

Welcome to SLCC Anatomy!

These study tools have been designed to prepare you for the various anatomical systems you will learn this semester. Each study guide includes conceptual questions on the corresponding chapters. Questions applicable to lecture are in green and those in black are focused on your lab section.

\*Please note that the authors of this study guide created it around Melanie Farr's and Dr. Eric Green's Lecture class and the lab manual. Your lecture could be organized differently depending on your instructor.

## **ANSWERS**

**The Human Body: Orientation, Tissues, and the Skeletal System**

**Chapter 1: The Human Body: Orientation**

1. Anatomy is the study of structure. From the Greek “to cut (-tomia) apart (ana-).”
2. Macroscopic or gross anatomy is the study of anatomical structures that can be seen with the naked eye.
3. Systemic Anatomy: an approach to anatomic study organized by anatomic structure like the cardiovascular system. This is the type of anatomy we are studying and is different from regional anatomy.

Regional Anatomy: an approach to anatomic study based on regions, parts, or divisions of the body

Surface anatomy: is the study of the external features of the body of an animal

Pathological anatomy: a branch of anatomy concerned with structural changes accompanying disease.

4. Physiology is the study of function. From the Greek “the study (-logia) of nature (physis).”

*\*Questions 5-12 reference terms that will be used throughout the entire semester. I encourage you to practice using the terminology when studying the body regions. Ex: the patellar region is inferior to the thoracic. Drawing figures and the arrows directing the corresponding planes is also helpful!*

5. Face up position or supine position means lying horizontally with the face and torso facing up.
6. Face down is prone position is a body position in which one lies flat with the chest down and the back up. In anatomical terms of location, the dorsal side is up, and the ventral side is down.
7. Anatomic position is standing with feet parallel, shoulder width apart, and flat on the floor.

The head is level, with the eyes open, looking forward. The arms are at the sides, with palms facing forward and thumbs pointing away from the body.

8. Superior/inferior: superior (from Latin, meaning 'above') is used to refer to what is above something, and inferior (from Latin, meaning 'below') to what is below it. For

example, in the anatomical position the most superior part of the human body is the head, and the most inferior is the feet.

9. Proximal/Distal are used to describe parts of a feature that are close to or distant from the main mass of the body, respectively. Thus the upper arm in humans is proximal and the hand is distal. typically used to describe points on the appendages.
10. Medial/Lateral: Lateral refers to the sides of an animal, as in "left lateral" and "right lateral". The term medial is used to refer to structures close to the centre of an organism. Ex: The radius is lateral to the ulna.
11. Ventral/dorsal: The dorsal surface of an organism refers to the back, or upper side, of an organism. Think dorsal fin of a dolphin is on it's back. The ventral surface refers to the front, or lower side, of an organism. If someone needs to get something off their chest they're venting- ventral.
12. Cranial/Caudal: Cranial refers to the 'head' end of an organism. Caudal is used to describe how close something is to the end of an organism, or tail region. Think tail bone for a human which is a biped.
13. Anterior/Posterior: Anterior refers to what is in front and posterior, what is to the back of the subject.
14. Superficial/Deep: Deep refers to something further away from the surface of the organism. Superficial refers to something near the outer surface of the organism. For example, in skin the epidermis is superficial to the subcutaneous tissue
15. Fill our the directional terms to these next 5 sentences:
  - a. Proximal
  - b. Superior
  - c. Superior
  - d. Anterior
  - e. Superficial
16. Coronal and sagital
17. Transverse
18. The dorsal cavity includes the cranial and spinal cavities.

19. The ventral cavity includes the thoracic and abdominopelvic cavities.

20. Serous membrane

*\*Reference the analogy in your textbook about the hand in the balloon to understand the different types of layers around organs. This concept will reoccur in nearly every system as it relates to a parietal and visceral layer.*

#### **Chapter 4: Tissues**

21. Four basic types of tissues:

- a.) epithelial tissue -- covers surfaces and forms glands
- b.) connective tissue -- support and binding
- c.) muscle tissue -- movement
- d.) nervous (neural) tissue -- control and communication

*\*Most organs contain all four types of tissues in different ratios and orientations.*

22. Naming the number of cell layers:

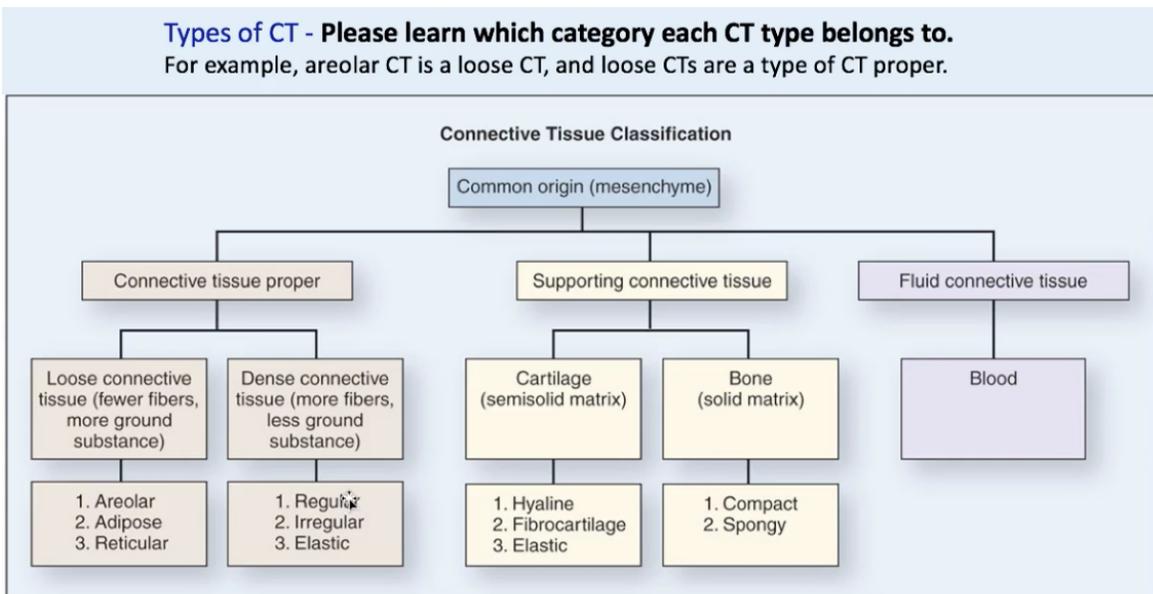
- a. Simple: single layer of cells (walls of capillaries and alveoli, kidney tubules); not good protection; concerned mainly w/ absorption, secretion, filtration
- b. Stratified: two or more layers of cells; can be thick and durable; provides protection in areas of wear and tear; often too thick for good absorption or diffusion
- c. Pseudostratified: looks like more than one layer but isn't; not all cells reach the free surface, but all are connected to basement membrane

23. Apical surface facing the lumen or external environment, the top.

24. Basal surface is the bottom edge of the cell or tissue adjacent to the basement membrane.

25. **Tight junctions - Ultrastrong connections that seal cells together near apical end. Prevent leakage in the spaces between cells, so that materials must pass**

- through the cells themselves. Some epithelia have more rows of tight junctions, making them better seals. Some have few or none, so they are called “leaky”.
26. Adhering junctions - Form a supporting belt that gives shape to cells, and generates a space between cells and their neighbors. Usually deep to the ring of tight junctions.
  27. Avascularity of a cell means no blood vessels penetrate epithelial surfaces. They would undermine selective permeability.
  28. Protection, Selective permeability, Secretion - by glands, for example, and Sensation - in cooperation with the nervous system.
  29. It could be either ciliated pseudostratified columnar epithelium or ciliated simple columnar. Remember if it is ciliated it must be columnar, however columnar are NOT necessarily ciliated.
  30. Columnar or pseudostratified.
  31. Simple columnar
  32. Endocrine, which produce hormones; Exocrine, which secrete products onto a surface.
  - 33.: Merocrine, Holocrine, and Apocrine.
  34. Loose, dense and supporting connective tissue.
  35. Protection, Physical framework of some organs, Connecting things together, Transport.



36 - 45.

This table can initially appear tedious. One way to remember it is to create a visual representation of the different tissues. So starting from the left we have a family of tissues that are very proper. Think of a formal family maybe British, dressed preppy with two children. One daughter is (despite the best efforts of the proper parents), quite slutty or Loose, She is fat (adipose) and has large areolas (areolar) on her breasts. She is perceived as loose because she is frequently finger blasted (the ECM of reticular tissue is characterized by and contains many fibroblasts). Now move to the right and the proper family has a dumb (dense) son. He shops at REI (regular.elastic. irregular) regularly and loves their (elastic) beef jerky. Because he is dense, he eats too much of it and this makes his poops regularly irregular. That family is kinda depressing... Moving on to the supportive CT. Unlike the proper family, these guys love each other and are very supportive. The two main structures that support the structure of your body are your cartilage and bone. Cartilage is a boy named Hef (Hyaline, elastic, fibrocartilage). He likes to high line (hyaline) between skyscrapers on elastic (elastic) chords. Because he doesn't wear a harness he falls and shatters the shock absorbers or fibrocartilage. Bone isn't as adventurous he sits at home and watches SC (spongy, compact). He's also a rapper inspired by Sponge bob named Lil Sponge and is taking over the rap game selling his compact discs on the sidewalk.

Finally the fluid connective tissue is a loner. Unlike the proper British family or the loving and supportive connective tissue this guy settled on establishing fluid rhymes and great flow as a rapper. Unlike bone he has street credit and is a certified member of the Bloods.

Hopefully that was at least entertaining. The point being there are a lot of different ways to memorize all of the structures and tables expected of you in Anatomy. More visual learners might lean towards a style like this. Generally the more inappropriate or heinous the easier to recall.

46. Cardiac, smooth, and skeletal.

47. Only in the heart.

48. Smooth muscle tissue is found around organs in the digestive, respiratory, reproductive tracts and the iris of the eye.

49. Smooth muscle

50. Extra cellular Matrix

51. Cardiac and skeletal

52. Cardiac

53-59 Cells of bone CT:

Osteoprogenitor cells: a progenitor is an ancestor, these guys have stem cells- they are where it all begins. They develop into Osteoblasts which secrete collagen, that is assembled extracellularly into fibers. They are the young builders of the bone. The fibers will then become encased in minerals. They build and build until they've trapped themselves in the matrix they've made, in lacunae. Osteoblasts then mature to become osteocytes. In this manner, they grow bone CT. Osteocytes are the more mature bone cells. They are perceptive leaders, and see the big picture, detecting stress on bone and then tell the younger osteoblasts to make more bone tissues. However with building comes great destruction. This is where the osteoclasts come in. These are large multinuclear cells that perform bone resorption and break down what the osteoblasts have worked so hard to create.

60. The wider section at each end of the bone is called the epiphysis (plural = epiphyses), which is filled with spongy bone.

61. The epiphyseal plate is a plate of hyaline cartilage found in children and adolescents, located in the metaphysis at the ends of each long bone.

62. The diaphysis is the tubular shaft that runs between the proximal and distal ends of the bone.

63. The hollow region in the diaphysis is called the medullary cavity, which is filled with yellow marrow.

64. Bones store minerals (calcium, phosphorus, magnesium) and additional nutrients.

65. Periosteum is found around outer surfaces of bone, except where there is articular cartilage. It is analogous to the perichondrium of cartilage tough sheath of dense

irregular CT and bone CT. The periosteum is the layer of bone to which tendons and ligaments are attached.

66. Articular cartilage at ends of epiphyses.

67. The outer surface of bone is called the periosteum.

68. 206

69. 126

70. In adults, about 20% of the human skeleton is replaced every year. But this is not uniformly distributed through all bones. There is more replacement in compact bone than in spongy bone. And places experiencing more stress are turned over more rapidly. For example, the distal part of the femur is replaced every 4 - 6 months, while the diaphysis is maybe not completely replaced in a lifetime.

71. 80

72. Exercise: mechanical stress on a region of bone stimulates osteoblasts and inhibits osteoclasts, to grow and strengthen bone in places that need to be strong to handle stresses.

73. Thin, flattened and usually curved, breastbone, ribs, most skull bones;

74. Vertebrae and hip bone

75. Volkmann's canals, also known as perforating holes or channels, are atomic arrangements in cortical bones. Volkmann's canals are inside osteons.

76. Endosteum

77. Eat Lots of Vegetables, Perform Strength Training and Weight-Bearing Exercises, Consume Enough Protein, Eat High-Calcium Foods Throughout the Day

78. Muscles

79. projections, openings, depressions, ridges

80. Red marrow is found mainly in the flat bones such as hip bone, breast bone, skull, ribs, vertebrae and shoulder blades

81. True

82. By adulthood yellow and red marrow are about equal.

83. Ossification

84. intramembranous ossification, endochondral ossification.

85. Osteoporosis is a bone disease that occurs when the body loses too much bone, makes too little bone, or both. As a result, bones become weak and may break from a fall or, in serious cases, from sneezing or minor bumps.

86. An anatomical feature of the infant human skull comprising any of the soft membranous gaps (sutures) between the cranial bones that make up the calvaria of a fetus or an infant.

87. There are four stages in the repair of a broken bone: 1) the formation of hematoma at the break, 2) the formation of a fibrocartilaginous callus, 3) the formation of a bony callus, and 4) remodeling and addition of compact bone.

88. Sutures

89. Coronal suture - unites the frontal bone with the parietal bones. Sagittal suture - unites the 2 parietal bones in the midline. Lambdoid suture - unites the parietal bones with the occipital bone. Squamosal suture - unites the squamous portion of the temporal bone with the parietal bones.

90. Pulley

91. The spine. This is a good orienting point when studying a scapula model.

92. Mandible

93. The epiphyseal plate is a hyaline cartilage plate in the metaphysis at each end of a long bone.

## **Anatomy Chapters on Muscles, Skin, Nervous Organization and the Brain**

### **Chapters 9-12- Muscle Function and Muscle Tissue**

- 1) Origin is the lever position that does not move where as the insertion is the part that moves. It is the distal attachment.
- 2) Pull, push

3) Prime mover/agonist does the main movement of that part of the body. An antagonist does the opposite action to a muscle (extensor vs flexor), synergist assists the prime mover in an action. One example would be if the prime mover is Biceps Brachii, Triceps is the antagonist to the prime mover and brachialis would be a synergist in this example.

4) Explain

- a. Flexion: decrease in joint angle; brings two bones closer to one another  
(Biceps brachii)
- b. Extension: increase in joint angle; tends to be a straightening action  
(Triceps Brachii)
- c. Abduction: movement away from midline (Supraspinatus)
- d. Adduction: movement toward the midline (Adductor Magnus)
- e. Circumduction: a complex movement with the distal portion of a limb that makes a circle (Rotator Cuff muscles)
- f. lateral rotation: Rotating a limb laterally (Infraspinatus)
- g. medial rotation: Rotating a limb medially (Teres Major)
- h. Supination: palms forward (Supinator)
- i. pronation: Palms forward (pronator teres)
- j. dorsiflexion: bringing the top of the foot toward the shin (extensor digitorum longus)
- k. plantarflexion: pointing the toes downward (flexor digitorum longus)
- l. inversion: turning the sole of the foot medially (tibialis anterior)

- m. eversion: turning the sole of the foot laterally (fibularis longus)
- n. retraction: to move posteriorly with changing the angle between the bones (temporalis)
- o. elevation: moving superiorly (jaw movement) (Masseter)
- p. opposition: special movement of the thumb where the thumb can cross over the palm of the hand and touch all fingers. (pollex)

- 5) A muscle is able to receive and respond to an electrical stimulus
- 6) A muscle is able to shorten upon stimulation
- 7) A muscle can be stretched
- 8) After being stretched a muscle is able to return to its normal shape without being loose
- 9) Smooth has elongated ends while cardiac and skeletal muscles are blunted ends. Cardiac and Smooth are involuntary while Skeletal is voluntary contraction. Skeletal muscle is multinucleated with nucleus at the periphery while cardiac and smooth are uninucleated and it is centrally located. Skeletal is quickest to become contracted but will remain contracted least amount of time. Smooth muscle will remain contracted the longest.
- 10) Motion, posture, stability of joints, heat production, supports, guards openings and keeps fluids moving.
- 11) flesh
- 12) yes
- 13) Epimysium and it is dense irregular connective tissue

- 14) It is weaved into the tendon (dense regular connective tissue) which is then weaved into the periosteum of the bone with makes it once continuous tissue making it less likely to be removed.
- 15) Fascicle and perimysium
- 16) Endomysium
- 17) Muscles have a lot of blood vessels and nerves which makes it highly vascular and innervated.
- 18) Skeletal muscle cells each have a nerve attached to it. Whereas cardiac and smooth muscles have gap junctions that allow them to communicate for contraction
- 19) Mitochondria
- 20) Myoglobin in the sarcoplasm and capillaries in the muscle cells
- 21) Myofibrils
- 22) The myofibrils are arranged into these.
- 23) Myosin
- 24) Z disc is where the sarcomere starts and stops
- 25) Actin
- 26) Center of A-Band (it is the light part of the A band when a muscle is at rest and not contracted)
- 27) myofibrils.
- 28) That explains the contraction of the muscle by actin and myosin sliding over one another.

- 29) The stimulus tells the muscle to contract and the myosin has heads on that pull on the knobs coming off of the actin and pulls the Z discs toward the middle. This compressed all areas of the sarcomere, however, the A-band width remains the same.
- 30) Actin and Myosin
- 31) The intercalated discs are thickened tissue of the sarcolemma and contains desmosomes and gap junctions.
- 32) Smooth muscle has an inner and outer layer. The inner layer contracts which decreases the diameter of the tube and lengthens the tube, then the outer layer pulls meaning it increases diameter of tube and shortens it. This is how peristalsis works.
- 33) Wavelike movements that move substances

## **Chapter 5 – The Integumentary System**

- 34) The skin and 6-9 pounds
- 35) The epidermis and dermis
- 36) Superficial to deep layers of the epidermis: Stratum corneum, Stratum lucidum, Stratum granulosum, Stratum spinosum and Stratum basale.
- 37) Melanoma (which is the deadliest form of skin cancer which only accounts for about 5% of skin cancers but has a low survival rate. It metastasizes rapidly. It occurs due to uncontrolled mitosis of melanocytes.) and Basal Cell Carcinoma (most common skin cancer but least malignant of skin cancers. It occurs due to uncontrolled mitosis of Keratinocytes)

- 38) Vasodilation is where the blood is brought to the surface of the skin and the skin is flushed that activates glands to release sweat. This is done to cool down the surface of the skin. Vasoconstriction is where the blood is drawn from the skin and brought more internally to warm internal organs. It causes the skin to become blueish (cyanosis).
- 39) 5 %
- 40) Excretion/secretion, Mechanical protection, UV protection, Body temperature regulation, sensation, Vitamin D Synthesis, and Blood reservoir.
- 41) Subcutaneous Layer
- 42) The stratum basale is attached to the basement membrane via hemidesmosomes and an adhesive.
- 43) Keratinocytes
- 44) Keratin
- 45) Melanocytes, they produce Melanin, which is responsible for the yellow-brown, black and brown pigments.
- 46) Everyone has roughly about the same number of Melanocytes, but it is due to where those melanocytes are located and how much melanin is produced and how long it lasts.
- 47) Albinism is that Melanocytes due not produce Melanin, and Vitiligo is a regional loss of melanocytes
- 48) Suntan is where melanocytes production of melanin when exposed to UV rays could keep up, sunburn is where the melanocyte production could not keep up.

- 49) To protect the skin (epidermis and below) from UV damage.
- 50) Tactile sensory receptors
- 51) Overgrowth of Melanocytes in an area
- 52) Carotene is what gives the skin its greenish/olive color and hemoglobin is in the blood of the skin and it gives the skin its rosy look
- 53) Epidermal Dendritic Cells or Langerhans
- 54) 8-10 layers
- 55) Prickle cells are the keratinocytes that start to become flatter and sharper on the ends. Mitosis does occur in the Stratum Spinosum.
- 56) Squamous Cell Carcinoma- it is the 2<sup>nd</sup> worst skin cancer to have but it can be taken care of if excised quickly. It is cancer of the 'prickle-cells'
- 57) Stratum Granulosum, 3-5 layers. It has a grainy look because of the keratin precursor (Keratohyaline). Keratinization begins here.
- 58) The Keratinocytes produce Keratin and become dead cells.
- 59) Stratum Lucidum
- 60) Because it is pretty much just cell filled with keratin because the cell has shed its nucleus and most of its keratin.
- 61) 20-30 layers thick. The cells are flat dead and filled with keratin but are tightly bounded.
- 62) Desmosomes
- 63) Papillary Layer- composed mostly of Areolar Connective Tissue and Reticular Layer- mostly composed of Dense irregular Connective Tissue

- 64) Dermal Papillae, blood vessels, nerve endings, glands
- 65) 50 % of the body's fat is stored in the subcutaneous layer.
- 66) Dead or damaged cells being replaced by new ones of the same type and then return to normal function.
- 67) Blood clot forms where damage occurs then capillaries sprout out and bring mesenchyme cells with them, then the mesenchymal cells differentiate into fibroblasts, which then start to lay down collagen fibers, and the scab then forms. Later the scab falls off and there is a pink fragile tissue called 'granulation tissue'. Then the capillaries atrophy and the collagen fibers shrink and you are left with a scar.
- 68) Different cells associated with Fibrosis:
- a. Labile cells: able to regenerate freely (epithelial cells and mucous membranes)
  - b. Permanent Cells: unable to regenerate which can be found in Neurons and Muscles (primarily Cardiac muscle cells)
  - c. Stable cells: stop regeneration once body stops growing but remember how to regenerate when needed. Connective Tissues and glands do this.
- 69) Skin becomes less resistant to cold weather, Vitamin D production decreases, Melanocytes decrease, shape of body becomes less curvy and skin thins.
- 70) 1<sup>st</sup> Degree Is damage to the epidermis, 2<sup>nd</sup> degree is damage to epidermis and upper dermis and 3<sup>rd</sup> degree is damage to the entire skin layers

71) Autografts (skin grafts from your body) and Allografts (foreskin) and pig skin (heterografts)

## **Chapter 14- Fundamentals of Nervous System and Nervous Tissue**

72) Collecting information, processing and evaluating information, responding to information

73) CNS

74) PNS

75) PNS

76) Cranial; Vertebral

77) CNS; from.

78) Gray and white matter.

79) White matter: Myelinated Axons (the wiring). Gray Matter: Neuron Cell bodies and unmyelinated axons.

80) Wiring

81) Nerve

82) Ganglia or Ganglion

83) Epineurium

84) Bundles of axons within a nerve. Perineurium is what encases a fascicle.

85) Endoneurium

86) 12 cranial nerves and 31 spinal nerves

87) Sensory nerves contain sensory neurons, motor nerves contain motor neurons and mixed nerves contain both.

- 88) Afferent: carries information from PNS to CNS as sensory. Efferent carries information from CNS to PNS for a motor response.
- 89) Special organs that detect a change in the environment either internal or external.
- 90) Somatic Sensory: skin, bone, muscle and 5 senses. Visceral Sensory: stomach pain, needing to urinate.
- 91) Somatic Motor division and Autonomic Motor division. Somatic Motor division deals with voluntary skeletal muscle movement, while the Autonomic Motor division deals with cardiac, smooth and glandular movements.
- 92) Sympathetic and Parasympathetic. Sympathetic is the fight or flight, whatever processes are needed at the time increase and those that are unnecessary to survive during the high stress situation is slowed down. Parasympathetic is when your body is in chill mode. It is your feed or breathe mode.
- 93) Oxygen and Glucose
- 94) Neurotransmitters
- 95) Afferent neurons are sensory neurons attached to sensory receptors and carry AP (action potential) toward CNS. Efferent neurons are attached to effectors that carry AP away from CNS to promote a response. Interneurons are the integration neurons in the CNS.
- 96) Neurons are classified by how many processes are coming off of the neuron. Multipolar neuron is a neuron that has many processes coming off of the cell body, unipolar neuron has one process coming off of the cell body and bipolar

neuron has two processes. Bipolar is commonly used in the PNS so that the neuron cell body can be protected.

97) Dendrites carry information to the Cell body, Axons carry it away

98) Attaches axon to cell body

99) Nerve fibers

100) Axon collateral (middle) Axon Terminals or Telodendria (end)

101) Synaptic Knobs

102) Myelinated axons is what makes the white matter white and it helps protect axon and helps the electrical stimulus travel faster and further.

103) CNS= Oligodendrocytes PNS= Neurolemmocytes/ Schwann Cells

104) Junction between neuron to neuron or neuron to effector

105) A true synapse is neuron to neuron, a neuromuscular synapse is neuron to muscle and a neuroglandular synapse is neuron to gland

106) Presynaptic is the neuron before the synapse and postsynaptic is the neuron after the synapse

107) 50; They are the support staff for neurons

108) Oligodendrocytes myelinate in the CNS, Ependymal cells secrete CSF, Microglial cells defense, Astrocytes assist in maintaining blood brain barrier.

109) Both of these cells are located in the PNS. Satellite cells are around the cell bodies of neurons in the ganglion and they pretty much do everything for the cell so the cell can focus on its primary responsibility. Neurolemmocytes/schwann cells myelinate in PNS.

110) Uncontrolled mitosis of Glial cells.

111) Autoimmune disease that attacks the myelin sheath and therefore get a short circuit in the electrical impulses

112) They are unable to regenerate because they are amitotic.

113) When an injury at the site happens the proximal ends seals up and swells up forming a knob and the distal end disintegrates. The Neurolemmocytes form a regeneration tube and tries to help guide the axon through it. If the axon makes it into the regeneration tube then it will most likely be re-innervated, however, if it does not make it to the regeneration tube then it is permanently damaged.

## **Chapter 15- The brain**

114) 1<sup>st</sup>: bone (skull, vertebral column), 2<sup>nd</sup> meninges, 3<sup>rd</sup>: CSF 4<sup>th</sup> BBB

115) Superficial to deep: Epidural (vertebral cavity only)-filled with loose connective tissue, dura mater (periosteal layer and meningeal layer), subdural space (potential space), arachnoid space (web of collagen fibers and elastic fibers that extend and connect pia mater and dura mater)- has arachnoid villi with one way valves to drain excess CSF, Pia mater: attached to the brain tightly with tiny blood vessels.

116) Epidural

117) Epidural

118) Dura mater is called the “tough mother.” The outermost layer of the dura mater is the periosteal layer, which is attached to skull in cranial cavity. It composed of dense irregular connective tissue that is continuous with periosteum. The deeper

- layer of the dura mater is the meningeal layer, which is the external covering of brain and it extends into fissures. These extensions are called cranial dural septa:
- 1) falx cerebri 2) falx cerebelli 3) tentorium cerebelli.
- 119) Dural venous sinuses (a big one is the superior sagittal sinus which you can see on a mid sagittal plane of the brain)
- 120) Chunks of the Dura mater (more specifically- meningeal layer) that extends into the fissures of the brain
- 121) Falx cerebri and it attaches to the crista galli
- 122) The cranial Dural septa that separates the cerebellum into its two hemispheres
- 123) Tentorium cerebelli
- 124) Subdural space, it is a potential space, if present, it only contains some fluid
- 125) Arachnoid and it is a web of collagen and elastic fibers that connects dura and pia mater.
- 126) Arachnoid villi extend into the dural venous sinuses and that have one way valves that open when there is excess CSF
- 127) The space deep to arachnoid is called Subarachnoid space. It circulates CSF and has blood vessels in there too.
- 128) Pia Mater is the deepest meninx. It gives the brain its shiny appearance. It's tightly bound to the brain.
- 129) CSF and it is made by Ependymal Cells in the Choroid Plexus within the ventricles.
- 130) Ventricles

131)Central Canal

132)The Ependymal Cells take the best stuff (oxygen, glucose, ions, amino acids etc.) out of the capillaries that are located within the Choroid Plexus and dump into the ventricles as CSF

133)CSF starts in both lateral ventricles by being secreted by Ependymal cells in the CP (Choroid Plexus) then the CSF circulates into the third ventricle and more CSF is secreted here via the Ependymal Cells within the CP then all the CSF that has been made thus far circulates through the Cerebral Aqueduct/Mesencephalic Aqueduct then circulates to the fourth ventricle where more CSF is made as well by the Ependymal Cells in the 4<sup>th</sup> ventricle in the CP then all of the CSF leaves via the lateral and median apertures then to the subarachnoid space then to the arachnoid villi then to the dural venous sinuses (if doesn't go out apertures it can go down Central canal)

134)Blockage of CSF that causes ventricles to swell which causes brain to push up against skull which causes one to have an abnormally large head.

135)Internal Carotid arteries and the Vertebral Arteries

136)Blood brain barrier. Easily: Oxygen and lipid soluble. Glucose has special transport mechanisms. Hard: Proteins, most antibiotics and dopamine

137)The BBB can slow down rate that glucose enters the brain based on how much glucose is coming into the body

138)Gyrus

139)A groove, "Valley"

140) A cleft, “a grand canyon”

141) Within the cerebral hemispheres

142) The part of the brain that everything you are consciously aware of happens here.

The newest part of the brain. Higher thought functions happen here. Voluntary stuff happens here.

143) Central Sulcus, Lateral Sulcus

144) Frontal Lobe: Long-term decision making, reasoning, judgment, personality,

motor speech and voluntary motor movement of skeletal muscle. The areas we are concerned with are the Prefrontal cortex, Broca's Motor Speech area, and Primary Motor Cortex.

145) Long-term decision making, personality, reasoning, social skills, intelligence and judgment

146) The Primary motor cortex is located on the Precentral gyrus. It is the area

responsible for voluntary movement of skeletal muscle on the opposite side of the body.

147) It is the motor speech area where spoken and written language is produced. It is

on the left side of the brain in 80% of the people.

148) Broca's aphasia is where you understand everything but you cannot formulate

words or write what you want to say or both.

149) The parietal lobes go from the central sulcus to the parieto-occipital sulcus and also the

lateral sulcus. Its primary function is sensation. Its main area is the

- Somatosensory Cortex on the postcentral gyrus which is responsible for sensory input on the opposite side of the body
- 150)The occipital lobe starts at parieto-occipital sulcus going posteriorly to that. Its function is known for vision.
- 151)The temporal lobe starts at lateral sulcus and go inferiorly.
- 152)Temporal lobe is generally responsible for word retrieval and language and word processing, visual and auditory memory. **Wernicke's specific function is imparting meaning to words spoken written or heard.**
- 153)**Where a person can speak fluently but have no meanings or understandings of what they are saying.**
- 154)It is deep to the temporal lobe, just have to pull back at the lateral sulcus. It is responsible for body awareness, taste, feelings of disgust and also memory.
- 155)Frontal Lobe
- 156)Temporal Lobe
- 157)Parietal Lobe
- 158)Cerebrum, cerebellum, brainstem and diencephalon
- 159)Falx Cerebri
- 160)**Left brain: is patterns, math, science and deep thinking. Right: Creativity, good nonverbal cues, being able to pick up on social cues, sex drive. It is good to overlap because if a stroke happens then you have a higher chance of regaining function. Females have a lot more overlap than males.**
- 161)Central white matter

162) Association tracts: run anterior to posterior within the same cerebral hemisphere, Projection tracts: run inferior to superior connecting cerebral cortex with spinal cord and vice versa, and commissural tracts: run left to right connecting cerebral hemisphere and cerebellar hemispheres.

163) Corpus Callosum

164) Cerebral Nuclei or basal nuclei. Caudate Nucleus: starting and stopping of movement of voluntary skeletal muscle. Amygdala: emotion, fear, vigilance, anxiety

165) Diencephalon

166) Thalamus. It is the relay station/router for the sensory input to the cerebral cortex. It is attached by the interthalamic adhesion

167) Mesencephalon

168) Primary function of the hypothalamus: Homeostasis, more specifically controls hunger and thirst, breathing, secretion of ADH and Oxytocin, circadian rhythms. The pituitary gland is attached via the infundibulum.

169) It attaches to pineal gland which secretes melatonin. Function is it helps

170) Thalamus, hypothalamus, and Epithalamus

171) Corpora Quadrigemina/Tectal Plate. The inferior and superior colliculi.

172) Commissural tracts (help connect communication between the cerebellar hemispheres) and Projection tracts (Connect the communication between cerebellum and cerebrum)

173) Regulate breathing

- 174)It controls breathing, heart rate and blood pressure in the gray matter. **The white matter is composed of projection tracts connecting the spinal cord with the brain.**
- 175)It coordinates body movements to be smooth, balance, muscle memory.
- 176)Folia are the folds and the white matter is called arbor vitae
- 177)Vermis
- 178)Mesencephalon, pons and medulla oblongata
- 179)breathing
- 180)Tentorium cerebelli
- 181)Falx cerebelli
- 182)**Decussation of pyramids**

### **Spinal Cord and Spinal Nerves, Blood, Heart, Vessels, Ear and Eye**

#### **Chapter 16-18: Spinal Cord and Spinal Nerves**

- 1) Once it crosses the foramen magnum
- 2) Epidural space
- 3) Cervical enlargement ----- Lumbar enlargement
- 4) Conus medullaris
- 5) Cauda equine
- 6) Filum terminale
- 7) White connective tissue that grabs the spinal cord structure in place
- 8) The cell body is in the dorsal root ganglion
- 9) **Anterior gray horn**
- 10) Intervertebral foramina
- 11) Phrenic nerve

- 12) C3-C5
- 13) The diaphragm allows for inspiration and exhalation (breathing) and loss of its function results in an inability to breath and therefore, suffocation.
- 14) Axillary nerve, long thoracic nerve, medial pectoral nerve, lateral pectoral nerve, median nerve, musculocutaneous nerve, ulnar nerve, radial nerve
- 15) They do not form a plexus. They innervate the intercostal muscles.
- 16) Femoral nerve innervates quadriceps, pectineus, iliopsoas group and sartorius; obturator nerve innervates adductors (magnus, longus, brevis), gracilis and pectineus.
- 17) Inferior gluteal nerve innervates gluteus maximus; superior gluteal nerve innervates tensor fascia latae, gluteus medius, gluteus minimus; sciatic nerve branches to tibial and common fibular nerves.
- 18) Radial nerve.
- 19) Rectus femoris, vastus lateralis, vastus medialis, vastus intermedius, pectineus, iliacus, psoas major, sartorius.
- 20) Myelin sheath. Guillan-Barré syndrome, multiple sclerosis (MS)
- 21) The tapered end of the spinal cord proper.
- 22) Vertebrae!
- 23) No. The closer to the brain a spinal cord injury occurs, the greater the effect on the body system.
- 24) Peripheral nerves generally are capable of regrowth.
- 25) Flexor carpi ulnaris, flexor digitorum profundus (medial half), adductor pollicis (not in lab manual), dorsal and palmar interossei (not in lab manual)

## **Chapter 21: The Blood**

- 26) Erythrocytes, leukocytes, and platelets
- 27) Five types: neutrophils, lymphocytes, monocytes, eosinophils, and basophils
- 28) Erythrocyte
- 29) Neutrophils, lymphocytes, monocytes, eosinophils, basophils

30) Blood doping is the intentional withdrawal and reinjection of an athlete's erythrocytes to maximize the amount of oxygen delivered to muscles, thus increasing athletic output and improving performance. Doping increases blood thickness and therefore requires that the heart muscle work harder to send blood throughout the body.

31) Leukocytes

### **Chapter 22-23: The Heart and Vessels**

32) Left atrium and right atrium (plural: atria); left ventricle and right ventricle

33) The flow of blood to and from the heart into the body, not the lungs. Left ventricle to right atrium.

34) The flow of blood to and from the lungs, not the body. Right ventricle to left atrium.

35) Deoxygenated blood must be reoxygenated in order to provide muscles and tissues with oxygen.

36) Atherosclerosis

37) Arteries; capillary beds

38) Arterioles

39) Capillary beds

40) Venules

41) Mediastinum

42) Apex; base

43) Fibrous pericardium, serous pericardium (with parietal layer, pericardial cavity, and visceral layer or epicardium), myocardium, endocardium

44) Dense irregular connective tissue

45) Inflammation of the pericardium

46) Interatrial septum

47) Sinoatrial node

- 48) Elastic arteries, muscular arteries, and arterioles. Elastic are close to the heart (aorta) Muscular are further down (Brachial Artery) and Arterioles are the arteries that are leading into the capillary beds.
- 49) Tunica intima, tunica media and tunica externa.
- 50) Where two or more vessels merge to allow for blood flow to parts of the body where other vessels may be damaged or missing.
- 51) Begins in right ventricle and ends in left atrium.
- 52) Draw the hepatic portal system in your notes.
- 53) Foramen ovale
- 54) A vessel in fetuses that connects the pulmonary trunk to the aorta, allowing for blood flow to the rest of the body without having to pass through capillary beds in the lungs because fetuses aren't breathing.
- 55) Right atrioventricular valve, tricuspid valve. Left atrioventricular valve, bicuspid valve, mitral valve.
- 56) Great cardiac vein, anterior interventricular artery
- 57) It is oxygenated.
- 58) Pulmonary veins.
- 59) The heart.
- 60) The diaphragm.
- 61) Right atrium.
- 62) Marginal artery, posterior interventricular artery
- 63) Anterior interventricular artery, circumflex artery
- 64) The left side of the heart has a thicker myocardium because it sends blood throughout the rest of the body and therefore needs to exert more force and increase blood pressure
- 65) Cardiac arrest
- 66) Autonomic nervous system

## **Chapter 16: The eye and the ear**

- 67) Six muscles attach the external surface of the eye

68) Inferior oblique, inferior rectus, superior rectus, medial rectus

69) Abducens (CNVI), trochlear (CNIV), and optic (CNII)

70) Lacrimal gland

71) Lacrimal caruncle

72) Sclera and cornea

73) Fibrous tunic, vascular tunic, neural tunic

74) Iris

75) Lens

76) Sclera

77) Fibrous tunic

78) Conjunctiva

79) Hearing and balance

80) Tympanic membrane

81) Temporal bone

82) Malleus, incus, stapes

83) Round window

84) Vestibule, semicircular canals

85) Vestibulocochlear nerve (CNVIII)

86) Because they can damage the tympanic membrane

87) The oval window

88) Sacculle, utricle

### **Mixed review**

89) Cerebral arterial circle, Circle of Willis

90) There is a common carotid artery, but not a common jugular vein

91) Azygos vein, hemiazygos vein, accessory hemiazygos vein

92) The blood needs to be cleaned of any toxins or pathogens before returning to the heart

93) They act as the “skeletal muscle pump,” which is the muscles contracting and squeezing the veins, pushing the blood through the veins and toward the heart

- 94) Hypertension, or high blood pressure
- 95) Because systemic arterial blood is much higher pressure than systemic venous blood, arteries must retain their function while being able to accommodate this high pressure and volume as blood is delivered throughout the body
- 96) An anastomosis

## **Urinary System and Reproductive System**

### **Chapter 27: The Urinary System**

- 1) Urine production and storage, monitors blood volume and blood pressure,  
Regulation of RBC production (kidney of the boss of bone marrow)
- 2) Kidney, ureter, urinary bladder, urethra

- 3) Retroperitoneal
- 4) Adrenal Gland
- 5) Hilum
- 6) Fibrous Capsule > Perinephric fat > Renal Fascia > Paranephric fat
- 7) Dense Irregular Connective tissue
- 8) Renal Fascia and is also composed of Dense irregular connective tissue
- 9) Label as many structures as you can and refer to your lab manual to make sure you have all of them.
- 10) Within renal pyramids, that is why they appear striated
- 11) Cortex; Medulla
- 12) Renal Papilla
- 13) Aorta > Renal Artery > segmental artery > interlobar artery > arcuate artery > interlobular artery > afferent arteriole > glomerulus > efferent arteriole > peritubular capillaries/vasa recta > interlobular vein > arcuate vein > interlobar vein > renal vein > inferior vena cava > right atrium
- 14) Capsular space of renal corpuscle > proximal convoluted tube > nephron loop ( descending limb > ascending limb) > distal convoluted tube > collecting duct > renal papilla > minor calyx > major calyx > renal pelvis > ureter > ureter openings > internal urethral sphincter > urethra > external urethral orifice
- 15) Renal plexus, they enter at the hilum
- 16) Nephron

17) Filtration is pressure driven and it goes from blood to urine (dump H<sub>2</sub>O, wastes, small solutes (ions and nutrients)- it's a big dump and not selective) then you have Reabsorption because you lose some things you want to keep (its careful and selective to pick back the things you want that was dumped- most of the water, some ions if needed depending on levels in the body and nutrients- this goes from urine to blood) then you have Secretion which is the very careful inspection of what is in the blood and only keeping what is absolutely necessary which goes from blood to urine- get rid of any waste that was not dumped first time with filtration and anything else that is in excess in the blood already like ions and nutrients) By the time we are finished with this 3 step process we have cleansed the blood and kept the good stuff needed.

18) More than a million per kidney

19) It is a massive dump of water and small solutes, nutrients and wastes from blood to urine; Renal corpuscle; It is pressure driven (blood vessels are higher pressure therefore its blood to urine)

20) This is where there is a selective process to pick out the good stuff needed to bring from urine back to bloodstream in the nephron. For example nutrients, ions as needed and most of the water gets brought back from urine back into blood. Primarily done at the proximal convoluted tube it goes from there to peritubular capillaries. In the nephron loop there is primarily water reabsorption primarily by osmosis

21) Secretion is the last step of the cleansing of the blood. It is a very selective process where it goes through and examines the blood very closely to make sure it did get rid of all the wastes and excess ion and excess nutrients that are not needed which are then dumped back into the urine. This can be active or passive. This primarily happens at the distal convoluted tube. Looking through blood one last time and dumping whatever needs to be dumped.

22) Glomerulus capsule or Bowmans capsule

23) Podocytes

24) Renal Corpuscle

25) Fenestrated capillaries

26) Filtration slits (because filtration happens here)

27) Space between glomerulus and glomerular capsule

28) Key:

- a. Interlobular artery
- b. Bowman's capsule
- c. Glomerulus
- d. Distal convoluted tube
- e. Collecting duct
- f. Nephron loop
- g. Proximal convoluted tube

29) Nephron loop, the longer the loop the more water absorption.

- 30) The molecule of urea comes from blood stream and is filtered out through the filtration slit of the podocytes into the glomerular capsule > proximal convoluted tube > nephron loop (descending limb > ascending limb) > distal convoluted tubule > collecting duct > renal papilla > minor calyx > major calyx > renal pelvis > ureter > urinary bladder > urethra > toilet
- 31) Afferent has a bigger diameter than the efferent arteriole therefore the efferent arteriole causes higher blood pressure in the glomerulus increasing rate of filtration since it is pressure driven
- 32) Juxtaglomerular apparatus
- 33) They have mechanoreceptors which monitor BP in the afferent arteriole; Wall of the afferent arteriole at the apparatus location; They secrete renin to help raise BP
- 34) Macula Densa Cells; Located in the wall of the Distal Convoluted Tubule, they measure the final solute concentration prior to going into the collecting duct. They send a chemical response if there is too much glucose or another nutrient to increase absorption of this nutrient.
- 35) About 10 inches long, the taller you are the longer they are
- 36) Posterior wall of Urinary Bladder
- 37) Urinary bladder
- 38) Urinary Trigone
- 39) Deep to superficial: Mucosa (transitional epithelium) > submucosa (dense irregular CT) > Muscularis (detrusor muscle ) 3 layers longitudinal to circular to

- outer longitudinal muscle > adventitia (loose areolar CT); Blood supply comes from internal iliac arteries and is drained by internal iliac veins
- 40) Internal urethral sphincter
  - 41) It is smooth muscle and it is involuntary
  - 42) Urine
  - 43) Mucosa (transitional epithelium except in the distal part of males urethra it is pseudostratified columnar epithelium) > Smooth muscle is the outer layer which thins out towards the end of the urethra
  - 44) In the urogenital diaphragm; Voluntary
  - 45) 1.5 inches in women and 8 inches in males
  - 46) External urethral orifice
  - 47) Semen.
  - 48) Proximal to distal: prostatic urethra > membranous urethra > spongy urethra
  - 49) Detrusor muscle (3 different layers deep to superficial: longitudinal > circular > longitudinal)
  - 50) Relax internal urethral sphincter and contract detrusor muscle
  - 51) Somatic motor neurons contract external urethral sphincter, relax detrusor and stimulate the internal urethral sphincter

## **Chapter 28: The Reproductive System**

- 52) Biological
- 53) External genitalia, internal reproductive organs, gonads, sex hormones and sex chromosomes

- 54) Testes
- 55) Glans penis
- 56) Mullerian; Wolffian; If one duct starts forming more then the other duct will start to degenerate.
- 57) Labia majora
- 58) 7 months
- 59) Vagina.
- 60) MIH (mullerian inhibiting hormone)
- 61) SRY gene, which is located on the Y chromosome. If a person is to become an anatomical male then two things must happen. The first switch would be the SRY gene, which initiates testes formation/development then the MIH hormone is released due to development of testes. After the IH hormone is released it causes the degeneration of the Mullerian ducts.
- 62) Female.
- 63) Y chromosome
- 64) Scrotum
- 65) Shaft of the penis (skin surrounding shaft)
- 66) Estrogen; Testosterone.
- 67) Testosterone
- 68) Before, that is why males also have nipples
- 69) Estrogen
- 70) Androgen insensitivity syndrome

- 71) Hypothalamus hormone, but this happens at puberty
- 72) Intersex
- 73) Cisgender is where their anatomy agrees with their psychology but transgender is where their anatomy does not agree with their psychology ( what they feel they are).
- 74) It is what you sexually prefer, like you prefer someone who is intersex, transgender, women, men and etc.
- 75) Ovary
- 76) Vulva
- 77) Greater vestibular glands; Lubricate the vagina
- 78) Prostate gland
- 79) Bulbs of vestibule, it is homologous to corpus spongiosum
- 80) 1) produce sex hormones 2) produce gametes 3) prepare for and house developing embryo
- 81) 28 days; the wall of the uterus gets thicker due to potential housing of a fertilized egg then it has to slough off to begin the process all over again.
- 82) Vaginal Orifice
- 83) Bulbs of vestibule; It is erectile tissue that swells when aroused to better grip the penis
- 84) The body that has paired corpora cavernosa that extend back as the crura (singular is called crus)
- 85) Estrogen, progesterone, and gametes.

- 86) Yes they are connected but not directly, only attached with the ovarian ligament.
- 87) Abdominal aorta
- 88) Outer layer is germinal epithelium (most common for ovarian cancers) and tunica albuginea
- 89) Tunica albuginea
- 90) Ovarian follicle
- 91) Follicles
- 92) Simple cuboidal epithelium
- 93) Ovarian cancer
- 94) Ovarian ligament
- 95) Broad ligament
- 96) Suspensory ligaments
- 97) Ciliated simple columnar epithelium
- 98) Fimbriae
- 99) Ampulla of the uterine tube
- 100)Cilia
- 101)Ectopic Pregnancy is a pregnancy outside the uterus and tubal pregnancy is when the pregnancy happens in the uterine tubes.
- 102)Inflammation and scarring in the uterus and uterine tubes, usually due to chlamydia or gonorrhoea, can lead to infertility.
- 103)Round Ligament
- 104)Deep to superficial: Endometrium > Myometrium- smooth muscle > Perimetrium

105)3

106)Functional Layer and Basal layer

107)Uterine

108)Functional layer sheds during menstruation and the basal layer is what makes more functional layer.

109)Vascular

110)Fornix

111)Rugae

112)Endometriosis

113)1) Expel the unfertilized oval 2) Birth canal 3) Receive the penis and semen during sexual intercourse

114) Mucosa and is made up of non-keratinized stratified squamous epithelium

115)Muscularis- smooth muscle then adventitia (fibrous connective tissue)

116)Glycogen, which is fermented.

117)Hymen

118)Labia majora

119)The scrotum is skin supporting the testes and regulating the temperature

120)Middle septum

121)Cremaster muscle; Dartos Muscle

122)Cremaster Muscle

123)Testes

124)Tunica vaginalis (extension of peritoneum) and tunica albuginea

125)Ovaries and testes

126)Epididymis, it takes 20 days for sperm to mature. It goes through duct of epididymis

127)Interstitial Cells

128)Abdominal Aorta

129)Sensory

130)Seminiferous Tubules > rete testis > Efferent Ductules > epididymis-head-body-tail > Ductus Deferens > Ampulla of the Ductus Deferens > Seminal Vesicle > Ejaculatory Duct and prostatic urethra > Membranous urethra > Spongy Urethra > External Urethral Orifice

131)Testicular artery and vein, testicular nerve and ductus deferens

132)Corpora Cavernosa

133)Corpora cavernosa (2 of them) and corpus spongiosum

134)Seminal Vesicle

135)Prostate gland

136)It cleanses the spongy urethra and adds to semen.

137)Arousal, Climax, refractory and resolution

138)Climax

139)Arousal

140)Increased blood flow to labia majora and vasoconstriction of the bulbs of vestibule causing swelling. The vagina becomes reddened and moist. The uterus tips back towards the rectum. The greater vestibular glands secrete fluid to

- lubricate vaginal orifice. The glands and corpora cavernosa swell to 2-3 times their size. Also the breasts swell.
- 141) Breathing return to normal so does BP. Muscle tone returns to normal, profound relaxation.
- 142) The Uterus tilts backwards towards the rectum and the cervix withdraws from the vagina.
- 143) Vasoconstriction of the bulbs of the vestibule causing swelling and erection. The labia majora have increased blood flow and these things happen to better grip the penis.
- 144) Greater vestibular glands and it happens during the arousal stage.
- 145) The corpora cavernosa have arteries in there and when they have increased blood flow that's pushing up against tunica albuginea which in turn cuts off the veins so there is no drainage of blood
- 146) 6 times
- 147) Bulbourethral glands
- 148) KILLS IT! It causes constriction of arteries which allows veins to vasodilate and drain blood.
- 149) Climax and it is both sexes.
- 150) Refractory because women can have multiple orgasms back to back. There is no limit!
- 151) Sympathetic
- 152) Vasopressin

153)It can last minutes to hours to days to weeks depending on the guy. Younger guys  
have a quicker refractory stage

154)Resolution

155>Returns to normal position and the vagina relaxes to normal position.