TISSUES TO ORGANS TO ORGANISMS—HUMAN ANATOMY & PHYSIOLOGY

A 14-DAY MEDITATION ON THE BODY SYSTEMS

Consider taking a 14-day period this summer to meditate on the wondrous structure and function of the human body, specifically yours!

- Start on the first day refamiliarizing yourself with the 11 body systems by quickly reading through these pages and reading Psalm 139.
- On each of the next 11 days, spend time focusing on one of the body systems.
- On the 13th day, meditate on how the whole body works together. Let wonder fill your mind as you proceed through this sacred time. Let gratitude fill your heart too!
- On the 14th (and subsequent days), move through your life with an increased awareness of who YOU are.

THE FIRST DAY—

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To honor the body itself, read Psalm 139 three times:

- First, to get a sense of it.
- Second, more slowly as you allow the words to sink in more deeply.
- A third time…looking for a particular phrase or word that speaks to you most at this moment. Stop and spend silent time with that passage.

Prayer for the End of Each Day

> Heavenly Father, I thank you for the gift of my whole body with its many wondrous systems.
>
> (for days 2-12: Today I want to thank you particularly for the _____ system. I have learned so much about myself by focusing on that system today. [Pause to recall the learnings and experiences of the day.])
>
> I have also learned about the abundant love and care you have for me and indeed for all creation. Help me to treasure my body, to take better care of it, so that I may accomplish whatever you ask of me to build your reign. Help me too to treasure all those around me: strangers & friends; fellow citizens & foreign visitors and immigrants; those similar and those different from myself. I ask this through Jesus Christ, your Son, who also dwelled within a human body, and who lives and reigns with you and the Holy Spirit, one God, forever and ever. Amen!

Bless the Lord, all you organisms,
With your cells, bless the Lord,
With your tissues, bless the Lord,
With your organs and their systems, bless the Lord,
Praise and exult God forever!

DAYS 2-12: ONE FOR EACH OF THE 11 BODY SYSTEMS:

- What are the structures and functions of the body system you will meditate on today?
- Recall a few times you saw the operation of this body system at work or experienced its effects? How do you feel now knowing that God has provided a wonderous structure to achieve that function?
- At what times have you been most grateful for this body system. Thank God for it! Tell yourself or someone else a story about it.
- On the other hand, when have you taken for granted or looked down upon this system? Take time to express a newfound appreciation for it, to yourself and to God.
- Some suggestions for each system, if you need something to jumpstart your day!

The pictures that accompany each day come from
http://www.ainuna.com/all-of-the-organ-systems-14/

Integumentary system (Day 2)

- Consists of skin = epidermis (surface of skin) and the dermis [consisting of sweat glands, sebaceous glands, hair follicles]
- Notice how your skin protects the body from infection and ultra-violet (UV) light.
- Notice how the evaporation of sweat from your body help to cool it off and maintain temperature within a narrow range. In fact, if you're hot and cease sweating, watch out, you are headed for heat stroke!
- If you happen to injure your skin, take note of its self-healing properties.
- If you don't get much sunshine, take a walk in the sun or take some vitamin D3 to help improve your health.
- Use your favorite body lotion to honor your skin and to initiate a conversation with it!

Skeletal system (Day 3):

- Consists of bones, cartilage (padding between bones), ligaments (found around joints between bones and/or cartilages) and tendons (attaches muscle to bone)
- Today stand up straight (with good posture) in honor of your good bones.
- Feel your ribs and how they protect your lungs. What other bones protect organs? HINT: Use your head to start!
- Notice different parts of your body throughout the day and how your bones give them shape! How do the shape of the bones and the joints between them allow the body to move in various directions, or not? Can you feel where your muscles attach to bone?
- Thank God for the basic functions of the skeletal system besides support
    - storing calcium and minerals needed for muscle contraction and nerve signal transduction
    - blood cell production
- Enjoy "The Human Bones Song": https://www.youtube.com/watch?v=h5dYvPruBFY
- Enjoy "The Skeleton Dance": https://www.youtube.com/watch?v=e54m6XOpRgU

Muscular system (Day 4):

- Types of muscle:
    - skeletal (for movement),
    - smooth (for involuntary movement such as in your gut for digestion),
    - cardiac (heart).
- As you move throughout the day, notice which skeletal muscles you're using
    - to sit and stand
    - to move from place to place
    - to grasp objects throughout the day
- If you have a flexibility or stretching program you use for exercise, consider doing it mindfully today to thank your muscles for their constant hard work.
- Notice how muscles are set-up in pairs to accomplish opposing motion. For example, the biceps lift the lower arm up when they contract; the triceps, bring it down. And, the quadriceps lift the lower leg up when they contract; the hamstrings, bring it down.

Nervous system (Day 5):

- Consists of brain, spinal cord and nerves.
- Spend part of the day experiencing the touch of different textures. What emotions do these textures evoke?
- Take note throughout the day of each of your other senses…sight, hearing, smell, taste.
- Thank God for your reflexes today!
- Notice how the brain gives you the ability to think, reflect, make decisions, move, etc.
- Thank God for the autonomic (or involuntary) nervous system which
    - keeps your heart beating, controls rate of breathing, adjusts your blood pressure,
    - aids in digestion, urination and defecation,
    - controls metabolism and body temperature,
    - initiates sexual arousal to stimuli,
    - produces bodily fluids such as
        - sweat, to help regulate body temperature,
        - tears, to flush the eyes and express emotion
        - saliva, to begin digesting food in the mouth
    - balance of electrolytes at a cellular level.
- What do you do with the "nervous energy" that accompanies stress? At what times does it motivate or paralyze you?

Endocrine system (Day 6):

Take time to look at the list of hormones below and how they regulate several of the other body systems. The endocrine system is like the conductor of an orchestra, giving direction to its various musicians. Notice how these different hormones are engaged throughout your day.

- Adrenal—makes cortisol to help with stress
- Hypothalamus—its antidiuretic hormone regulates fluid balance
- Ovaries/Testes—make the sex hormones, estrogen and progesterone
- Pancreas—produces insulin to digest glucose & other sugars
- Pituitary—adrenaline is produced as a response of the body to emergencies or crisis; somatotropin is a growth hormone important in development during childhood and adolescence
- Thymus—this gland makes a hormone which assists in the production of T-cells in the immune system.
- Thyroid—makes thyroxin, controlling metabolism and weight; parathormone, controls levels of calcium and phosphate in the blood.

Cardiovascular (circulatory) system (Day 7):

- Consists of the heart, arteries, veins and capillaries, creating the transportation highway for the body
- Start with taking your pulse on your neck or your wrist:
  - when you're resting.
  - while you're walking or after vigorous exercise.
- rBecome aware of how blood is constantly circulating throughout your body every moment of every day of your life. Over a lifetime of 80 years at an average rate of one heartbeat each second, your heart will contract over 2.5 billion times! At the same rate in the last 24-hour period, that's 86,400 times!
- As you stretch your muscles, breathe more deeply into the ones that are most sore (and need lots of oxygen!).
- Meditate on the path that releases CO_2 and reoxygenates the blood:
  - from the biggest veins, the superior and inferior vena cava back to the right atrium of the heart,
  - through the tricuspid valve, from the right atrium to the right ventricle,
  - through the pulmonary valve to the pulmonary artery,
  - where it enters the lungs, releasing CO_2 and accepting O_2.
  - After the lungs, it enters the pulmonary vein to the left atrium.
  - passing through the mitral valve to the right ventricle and then finally,
  - through the aortic valve to the biggest artery, the aorta.
  - What will/did your path of rejuvenation throughout today look like?
- Meditate on what the blood can do once it is energized:
  - Arteries take blood through smaller and smaller blood vessels until capillaries allow the extraction of O_2 where needed.
  - The blood also releases CO_2 to the capillaries which will travel back through the veins to the superior or inferior vena cava.
  - What does the successful work of my day look like?
- What happens to the body if oxygenation is not sufficient? What happens to my actions during the day if my rejuvenation is not sufficient?

Cardiovascular system
- Transports nutrients, respiratory gases, wastes, and heat
- Transports immune cells and antibodies
- Transports hormones
- Regulates pH

Lymphatic and immune system (Day 8):

- Consists of white blood cells (T-cells, B cells, and macrophages) as well as lymph vessels which return fluid lost from the circulatory system back to it.
- The immune system gives us protection from anything not recognized as ourselves. You may not realize it, but your immune system has helped you *stay* healthy most of the time, fighting off germs and other bodily invaders! Spend a day when you feel well, rejoicing in this.
- The immune system also helps when you do get sick, to produce mucus and other bodily fluids once bacteria or viruses take hold. If you happen to get sick during the 14-day meditation, use this day to thank God for your immune system as it helps you to feel better (eventually)!
- Rest! The immune system does its best work at that time.

Lymphatic system
- Returns tissue fluids to bloodstream
- Protects against infection and disease

Respiratory system (Day 9):

- Consists of the nose, trachea, bronchi, bronchioles, alveoli and the lungs.
- Breathe in fresh air! Take some time (2-3 minutes) periodically throughout the day to notice how automatic this essential activity is. Allow the fresh air to rejuvenate your body! Breathe deeply!
- Breathe out! Notice how clean and relaxed your body feels after exhaling out CO_2 and other waste products.
- When you overexert yourself today, notice your need to slow down and tend to your breath. Without sufficient breath, we cannot live!
- Notice how the respiratory system gives the body a way to allow gases to enter and to exit the body.

Respiratory system
- Exchanges respiratory gases with the environment

Digestive system (Day 10):

- Digestive enzymes enter the digestive system from the salivary glands (mouth), the pancreas, the liver and the gall bladder.
- First feast on your food with your eyes, and then as you place the food into your mouth,
- Let the taste of your food linger on your tongue and enjoy the sensations of sweet, sour, salty and bitter…maybe even umami (savory).
- Enjoy the scent of your food with your nose before you eat and just before you swallow.
- Feel the food travel from your mouth through your throat and esophagus to your stomach.
- Notice when you feel either full or empty. Do you stop at appropriate times when you are full and eat when you are mostly empty?
- Meditate on the digestion occurring mostly in your stomach and your small intestine. Your body is quietly extracting nutrients from your food at this time.
- When you defecate, thank God for your body's ability to get rid of solid waste. Try to notice how many days food spends in your body.

Digestive system
- Physical and chemical breakdown of food
- Absorbs, processes, stores food

Urinary (excretory) system (Day 11):

- Consists of the kidneys, ureters, bladder and urethra.
- This is the way your body rids itself of liquid or dissolved waste.
- As you urinate today, thank God for this system which cleanses our bodies of wastes from our metabolism. Be sure to drink six to eight glasses 8-ounce glasses of water to encourage this meditation!
- And, even if you have very little time today to meditate, use the time in the bathroom (obviously not optional) to take a few minutes to notice this system!

Urinary system
- Maintains constant internal environment through the excretion of nitrogenous waste

Reproductive system (Day 12):

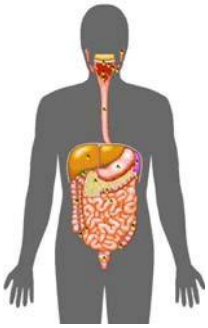
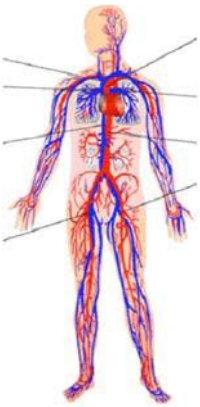
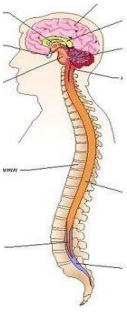
- Consists of:
  - The egg-producing ovaries and uterus in women.
  - The sperm-producing testes and penis in men.
- Notice the drive within you to procreate and/or to be intimate with another.
- How does your relationship support this desire?
- If you have children, recall the process of childbirth and rejoice in the fruits of your reproductive system.
- Spend some time thinking about the wonder of fertilization and pregnancy.
- If you are past the years where conception is possible, give thanks for the ways in which your reproductive system has served you well in your life, if only with the possibility of bringing forth the next generation of people to the Earth.

