>
<th>ORIGIN</th>
<th>INSERTION</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibularis longus</td>
<td>Upper two-thirds of fibula and intermuscular septa</td>
<td>Plantar base of first metatarsal and first cuneiform and</td>
<td>Plantar flexes and everts foot</td>
</tr>
<tr>
<td>Fibularis brevis</td>
<td>Lower two-thirds of fibula</td>
<td>Plantar base of fifth metatarsal</td>
<td>Plantar flexes and everts foot</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DORSUM OF FOOT</th>
<th>ORIGIN</th>
<th>INSERTION</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extensor digitorum brevis</td>
<td>Dorsal surface of calcaneus</td>
<td>By four tendons into extensor expansion</td>
<td>Extends toes</td>
</tr>
<tr>
<td>Extensor hallucis brevis</td>
<td>Medial surface of calcaneus</td>
<td>Proximal phalanx of great toe</td>
<td>Extends toes</td>
</tr>
</tbody>
</table>
1. Basic cell structure of a multipolar neuron. Identify and describe function
   a. Cell body
   b. Nucleus
   c. Axon hillock
   d. Dendrite
   e. Axon
   f. Schwann cells and myelin sheath
   g. Nodes of Ranvier
   h. Telodendria
   i. Axon Terminals=Synaptic end bulbs
2. Distinguish structurally and functionally between unipolar, bipolar, and multipolar neurons.
   a. Where can each be located?

3. What is another word for a sensory neuron?

4. What is another word for a motor neuron?

5. What type of neuron is between sensory and motor neurons?

6. Identify the following structures
   a. Epineurium
   b. Perineurium
   c. Endoneurium
   d. Fascicle
   e. Axon
   f. Myelin sheath
7. Glial Cells: Identify structure and function.
   a. CNS
      i. Astrocytes

      ii. Oligodendrocytes

      iii. Microglia

   b. PNS
      i. Schwann cells
Lab Evaluation Form  BI 231: Fall 2007

| Forms should be collected by a student and returned to HT 305 on the last day of class. |

Lab instructor: ___________________________  Lab day & time _______________________

**Lab instructor preparedness & overall effectiveness:**

<table>
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<tbody>
<tr>
<td>Poor</td>
<td>Average</td>
<td>Excellent</td>
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Comments:

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**Survival Guide**

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Comments:

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**Lab:**  Did the lab objectives increase your overall understanding of A&P?

<table>
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Comments: