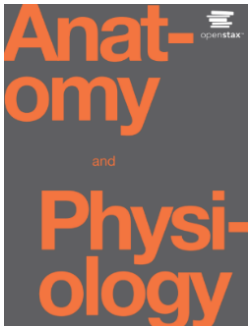

Student Study Guide with Test Questions

G215-A: Anatomy and Physiology - Part I by Kelly A. Young

Should this be your 'first exposure' to this material, it can be easy to become overwhelmed. Our advice ~ breathe! First exposure is a very important step in the learning process. By reading the text and working through your study guide you will gain understanding of the way the human body functions and how one part interrelates to the others. As this book is intended to become a part of your reference library, memorization is not required.

As you read, keep in mind that the body is made up of many parts, yet designed to function as a whole and in a balanced manner. This study guide is designed to highlight important concepts from the text as well as add in some outside information to foster thought processes as you read.

Anatomy and Physiology - Part I covers the material in units 1 and 2 of the text which provide a basic understanding of human anatomy and physiology, including its language, the levels of organization, and the basics of chemistry and cell biology. As a foundation for the further study of the body, chapters 1 through 4 focus on the body's regions, important chemicals, and the ways in which cells work to maintain homeostasis.

Unit 2 (chapters 5–11) is organized by specific body systems in relation to how these systems contribute to the support and movement of the body. The goal of this unit is to explore specific systems of the body while maintaining a focus on homeostasis as well as noting diseases and conditions that indicate disruption.

We encourage you to ask questions about the material in the Natural Health category of The Learning Center, in our Student Discussion Group. We have found whenever one person has a question, undoubtedly others do as well. Thank you in advance for speaking up!

Select the best answer(s) from the text.

Unit 1: Chapter 1

1. Your study of anatomy and physiology will make more sense if you continually relate the form of the structures you are studying to their _____.
    A. Placement
    B. Function
    C. Role
    D. All of the above

2. An _____ is an anatomically distinct structure of the body composed of two or more tissue types.
    A. Organ system
    B. Organelle
    C. Organism
    D. Organ

3. The smallest independently functioning unit of an organism is a(n) _____.
    A. Cell
    B. Molecule
    C. Organ
    D. Tissue

4. Metabolism can be defined as the _____.
    A. Adjustment by an organism to external or internal changes
    B. Process whereby all unspecialized cells become specialized to perform distinct functions
    C. Process whereby new cells are formed to replace worn-out cells
    D. Sum of all anabolic and catabolic chemical reactions in an organism

5. Adenosine triphosphate (ATP) is an important molecule because it _____.
    A. Is the result of catabolism
    B. Releases energy in uncontrolled bursts
    C. Stores energy for use by body cells wherever it is needed
    D. All of the above

6. Some other micronutrients, such as vitamin C and most of the B vitamins, are water-soluble and cannot be stored, so you need to consume them _____.
    A. Twice a day
    B. Every day or two
    C. Once a week
    D. For breakfast

7. The body maintains its internal organization by means of _____.
    A. Membranes
    B. Sheaths
    C. Other compartment-separating structures
    D. All of the above

TEXT HIGHLIGHTS: "The main disadvantage of CT scanning is that it exposes patients to a dose of radiation many times higher than that of X-rays. In fact, children who undergo CT scans are at increased risk of developing cancer, as are adults who have multiple CT scans."

NOTE: Radiation exposure is cumulative.

Unit 1: Chapter 2

NOTE: This chapter is about basic chemistry – how the body is organized at the chemical level. Basic chemistry will also be covered in phytochemistry, a course for students in the Clinical Master Herbalist program about how plants are organized at the chemical level.

8. Together, just four elements make up more than 95 percent of the body's mass. These include:
    A. Calcium, magnesium, iron, and carbon
    B. Oxygen, carbon, hydrogen, and nitrogen
    C. Sodium, chlorine, carbon, and hydrogen
    D. Oxygen, calcium, iron, and nitrogen

9. (True or False) An atom's protons and electrons carry electrical charges. Protons have a positive charge, electrons have a negative charge, and neutrons have no electrical charge. The number of protons and electrons within a neutral atom are equal, thus, the atom's overall charge is balanced.

10. Which of the following statements about chemical bonds is true?
    A. Covalent bonds are stronger than ionic bonds.
    B. Hydrogen bonds occur between two atoms of hydrogen.
    C. Bonding readily occurs between nonpolar and polar molecules.
    D. A molecule of water is unlikely to bond with an ion.

11. Chewing a bite of bread mixes it with saliva and facilitates its chemical breakdown. This is most likely due to the fact that _____.
    A. The inside of the mouth maintains a very high temperature
    B. Chewing stores potential energy
    C. Chewing facilitates synthesis reactions
    D. Saliva contains enzymes

12. (True or False) As much as 90 percent of an adult's body weight is water. This water is contained both within the cells and between the cells that make up tissues and organs. Its several roles make water indispensable to human functioning.