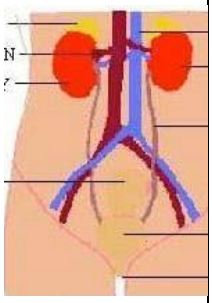
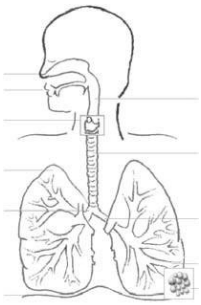
DAYS 13 and 14--

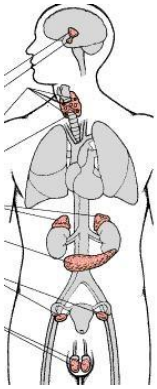
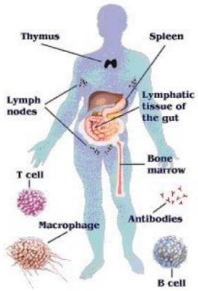
- To honor the body itself with your new appreciation of it from your meditations, read Psalm 139 three times again:
  - First, to review it again.
  - Second, more slowly as you allow the words to sink in more deeply.
  - A third time…looking for a particular phrase or word that speaks to you most at this time. Stop and spend silent time with that passage.
- Respond with a
  - letter of gratitude to your body.
  - a story around one or more the body systems and how it works in cooperation with other body systems to achieve a greater good!
  - painting or sketch that speaks of the interconnectedness of your own body.
  - prayerfully listening to a classical piece of music, taking note of how the instruments *together* convey the message, making a beautiful work possible. A suggestion from my experience as a lover of classical music:
    - Pachelbel's Canon in D: https://www.youtube.com/watch?v=Rk5DWqls0gg
- Walk through this last day, and the rest of your life, with an increased awareness of how sacred your body is. Thank God for this awareness!

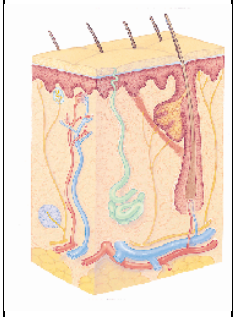
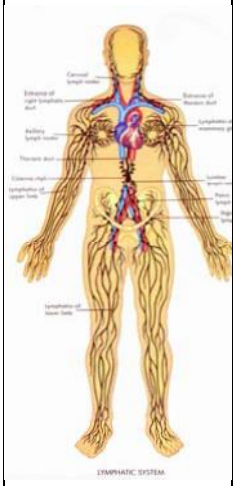
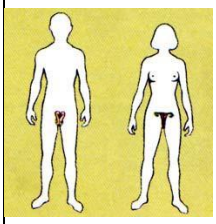
MORE SCIENCE BEHIND THE 14-DAY MEDITATION FOR THE BODY SYSTEMS

https://www.wsfcs.k12.nc.us/cms/lib/NC01001395/Centricity/Domain/8472/Body%20Systems%20Interactions%20chart.pdf

System	Function	Diagram	Major Organs	Interactions with other Systems
Digestive	1. take in food (ingestion) 2. digest food into smaller molecules and absorb nutrients 3.remove undigestable food from body (feces)		Mouth, esophagus, stomach, Sm. Intestine, Lg. intestine, rectum, anus Salivary glands, pancreas, liver, gall bladder	1. w/circulatory – absorb & deliver the digested nutrients to the cells 2. w/muscular – control the contractions of many of the digestive organs to pass food along 3.w/nervous – hypothalamus maintains homeostasis by triggering appetite (stomach growling), digest.
Circulatory	Transport materials to and from cells		Heart Veins Arteries Capillaries Red blood cells	1. w/respiratory – deliver O_2 from lungs to cells and drop off CO_2 from cells to lungs 2. w/digestive – absorb and deliver digested nutrients to cells 3. w/excretory - kidneys filter cellular waste out of blood for removal 4. w/lymphatic – both transport things to and from cells 5. w/immune – transports WBCs throughout body to fight disease 6. w/nervous – brain controls heartbeat 7. w/endocrine – trans. hormones
Nervous	1. gathers & interprets information 2. responds to info 3.helps maintain homeostasis		Brain and Spinal cord Nerve cells = neurons hypothalamus	Controls all other systems Hypothalamus – maintains homeostasis by working with all systems

System	Function	Diagram	Major Organs	Interactions- Working with Other Systems
Excretory	1. removes waste products from cellular metabolism (urea, water, CO_2) 2. filters blood		Kidneys Ureters Bladder Urethra Lungs Skin – sweat glands Liver (produces urea)	1. w/circulatory – filters waste out of blood 2. w/lungs – removes excretory waste 3. w/integumentary – removes excretory waste
Respiratory	Takes in oxygen and removes carbon dioxide and water		Nose Trachea Bronchi Bronchioles Alveoli lungs	1. w/circulatory – takes in O_2 for delivery to cells and removes CO_2 brought from cells 2. w/excretory – removes excretory waste 3. w/nervous – controls breathing 4. w/muscular – diaphragm controls breathing
Skeletal	1. protects organs 2. provides shape, support 3.stores materials (fats, minerals) 4. produces blood cells 5. allows movement		Bones Cartilage ligaments	1. w/muscular – allow movement 2. w/circulatory – produce blood cells 3. w/immune – produce white blood cells 4. w/circulatory and respiratory – protects its organs

System	Function	Diagram	Major Organs	Interactions- Working with Other Systems
Muscular	Allows for movement by contracting		Cardiac muscle Smooth muscle Skeletal muscle tendons	1. w/skeletal – allow movement 2. w/digestive – allow organs to contract to push food through 3. w/respiratory – diaphragm controls breathing 4. w/circulatory – controls pumping of blood (heart) 5. w/nervous – controls all muscle contractions
Endocrine	Regulates body activities using hormones. Slow response, long lasting		Glands *Hypothalamus *Pituitary *Thyroid *Thymus *Adrenal *Pancreas *Ovaries/Testes Glands produce Hormones	1. w/circulatory – transports hormones to target organs 2. w/nervous – maintain homeostasis, hormone release 3. w/reproductive – controlled by hormones 4. w/skeletal – controls growth of bones
Immune (sometimes includes the lymphatic system—see below)	Fights off foreign invaders in the body		White Blood Cells (WBC) *T cells *B cells -produce antibodies *Macrophages Skin	1. w/circulatory- transports WBCs to fight invaders 2. w/lymphatic – has many WBCs to fight invaders, spleen filters bacteria & viruses out of blood 3. w/skeletal – WBCs made in bone marrow 4. w/integumentary – prevents invaders from getting in

System	Function	Diagram	Major Organs	Interactions- Working with Other Systems
Integumen-tary	1. barrier against Infection (1st line of defense) 2. helps regulate body temp. 3.removes excretory waste (urea, water) 4. protects against sun's UV rays 5. produces vitamin D		SKIN *Epidermis *Dermis - sweat gland - sebaceous gland (oil) - hair follicle - blood vessels - nerves	1. w/excretory – removes cellular waste 2. w/nervous – controls body temperature (sweating, goose bumps) 3. w/immune – prevents pathogens from entering
Lymphatic	1. stores and carries WBC's that fight disease 2.collects excess fluid and returns it to blood (2nd circulatory system-reaches places other one can't – between cells)		Lymph (liquid part of blood – plasma, when it's in lymph vessels) Lymph Vessels Lymph Nodes Contain WBCs	1. w/immune – holds lots of WBCs to fight pathogens 2. w/circulatory – to transport materials to and from cells
Reproduct-ive	Allows organisms to reproduce which prevents their species from becoming extinct.		Ovaries *produce eggs Testes *produce sperm	1. w/endocrine – controls production of sex cells 2. w/muscular – uterus contracts to give birth – controlled by hormones

VIDEO SERIES ON ANATOMY & PHYSIOLOGY

Integumentary System
https://www.youtube.com/watch?v=Orumw-PyNjw
The Integumentary System—Part 1: Skin Deep Crash Course A&P #6
https://www.youtube.com/watch?v=EN-x-zXXVwQ
The Integumentary System—Part 2: Skin Deeper Crash Course A&P #7

Nervous System
https://www.youtube.com/watch?v=qPix_X-9t7E
The Nervous System, Part 1: Crash Course A&P #8
https://www.youtube.com/watch?v=OZG8M_ldA1M
The Nervous System, Part 2—Action! Potential!: Crash Course A&P #9
https://www.youtube.com/watch?v=VitFvNvRIIY
The Nervous System, Part 3—Synapses!: Crash Course A&P #10
https://www.youtube.com/watch?v=q8NtmDrb_qo
Central Nervous System: Crash Course A&P #11
https://www.youtube.com/watch?v=QY9NTVh-Awo
Peripheral Nervous System: Crash Course A&P #12
https://www.youtube.com/watch?v=71pCilo8k4M
Autonomic Nervous System: Crash Course A&P #13
https://www.youtube.com/watch?v=0IDgBlCHVsA
Sympathetic Nervous System: Crash Course A&P #14
https://www.youtube.com/watch?v=qqU-VjqjczE
Parasympathetic Nervous System: Crash Course A&P #15
https://www.youtube.com/watch?v=mFm3yA1nslE
Taste & Smell: Crash Course A&P #16
https://www.youtube.com/watch?v=Ie2j7GpC4JU
Hearing & Balance: Crash Course A&P #17
https://www.youtube.com/watch?v=o0DYP-u1rNM
Vision: Crash Course A&P #18