13. Hydrochloric acid (HCl), which is released from cells in the lining of the stomach, is a strong acid because it releases all of its H^+ in the stomach's watery environment. This strong acid:
    A. Kills ingested microbes
    B. Does not harm a healthy stomach
    C. Aids in digestion
    D. All of the above

14. Although most body cells can break down other organic compounds for fuel, all body cells can use _____. Moreover, nerve cells (neurons) in the brain, spinal cord, and through the peripheral nervous system, as well as red blood cells, can use only glucose for fuel.
    A. Glucose
    B. Glycogen
    C. Galactose
    D. Glycerol

15. Triglycerides:
    A. Fuel long, slow physical activity such as gardening or hiking
    B. Are a major fuel source for the body when at rest or asleep
    C. Assists the absorption and transport of the nonpolar fat-soluble vitamins A, D, E, and K
    D. All of the above

16. (True or False) Prostaglandins are chemicals derived from saturated fatty acids which stimulate the production of certain prostaglandins that help regulate aspects of blood pressure and inflammation.

NOTE: NSAIDS (Non-Steroidal Anti-Inflammatory Drugs) are the most commonly used over-the-counter drugs for pain. They are well-known medications such as Aleve, Motrin, and Advil. There are many side-effects from taking them. The most high-risk side-effects include miscarriage, heart failure, gastrointestinal ulcers, internal bleeding (and other damage), kidney failure, hearing loss, allergic reactions, Reye's syndrome in children, and death.

"FDA added a boxed warning to prescription drug labels for this risk in 2005. More recent data and information are prompting FDA to update NSAID labeling. Today we know that the risk of heart attack and stroke may occur early in treatment, even in the first weeks. "There is no period of use shown to be without risk," says Judy Racoosin, M.D., M.P.H., deputy director of FDA's Division of Anesthesia, Analgesia, and Addiction Products. People who have cardiovascular disease, particularly those who recently had a heart attack or cardiac bypass surgery, are at the greatest risk for cardiovascular adverse events associated with NSAIDs. FDA is adding information in the drug label for people who already have had a heart attack. This vulnerable population is at an increased risk of having another heart attack or dying of heart attack-related causes if they're treated with NSAIDs, according to studies. But the risk is also present in people without cardiovascular disease. "Everyone may be at risk – even people without an underlying risk for cardiovascular disease," Racoosin adds." FDA Strengthens Warning of Heart Attack and Stroke Risk for Non-Steroidal Anti-Inflammatory Drugs

"Many over-the-counter pain and fever-reducers are classified as nonsteroidal anti-inflammatories (NSAIDs), which act in part by blocking the cyclooxygenase-2 (cox-2) enzyme. But blocking the cox-2 enzyme is not a good idea in the context of vaccination, because the cox-2 enzyme is necessary for high production of B-lymphocytes. When people take medications like Advil for discomfort at the injection site, Phipps said, they're also inadvertently reducing the ability of B cells to make the antibodies that protect against the flu.

'Unless your healthcare provider tells you otherwise, it's best not to take pain relievers one or two days before the flu vaccine and for a week afterward,' said Phipps, who added

17. A protein is an organic molecule composed of amino acids linked by peptide bonds. Proteins:
    A. Include the keratin in the epidermis of skin that protects underlying tissues
    B. Include the collagen found in the dermis of skin, in bones, and in the meninges that cover the brain and spinal cord
    C. Are components of digestive enzymes, antibodies, the neurotransmitters that neurons use to communicate with other cells, and the peptide-based hormones that regulate certain body functions
    D. All of the above

18. (True or False) The body can use proteins for energy when carbohydrate and fat intake is inadequate, and stores of glycogen and adipose tissue become depleted. However, since there is no storage site for protein except functional tissues, using protein for energy causes tissue breakdown, and results in body wasting.

19. In DNA, nucleotide bonding forms a compound with a characteristic shape known as a(n) _____.
    A. Beta chain
    B. Pleated sheet
    C. Double helix
    D. Alpha helix

20. (True or False) Messenger RNA (mRNA) is created during protein synthesis to carry the genetic instructions from the DNA to the cell's protein manufacturing plants in the cytoplasm, the ribosomes.

Unit 1: Chapter 3

21. (True or False) Homeostasis is a term used in biology that refers to a dynamic state of imbalance within parameters that are compatible with life.

22. The cell membrane is an extremely pliable structure composed primarily of:
    A. Back-to-back phospholipids
    B. Cholesterol
    C. Various proteins
    D. All of the above

23. (True or False) A hydrophilic molecule (or region of a molecule) is one that is attracted to water. A hydrophobic molecule (or region of a molecule) repels and is repelled by water.

24. (True or False) The sodium-potassium pump, which is also called Na+ /K+ ATPase, is found in many cell (plasma) membranes. It transports sodium out of a cell while moving potassium into the cell.

25. (True or False) Symporters are secondary active transporters that move two substances in the same direction. The flood of sodium ions through the symporter provides the energy that allows glucose to move through the symporter and into the cell, against its concentration gradient.

26. (True or False) The nucleus is a cell's central organelle, which contains the cell's DNA.

27. Which of the following organelles produces large quantities of ATP when both glucose and oxygen are available to the cell?
    A. Mitochondria
    B. Peroxisomes
    C. Lysosomes
    D. ER

28. Free radicals are reactive because they contain free unpaired _____; they can easily oxidize other molecules throughout the cell, causing cellular damage and even cell death. Free radicals are thought to play a role in many destructive processes in the body, from cancer to coronary artery disease.
    A. Protons
    B. Neutrons
    C. Electrons
    D. Morons

29. Which of the following is part of the elongation stage of DNA synthesis?
    A. Pulling apart the two DNA strands
    B. Attaching complementary nucleotides to the template strand
    C. Untwisting the DNA helix
    D. None of the above

30. Which of the following list the correct order of the cell cycle?
    A. Cytokinesis, Mitosis, Interphase
    B. Interphase, Mitosis, Cytokinesis
    C. Interphase, Cytokinesis, Mitosis
    D. Mitosis, Interphase, Cytokinesis

Homeostatic IMBALANCES

Cancer Arises from Homeostatic Imbalances

Cancer is a malfunction originating at the cellular level. The Anatomy and Physiology book states: "failures of cell cycle control can cause unwanted and excessive cell division." Causation due to dysfunctional DNA, nutrient deficiencies, toxicity, or some other cause or combination of factors are at the core of what we call "cancer". The natural health professional must look for the root cause to stop the unwanted cancerous growth/spread and support the body's program to restore homeostasis at the cellular level. With this in mind you may wish to reread page 120!

NOTE: Reflect upon both yours and your client's limitations. Late stage cancers are difficult to deal with and limited turnaround time may not be sufficient. It likely will be necessary to make a referral to a more experienced holistic professional or clinic. Sometimes providing your clients with options is your valuable role.

31. Embryonic stem cells are **significantly different** than other types of stem cells because they:
    A. Are specialized cells
    B. Can continually divide and regenerate new stem cells instead of further specializing
    C. Are pluripotent, capable of developing into any type of cell or tissue except a placenta or embryo
    D. B & C only

Unit 1: Chapter 4

32. Which of the following is not a type of tissue?
    A. Muscle
    B. Nervous
    C. Embryonic
    D. Epithelial

33. Epithelial tissue, also referred to as epithelium, refers to the sheets of cells that:
    A. Cover exterior surfaces of the body
    B. Lines internal cavities and passageways
    C. Forms certain glands
    D. All of the above

34. (True or False) The endocrine system is part of a major regulatory system coordinating the regulation and integration of body responses. The secretions of endocrine glands are called hormones. Hormones are released into the interstitial fluid, diffused into the bloodstream, and delivered to targets, in other words, cells that have receptors to bind the hormones.

35. Connective tissue is made of which three essential components?
    A. Cells, ground substance, and carbohydrate fibers
    B. Cells, ground substance, and protein fibers
    C. Collagen, ground substance, and protein fibers
    D. Matrix, ground substance, and fluid

TEXT HIGHLIGHTS: "Fibroblasts are present in all connective tissue proper. Fibrocytes, adipocytes, and mesenchymal cells are fixed cells, which means they remain within the connective tissue. Other cells move in and out of the connective tissue in response to chemical signals. Macrophages, mast cells, **lymphocytes, plasma cells, and phagocytic cells are found in connective tissue proper but are actually part of the immune system protecting the body**. …Connective tissue proper includes the fixed cells fibrocytes, adipocytes, and mesenchymal cells. …Polysaccharides and proteins secreted by fibroblasts combine with extra-cellular fluids to produce a viscous ground substance that, with embedded fibrous proteins, forms the extra-cellular matrix."

36. Loose connective tissue is found between many organs where it:
    A. Fills in the spaces between the organs and skeletal muscles
    B. Allows water, salts, and nutrients to diffuse through to adjacent or imbedded cells and tissues
    C. Absorbs shock and binds tissues together
    D. B & C only

TEXT HIGHLIGHTS: Lymph contains a liquid matrix and white blood cells. Lymphatic capillaries are extremely permeable, allowing larger molecules and excess fluid from interstitial spaces to enter the lymphatic vessels. Lymph drains into blood vessels, delivering molecules to the blood that could not otherwise directly enter the bloodstream. In this way, **specialized lymphatic capillaries transport absorbed fats away from the intestine and deliver these molecules to the blood.**

NOTE: It may be helpful to think of the lymphatic system as a connection between the tissues and the bloodstream. Cells are always undergoing maintenance and repair! The waste material is shuttled out of the cell and into the interstitial fluid that surrounds each cell. From the fluid around the cell the waste enters the lymphatic vessels and is shuttled to the nodes and eventually to the blood and the liver.

The "liquid matrix" mentioned in the text highlights above include a myriad of different factors. A few notable mentions would be gasses such as CO_2, hormones secreted from the endocrine glands, and histamine which is "released into intestinal lymph during fat absorption". www.ncbi.nlm.nih.gov/pmc/articles/PMC3625874/

The brain, part of the central nervous system, has blood vessels but has been thought to lack lymphatic vessels, as they've never been found. Researchers recently discovered a series of channels that surround blood vessels within the brains of mice. This system, managed by the brain's glial cells, was termed the glymphatic system. It moves cerebrospinal fluid, a clear liquid surrounding the brain and spinal cord, quickly and deeply throughout the brain, removing waste. *Continued…*

To better understand the connections between the lymphatic system and the brain, a team led by Drs. Antoine Louveau and Jonathan Kipnis of the University of Virginia School of Medicine used high-powered microscopes to examine the brains of mice. Their research was funded in part by NIH's National Institute on Aging (NIA) and National Institute of Neurological Disorders and Stroke (NINDS). Findings appeared online on June 1, 2015, in *Nature*.

The scientists examined layers of tissue, known as meninges, that cover the brain and contain blood vessels and cerebrospinal fluid. While searching for structures associated with the meninges, the researchers noticed vessel-like patterns. These vessels contained markers of the lymphatic system. By injecting dye into anesthetized mice and tracking its path, they found that the vessels carried fluid and immune cells from the cerebrospinal fluid, along veins in the sinuses, and into nearby deep cervical lymph nodes. The researchers surmise that these vessels may serve as a second step in the drainage of fluid from the brain, after it's drained into the cerebrospinal fluid through the glymphatic system.

These vessels may have gone undiscovered until now due to their hidden location. The method the team used to prepare the meninges kept these layers intact. The researchers found similar structures in autopsy specimens of human meninges. Organization of the vessels in the human central nervous system will now need to be determined.

The discovery of a pathway for immune cells to exit the central nervous system raises the question of whether disruption of this route may be involved in neurological disorders that are associated with immune system dysfunction, such as multiple sclerosis, meningitis, and Alzheimer's disease.

"We think these vessels may play a role in pathogenesis of neurological conditions that have an immune component," Kipnis says. https://www.nih.gov/news-events/nih-research-matters/lymphatic-vessels-discovered-central-nervous-system

37. Which of the following tissues are considered connective tissues?
    A. Cartilage
    B. Bone
    C. Blood & Lymph
    D. All of the above

38. (True or False) Smooth muscle tissue contraction is responsible for involuntary movements in the internal organs. It forms the contractile component of the digestive, urinary, and reproductive systems as well as the airways and arteries. Each cell is spindle shaped with a single nucleus and no visible striations.

NOTE: The increased temperature of inflamed tissues has the twin benefits of inhibiting the growth and division of microbes, while promoting the activity of phagocytes. Using drugs like Tylenol to lower a fever interferes with the body's ability to fight infection.

39. The purpose of inflammation in the body is to limit the cause and extent of injury as well as the repair and regeneration of damaged tissue. In response to injury, _____ cells present in tissue degranulate, releasing the potent vasodilator histamine.
    A. Epithelial
    B. Stem
    C. Mast
    D. All of the above

Unit 2: Chapter 5

40. (True or False) The integumentary system is another name for the skin.

41. The skin is the largest _____ in the body and there are two main layers, the epidermis and the dermis.
    A. Connective tissue
    B. Organ
    C. Gland
    D. All of the above

NOTE: Tinea is a type of fungal infection of the hair, skin, or nails. Tinea is often called ringworm because it may look like tiny worms are under the skin (they're not!). Because the fungi that cause tinea (ringworm) life on different parts of the body, they are named for the part of the body they infect.

TEXT HIGHLIGHTS: Most commercial antiperspirants use an aluminum-based compound as their primary active ingredient to stop sweat. When the antiperspirant enters the sweat gland duct, the aluminum-based compounds precipitate due to a change in pH and form a physical block in the duct. Which prevents sweat from coming out of the pore.

NOTE: A 'retrospective cohort' or 'historical research' study looks back at the medical records of individuals alike in many ways but who differ by certain characteristic(s). These types of studies are not given the credibility of a experimental scientific study that looks for measurable changes in DNA and other factors, however, retrospective studies are useful in that they point to factors that need to be ruled out. There is much controversy in the scientific community whether aluminum plays a part in breast cancer that could easily be ruled out by sizable experimental studies. Unfortunately, to date, only insignificant studies with conflicting results have been done.

"A 2003 retrospective cohort study examining the frequency of underarm shaving and antiperspirant/deodorant use among 437 breast cancer survivors* reported younger age at breast cancer diagnosis for women who used antiperspirants/deodorants frequently or who started using them together with shaving at an earlier age. Because of the retrospective nature of the study, the results are not conclusive."
https://www.cancer.gov/about-cancer/causes-prevention/risk/myths/antiperspirants-fact-sheet#r3

*An Earlier Age of Breast Cancer Diagnosis Related to More Frequent Use of Antiperspirants/deodorants and Underarm Shaving, https://pubmed.ncbi.nlm.nih.gov/14639125/

As another study entitled Aluminum, Antiperspirants and Breast Cancer asserts ,"Clinical studies showing a disproportionately high incidence of breast cancer in the upper outer quadrant of the breast together with reports of genomic instability in outer quadrants of the breast provide supporting evidence for a role for locally applied cosmetic chemicals in the development of breast cancer. Aluminium is known to have a genotoxic profile, capable of causing both DNA alterations and epigenetic effects, and this would be consistent with a potential role in breast cancer if such effects occurred in breast cells. Oestrogen is a well established influence in breast cancer and its action, dependent on intracellular receptors which function as ligand-activated zinc finger transcription factors, suggests one possible point of interference from aluminium. Results reported here demonstrate that aluminium in the form of aluminium chloride or aluminium chlorhydrate can interfere with the function of oestrogen receptors of MCF7 human breast cancer cells both in terms of ligand binding and in terms of oestrogen-regulated reporter gene expression." https://pubmed.ncbi.nlm.nih.gov/16045991/

This scientific article, 'Aluminum and the Human breast' makes somevaluable assertions. "he human population is exposed to aluminium (Al) from diet, antacids and vaccine adjuvants, but frequent application of Al-based salts to the underarm as antiperspirant adds a high additional exposure directly to the local area of the human breast. Coincidentally the upper outer quadrant of the breast is where there is also a disproportionately high incidence of breast cysts and breast cancer. Al has been measured in human breast tissues/fluids at higher levels than in blood, and experimental evidence suggests that at physiologically relevant concentrations, Al can adversely impact on human breast epithelial cell biology. Gross cystic breast disease is the most common benign disorder of the breast and evidence is presented that Al may be a causative factor in formation of breast cysts. Evidence is also reviewed that Al can enable the development of multiple hallmarks associated with cancer in breast cells, in particular that it can cause genomic instability and inappropriate proliferation in human breast epithelial cells, and can increase migration and invasion of human breast cancer cells. In addition, Al is a metalloestrogen and oestrogen is a risk factor for breast cancer known to influence multiple hallmarks. The microenvironment is established as another determinant of breast cancer development and Al has been shown to cause adverse alterations to the breast microenvironment. If current usage patterns of Al-based antiperspirant salts contribute to causation of breast cysts and breast cancer, then reduction in exposure would offer a strategy for prevention, and regulatory review is now justified." https://pubmed.ncbi.nlm.nih.gov/26997127/

NOTE: Although BOTOX® is generally considered safe for cosmetic purposes, it does come with associated health risks up to and including death. BOTOX® is the neurotoxin 'Botulinum toxin type A', the most potent toxin known. It is commonly used for cosmetic purposes to plump out the skin where wrinkles appear. Medicinally, children with cerebral palsy may receive injections to reduce spasticity and dystonia (where the muscles contract involuntarily).

Due to potentially life-threatening effects, the FDA now requires manufacturers of Botox and other botulinum toxin products to include a "black box" warning if the toxin spreads to other areas of the body. Black box or 'boxed' warnings required by the FDA are reserved for serious safety risks. Additionally, the following "Note to physicians" that is included on the Allergan (Botox) 02-Oct-2018 revision of the safety data sheet is interesting:

"WARNING: DISTANT SPREAD OF TOXIN EFFECT. The effects of BOTOX and all botulinum toxin products may spread from the area of injection to produce symptoms consistent with botulinum toxin effects. These symptoms have been reported **hours to weeks after injection**. Swallowing and breathing difficulties can be life threatening and there have been reports of death. The risk of symptoms is probably greatest in children treated for spasticity but symptoms can also occur in adults, particularly in those patients who have an underlying condition that would predispose them to these symptoms. In the event of overdose, antitoxin raised against botulinum toxin is available from the Centers for Disease Control and Prevention (CDC) in Atlanta, GA. However, **the antitoxin will not reverse any botulinum toxin-induced effects already apparent by the time of antitoxin administration**." *Bold for emphasis*
https://media.allergan.com/actavis/actavis/media/allergan-pdf-documents/safety-data-sheets/Botox%20Drug%20product.PDF

"On April 2, 2008 it was revealed in the Journal of Neuroscience (JN) that an Italian study conducted by the National Research Council's Institute of Neuroscience of Pisa, Italy found that protein associated with botulinum toxin injected into the whisker muscles of rats had migrated to the area of the brain stem within three days of injection. Researchers also discovered that the toxin migrated to various other parts of the brain that controls long-term memory and spatial navigation, and from the superior colliculus – which is associated with eye-head coordination – back to the eye." Transdermal Magnesium Therapy by Dr. Mark Sircus p.272

42. In humans, exposure of the skin to sunlight is required for _____.
    A. Vitamin D Synthesis
    B. Arteriole Constriction
    C. Folate Production
    D. Thermoregulation

"Vitamin D itself is biologically inactive, and it must be metabolized to its biologically active forms. After it is consumed in the diet or synthesized in the epidermis of skin, vitamin D enters the circulation and is transported to the liver. In the LIVER, vitamin D is hydroxylated to form 25-hydroxyvitamin D (calcidiol; 25-hydroxyvitamin D), the major circulating form of vitamin D. In the KIDNEY, the 25-hydroxyvitamin D-3-1 hydroxylase enzyme catalyzes a second hydroxylation of 25-hydroxyvitamin D, resulting in the formation of 1,25- dihydroxyvitamin D (calcitriol, 1alpha,25-dihydroxyvitamin D), the most potent form of vitamin D. Most of the physiological effects of vitamin D in the body are related to the activity of 1,25-dihydroxyvitamin D." – Linus Pauling Institute 2016

TEXT HIGHLIGHTS: The epidermal layer of human skin synthesizes **vitamin D** when exposed to UV radiation. In the presence of sunlight, a form of vitamin D_3 called cholecalciferol is synthesized from a derivative of the steroid CHOLESTEROL in the skin. …In addition to its essential role in bone health, vitamin D is essential for general immunity against bacterial, viral, and fungal infections. Recent studies are also finding a link between insufficient vitamin D and cancer.

NOTE: Our bodies need cholesterol and will, in fact, make its own cholesterol when dietary intake is not sufficient (i.e., low-fat diets or diet high in hydrogenated fats and low in healthy fats). Cholesterol is necessary for the production of vitamin D_3.

Match the following action to the correct term involved in the healing process of skin injuries:

TERMS	ACTIONS
43. _____ Blood Clot/Scab	A. Rapidly divide to deposit collagen for tissue repair
44. _____ Immune Cells	B. Recreate the epidermis
45. _____ Fibroblasts	C. Stops the flow of blood and protects wound
46. _____ Blood Capillaries	D. Increase blood circulation and oxygen
47. _____ Basal Stem Cells	E. Reduce chance of infection

NOTE: "Sulfur baths, and other forms of sulfur applied to the skin, seem to help treat psoriasis, eczema, dandruff, folliculitis (infected hair follicles), warts, and pityriasis versicolor, a long-lasting skin disorder characterized by patches of skin that are a different color form the usual skin tone." – *University of Maryland Medical Center, 2016*

Unit 2: Chapter 6

NOTE: Bone development occurs in three general phases that coincide with age: growth, modeling or consolidation, and remodeling. The remodeling phase predominates during adulthood, with bone resorption and formation activities constantly occurring in linked succession (resorption refers to the breakdown of bone by osteoclasts, resulting in the release of calcium and phosphate [bone mineral] into the blood.)

48. (True or False) Bone, or osseous tissue, is a hard, dense connective tissue that forms most of the adult skeleton. It is the only tissue in the body that is considered to be calcified and non-living.

49. The skeletal system is made of _____.
    A. Muscles and tendons
    B. Bones and cartilage
    C. Vitreous humor
    D. Minerals and fat

50. Bones protect internal organs from injury by covering or surrounding them. Which of the following statements is true?
    A. The ribs protect the lungs and the heart
    B. The spine (vertebral column) protects the spinal cord
    C. Skull bones (cranium) protect the brain
    D. All of the above

51. Bones perform which of the following functions?
    A. Storage of minerals important to body function
    B. Fat storage and blood cell production
    C. The production of estrogen and testosterone
    D. A & B only

52. (True or False) Flat bones, like those of the cranium, consist of a layer of spongy bone, lined on either side by a layer of compact bone. The two layers of compact bone and the interior spongy bone work together to protect the internal organs. If the outer layer of a cranial bone fractures, the brain is still protected by the intact inner layer.

53. (True or False) The spongy bone and medullary cavity receive nourishment from arteries that pass through the compact bone. The arteries enter through the nutrient foramen. As the blood passes through the marrow cavities, it is collected by veins, which then pass out of the bone through the foramina.

54. Why is cartilage slow to heal?
    A. Because it eventually develops into bone
    B. Because it is semi-solid and flexible
    C. Because it does not have a blood supply
    D. Because endochondral ossification replaces all cartilage with bone

55. Bones continue to grow in length until early adulthood. The rate of growth is controlled by:
    A. Hormones
    B. Chondrocytes
    C. The Calcified Matrix Zone
    D. Cell Maturation

56. (True or False) In adults about 35 percent of the skeleton is remodeled annually just by destroying old bone and renewing it with fresh bone.

57. (True or False) People who exercise regularly have greater bone density than people who are more sedentary. Resistance training is especially important to slow down the eventual bone loss due to aging and for preventing osteoporosis.

58. Milk and other dairy foods are not the only sources of calcium. This important nutrient is also found in green leafy vegetables, broccoli, and intact _____ and canned sardines with their soft bones. Nuts, beans, seeds, and shellfish provide calcium in smaller quantities.
    A. Trout
    B. Salmon
    C. Cod
    D. Pike

TEXT HIGHLIGHTS: Vitamin K also supports bone mineralization and may have a synergistic role with vitamin D in the regulation of bone growth. Green leafy vegetables are a good source of vitamin K.

The minerals magnesium and fluoride may also play a role in supporting bone health. While magnesium is only found in trace amounts in the human body, more than 60 percent of it is in the skeleton, suggesting it plays a role in the structure of bone. Fluoride can displace the hydroxyl group in bone's hydroxyapatite crystals and form fluorapatite. Similar to its effect on dental enamel, fluorapatite helps stabilize and strengthen bone mineral. Fluoride can also enter spaces within hydroxyapatite crystals, thus increasing their density.

Omega-3 fatty acids have long been known to reduce inflammation in various parts of the body. Inflammation can interfere with the function of osteoblasts, so consuming omega-3 fatty acids, in the diet or in supplements, may also help enhance production of new osseous tissue.

NOTE: The process of bone formation requires an adequate and constant supply of nutrients. Nutrients that are known to directly and indirectly affect bone structure are: vitamins A, C, D, K, B6, B12, folic acid, and the minerals phosphorus, calcium, potassium, magnesium, fluoride (naturally-occurring non-toxic fluoride from real food, not toxic industrial-waste fluoride that is put in our drinking water, added to toothpaste, and used topically by dentists), sodium, manganese, copper, boron, iron, and zinc. A daily supply of dietary protein is required for bone maintenance.

Also note that magnesium is considered a "macro-mineral" (not a trace mineral as described in the text) with the adult body containing about 25 grams. https://ods.od.nih.gov/factsheets/Magnesium-HealthProfessional/ Magnesium is also a co-factor in over 300 enzymatic reactions in the human body and like calcium, requires vitamin D for best absorption.

Additionally, the trace mineral boron is necessary for bone health as it boosts calcium absorption, driving it deep into the tissues where it needs to be. The article entitled 'Nothing Boring About Boron' by Lara Pizzorno published in Integrative Medicine: A Clinician's Journal, states: "Boron plays an important role in osteogenesis, and its deficiency has been shown to adversely impact bone development and regeneration. Boron influences the production and activity of steroid hormones, actions via which this trace mineral is involved in the prevention of calcium loss and bone demineralization. Boron supplementation has repeatedly been shown to markedly reduce urinary excretion of both calcium and magnesium and to increase serum levels of estradiol and

calcium absorption in peri- and postmenopausal women. Boron also beneficially impacts vitamin-D utilization. Supplementation with boron stimulates bone growth in vitamin-D deficient animals and alleviates dysfunctions in mineral metabolism characteristic of vitamin-D deficiency." https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4712861/

"Data indicate that various protein sources may exhibit different effects on bone metabolism. Some, but not all, studies have found that meat as a protein source is associated with higher serum levels of IGF-1, which is in turn associated with increased bone mineralization and fewer fractures. Soy foods have been linked with lower levels of IGF-1." (American Society for Clinical Nutrition, 2015)

59. (True or False) When an elderly person falls and breaks a hip (really, the femur), it is very likely the femur that broke first, which resulted in the fall.

60. Parathyroid hormone has which of the following effect(s) on the skeletal system:
    A. Stimulates osteoclast proliferation and activity
    B. Promotes the reabsorption of calcium by the kidney tubules
    C. Stimulate the synthesis of vitamin D promoting the intestinal absorption of calcium
    D. All of the above

Unit 2: Chapter 7

NOTE: Bone cells that are responsible for bone formation are called osteoblasts, they later mature into osteocytes. Osteoblast cells secrete both the organic and inorganic components of bone. Osteoclasts are involved in resorption of bone to maintain the optimum shape.

61. The skeletal system forms the rigid internal framework of the body. It consists of:
    A. Bones, Cartilages, and Ligaments
    B. Muscles, Bones, and Cartilages
    C. Cranium, Bones, and Thoracic Cage
    D. Bones, Joints, and Skull

62. There are _____ total bones in the adult skeleton. The Axial skeleton consisting of _____ and the appendicular skeleton consisting of _____ bones:
    A. 206, 126, 80
    B. 232, 126, 106
    C. 206, 80, 126
    D. 232, 106, 126

63. (True or False) Younger individuals have higher numbers of bones because some bones fuse together during childhood and adolescence to form an adult bone.

64. (True or False) The appendicular skeleton forms the vertical, central axis of the body and includes all bones of the head, neck, chest, and back. It serves to protect the brain, spinal cord, heart, and lungs. It also serves as the attachment site for muscles that move the head, neck, and back, and for muscles that act across the shoulder and hip joints to move their corresponding limbs.

65. (True or False) A cleft palate makes it very difficult for an infant to generate the suckling needed for nursing, thus leaving the infant at risk for malnutrition.

66. (True or False) The sphenoid sinuses are most commonly involved during sinus infections. Because their connection to the nasal cavity is located high on their medial wall, they are difficult to drain.

67. The adult vertebral column consists of _____ vertebrae, plus the sacrum and coccyx.
    A. 22
    B. 24
    C. 26
    D. 32

68. The cervical region of the vertebral column consists of _____.
    A. 7 Vertebrae
    B. 12 Vertebrae
    C. 5 Vertebrae
    D. A single bone derived from the fusion of five vertebrae

69. Embryonic development of the axial skeleton involves _____.
    A. Intramembranous ossification, which forms the facial bones
    B. Endochondral ossification, which forms the ribs and sternum
    C. The notochord, which produces the cartilage models for the vertebrae
    D. The formation of hyaline cartilage models, which give rise to the flat bones of the skull

Unit 2: Chapter 8

70. The most commonly fractured bone in the body is _____.
    A. The Femur
    B. The Clavicle
    C. The Funny Bone
    D. The Radius

71. The _____ and _____ joints are responsible for all the movements of the hand at the wrist.
    A. The Phalanx and Meninges
    B. The Ulna and Radius
    C. The Tibia and Fibula
    D. The Radiocarpal and Midcarpal

72. (True or False) Carpal tunnel syndrome is caused by the overuse of the muscle tendons or by a wrist injury that produces inflammation and swelling and, therefore, compression of a nerve within the narrow tunnel through which the tendons of nine muscles of the anterior forearm and the nerve pass to the hand. This syndrome is characterized by pain or numbness, and muscle weakness in those areas of the hand supplied by this nerve.

73. (True or False) Elderly people whose bones are weakened due to osteoporosis are prone to fractures.

74. The boney pelvis is the entire structure formed by the two hip bones, the sacrum, and, attached inferiorly to the sacrum, the coccyx. The primary purpose for this structure is:
    A. To provide mobility to the body
    B. To bear weight
    C. To protect reproductive organs
    D. To allow humans to sit

75. Which is the longest and strongest bone of the body?
    A. The Humorous
    B. The Ulna
    C. The Tibia
    D. The Femur

76. (True or False) Toes are the common name for the metatarsal bones of the foot.

77. (True or False) In an embryo, each upper and lower limb initially develops as a small bulge called a limb bud.

78. (True or False) These days, most cases of clubfoot are corrected with surgery.

Unit 2: Chapter 9

79. Joints allow flexibility and movement of the skeleton and allow attachment between bones. There are three classifications of structural joints (articulations) that include which of the following?
    A. Fibrous, Cartilaginous, and Ligament
    B. Fibrous, Cartilaginous, and Synovial
    C. Fibrous, Cartilaginous, and Suture
    D. All of the above

80. (True or False) The functional classification of joints is determined by the amount of mobility found between the adjacent bones.

81. _____ joints allow flexibility and movement and stabilizes the alignment of the bones.
    A. Fibrous
    B. Cartilaginous
    C. Synovial
    D. All of the above

82. Cartilaginous joints are a tough but flexible type of connective tissue which made from:
    A. Synovial Cartilage
    B. Fibrocartilage
    C. Hyaline Cartilage
    D. B & C only

83. Synovial joints are characterized by the presence of a _____ cavity filled with fluid.
    A. Moveable
    B. Fibrous
    C. Joint
    D. All of the above

NOTE: Synovial fluid fills the spaces in synovial joints. It nourishes the structures within the joint cavity, contains phagocytes, acts as a lubricant, maintains joint stability, and prevents the ends of bones from being separated. The following 'text highlights' from chapter 4 is an excellent description to bring back to remembrance.

TEXT HIGHLIGHTS: A synovial membrane is a type of connective tissue membrane that lines the cavity of a freely movable joint. For example, synovial membranes surround the joints of the shoulder, elbow, and knee. Fibroblasts in the inner layer of the synovial membrane release hyaluronan into the joint cavity. The hyaluronan effectively traps available water to form the synovial fluid, a natural lubricant that enables the bones of a joint to move freely against one another without much friction. This synovial fluid readily exchanges water and nutrients with blood, as do all body fluids.

84. (True or False) Bursae are pus-filled sacs that serve to prevent friction between skin, muscle, or tendon and an underlying bone.

85. The most common type of arthritis is osteoarthritis, which is associated with _____ and "wear and tear" of the articular cartilage.
    A. Activity
    B. Aging
    C. Drinking Milk
    D. All of the above

86. (True or False) The range-of-motion of the hip is more limited than that of the shoulder joint because the hip carries the weight of the body and thus requires strength and stability during standing and walking.

87. (True or False) The embryonic tissue that gives rise to all bones, cartilages, and connective tissues of the body is called mesenchyme.

Unit 2: Chapter 10

88. Name the three types of muscle:
    A. Skeletal, Cardiac, and Involuntary
    B. Skeletal, Cardiac, and Smooth
    C. Skeletal, Digestive, and Smooth
    D. Voluntary, Cardiac, and Smooth

TEXT HIGHLIGHTS: Every skeletal muscle is also richly supplied by blood vessels for nourishment, oxygen delivery, and waste removal. In addition, every muscle fiber in a skeletal muscle is supplied by the axon branch of a somatic motor neuron, which signals the fiber to contract. Unlike cardiac and smooth muscle, the only way to functionally contract a skeletal muscle in through signaling from the nervous system.

NOTE: Food for thought! ~ The human body not only is very chemical in its reactions; it is very electric. There are different ways of measuring this. Here's one to think about. The term pH means Potential Hydrogen. Therefore, the pH number corresponds to an actual measurement of voltage called millivolts (mV). This is why you hear about the dangers of the body becoming too acidic as it disrupts the voltage (or membrane potential) of cells. The truth is, the body requires balance and can also become too alkaline which is disruptive as well.

Another way to consider that the body uses and makes electricity is that it needs "electrolytes". What are electrolytes? Electrolytes are minerals that carry an electric charge. They are necessary in various bodily processes, including proper nerve and acid-base balance. Proper hydration is also important in maintaining the body's electrolyte balance. Pure water itself does not conduct electricity; it is the minerals dissolved in water that do. These minerals are: sodium, potassium, chloride, calcium, magnesium, phosphate, and bicarbonate. Electrolytes are needed by the nervous system and for proper muscle function.

TEXT HIGHLIGHTS: All living cells have membrane potentials, or electrical gradients across their membranes. The inside of the membrane is usually around -60 to -90 mV, relative to the outside. This is referred to as a cell's membrane potential. Neurons and muscle cells can use their membrane potentials to generate electrical signals. They do this by controlling the movement of charged particles, called ions, across their membranes to create electrical currents. This is achieved by opening and closing specialized proteins in the membrane called ion channels. Although the currents generated by ions moving through these channel proteins are very small, they form the basis of both neural signaling and muscle contraction.

Both neurons and skeletal muscle cells are electrically excitable, meaning that they are able to generate action potentials. An action potential is a special type of electrical signal that can travel along a cell membrane as a wave. This allows a signal to be transmitted quickly and faithfully over long distances.

89. (True or False) The “excitation” step in skeletal muscles is always triggered by signaling from the nervous system.

90. (True or False) The relaxation of a skeletal muscle begins with the motor neuron. When the motor neuron stops releasing its chemical signal, ACh, into the synapse and the NMJ (neuromuscular junction). The muscle fiber will then repolarize.

91. (True or False) Cardiac muscle is striated muscle that is present throughout the body.

Unit 2: Chapter 11

92. (True or False) It is not important to stretch and increase blood flow to the muscles prior to exercising.

93. The large mass at the center of a muscle is called the _____. Tendons emerge from both ends of the (insert same word here) and connect to the muscle to the bones, allowing the skeleton to move.
    A. Belly
    B. Bulge
    C. Bump
    D. Swell

94. Which of the following is unique to the muscles of facial expression?
    A. They insert onto the cartilage found around the face
    B. They all originate from the scalp musculature
    C. They insert into the skin
    D. They only insert onto the facial bones

95. The muscles of the chest serve to facilitate breathing by changing the _____ of the thoracic cavity. When you inhale, your chest rises because the cavity expands. Alternately, when you exhale, your chest falls because the thoracic cavity decreases in size.
    A. Shape
    B. Size
    C. Pressure
    D. All of the above

96. Defecating, urination, and even childbirth involve _____ between the diaphragm and abdominal muscles (this is referred to as the “Valsalva maneuver”). You hold your breath by a steady contraction of the diaphragm; this stabilizes the volume and pressure of the peritoneal cavity. When the abdominal muscles contract, the pressure cannot push the diaphragm up, so it increases pressure on the intestinal tract (defecation), urinary tract (urination), or reproductive tract (childbirth).
    A. Cooperation
    B. Isolation
    C. Separation
    D. All of the above

97. (True or False) Most muscles that insert on the femur (the thigh bone) and move it, originate on the pelvic girdle.

~ END of PART I ~