Skeletal System
https://www.youtube.com/watch?v=rDGqkMHPDqE The Skeletal System: Crash Course A&P #19
https://www.youtube.com/watch?v=DLxYDoN634c Joints: Crash Course A&P #20

Muscular System
https://www.youtube.com/watch?v=Ktv-CaOt6UQ
Muscles, Part 1—Muscle Cells: Crash Course A&P #21
https://www.youtube.com/watch?v=I80Xx7pA9hQ&t=198s
Muscles, Part 2—Organismal Level: Crash Course A&P #22

Endocrine System
https://www.youtube.com/watch?v=eWHH9je2zG4
Endocrine System, Part 1—Glands and Hormones: Crash Course A&P #23
https://www.youtube.com/watch?v=SCV_m91mN-Q
Endocrine System, Part 2—Hormone Cascades: Crash Course A&P #24

Cardiovascular (circulatory) System
https://www.youtube.com/watch?v=X9ZZ6tcxArI The Heart, Part 1—Under Pressure: Crash Course A&P #25
https://www.youtube.com/watch?v=FLBMwcvOaEo The Heart, Part 2—Heart Throbs: Crash Course A&P #26
https://www.youtube.com/watch?v=v43ej5lCeBo Blood Vessels, Pt 1—Form & Function: Crash Course A&P#27
https://www.youtube.com/watch?v=ZVklPwGALpI Blood Vessels, Part 2: Crash Course A&P #28
https://www.youtube.com/watch?v=HQWlcSp9Sls Blood, Part 1—True Blood: Crash Course A&P #29
https://www.youtube.com/watch?v=9-XoM2144tk Blood, Part 2—There Will Be Blood: Crash Course A&P #30

Respiratory System
https://www.youtube.com/watch?v=bHZsvBdUC2I Respiratory System, Part 1: Crash Course A&P #31
https://www.youtube.com/watch?v=Cqt4LjHnMEA Respiratory System, Part 2: Crash Course A&P #32

Digestive System
https://www.youtube.com/watch?v=yIoTRGfcMqM Digestive System, Part 1: Crash Course A&P #33
https://www.youtube.com/watch?v=pqgcEIaXGME Digestive System, Part 2: Crash Course A&P #34
https://www.youtube.com/watch?v=jGme7BRkpuQ Digestive System, Part 3: Crash Course A&P #35
https://www.youtube.com/watch?v=fR3NxCR9z2U Metabolism & Nutrition, Part 1: Crash Course A&P #36
https://www.youtube.com/watch?v=kb146Y1igTQ Metabolism & Nutrition, Part 2: Crash Course A&P #37

Urinary System
https://www.youtube.com/watch?v=l128tW1H5a8 Urinary System, Part 1: Crash Course A&P #38
https://www.youtube.com/watch?v=DlqyyyvTI3k Urinary System, Part 2: Crash Course A&P #39

Reproductive System
https://www.youtube.com/watch?v=RFDatCchpus
Reproductive System, Part 1—Female Reproductive System: Crash Course A&P #40
https://www.youtube.com/watch?v=-XQcnO4iX_U
Reproductive System, Part 2—Male Reproductive System: Crash Course A&P #41
https://www.youtube.com/watch?v=SUdAEGXLO-8
Reproductive System, Pt 3—Sex & Fertilization:Crash Course A&P #42
https://www.youtube.com/watch?v=BtsSbZ85yiQ
Reproductive System, Part 4—Pregnancy & Development: Crash Course A&P #43

Lymphatic and Immune System
https://www.youtube.com/watch?v=I7orwMgTQ5I Lymphatic System: Crash Course A&P #44
https://www.youtube.com/watch?v=GIJK3dwCWCw Immune System—Part 1: Crash Course A&P #45
https://www.youtube.com/watch?v=2DFN4IBZ3rI Immune System—Part 2: Crash Course A&P #46
https://www.youtube.com/watch?v=rd2cf5hValM Immune System—Part 2: Crash Course A&P #47