Unit 1: Introduction to Anatomy and Physiology

1. How do the terms anatomy and physiology relate to each other?

2. Fill in the blanks for the levels of structural organization of the human body.
   Atom → ___________ → ___________ → Cell → ___________ → ___________ → ___________ → ___________ → Organism

3. In negative feedback the stimulus is (enhanced/reduced). An example of a negative feedback would be if a person had an elevated body temperature, the homeostatic response would be to (elevate/lower) the body temperature.

4. In positive feedback the stimulus is (enhanced/reduced). An example of a positive feedback would be blood clotting. Damaged tissue would stimulate platelets to the area and the platelets would release a chemical that would bring (more/less) the platelets to the area.

5. Choose the correct anatomical term to describe the location of the following structures.
   a. The knee is (distal/proximal) to the thigh.
   b. The breastbone is (anterior/posterior) the spine.
   c. The eyes are (lateral/medial) to the nose.
   d. The lungs are (deep/superficial) to the skin.
   e. The head is (inferior/superior) to the abdomen.

6. Pick which picture to the right fits the descriptions below.
   a. _____ Divides the body into anterior and posterior parts.
   b. _____ Divides the body into superior and inferior parts.
   c. _____ Divides the body into right and left parts.
   d. _____ Frontal (coronal) plane
   e. _____ Midsagittal plane
   f. _____ Transverse (cross section) plane

7. Use the word bank below to label the body cavity diagram

Abdominal cavity
Abdominopelvic cavity
Cranial cavity
Dorsal Cavity
Thoracic cavity
Pelvic cavity
Ventral cavity
Vertebral cavity
Unit 2: Basic Chemistry

Match the category of biological macromolecule with the descriptions below.

A. Carbohydrates  B. Lipids  C. Nucleic acids  D. Proteins
1. _____ Energy storage (more than one answer).
2. _____ Monosaccharides
3. _____ Genetic information
4. _____ Composed of 3 fatty acids and a glycerol
5. _____ Composed of amino acid chains
6. _____ Composed of nucleotides
7. _____ Enzymes
8. _____ Cushions and protects organs

Match the type of carbohydrate with the structural descriptions below (HONORS).

A. Disaccharides  B. Monosaccharides  C. Polysaccharides
9. _____ Polymers of simple sugars linked together
10. _____ Single chain or ring
11. _____ Two monosaccharides joined together
12. What is the main source of fuel for cellular respiration (HONORS)? ________________________________
13. What is the structure of a fatty acid (HONORS)? __________________________________________
14. Types of Lipids Chart (HONORS)

<table>
<thead>
<tr>
<th>Type of Lipid</th>
<th>Structure</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triglyceride</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phospholipid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steroid</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

15. Types of Triglyceride Chart (HONORS)

<table>
<thead>
<tr>
<th>Structure</th>
<th>Name</th>
<th>State of matter</th>
<th>Animal or Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Triglyceride" /></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

16. The diagram to the right is an amino acid. Label the R group, amine group and carboxyl group (HONORS).

17. Which structure on the diagram in question 16 distinguishes this amino acid from another amino acids (HONORS)? __________________________________________

18. What type of bonding occurs between amino acids to form a protein (HONORS)? ____________________________________________________
19. Types of Proteins Chart (HONORS)

<table>
<thead>
<tr>
<th>Type of Protein</th>
<th>Structure</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibrous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Globular</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Match the terms regarding cellular respiration to the definitions below (HONORS)

A. Aerobic Respiration  
B. Anaerobic Respiration  
C. ATP

20. ____ Energy rich molecule that powers all cellular activities.
21. ____ The chemical reaction is \( \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{H}_2\text{O} + 6\text{CO}_2 + 32 \text{ ATP} + \text{heat} \).
22. ____ The chemical reaction is \( \text{C}_6\text{H}_{12}\text{O}_6 \rightarrow 2\text{C}_3\text{H}_6\text{O}_3 \) (lactic acid)+ 2 ATP.
23. ____ Occurs when cells require large amounts of ATP quickly.
24. ____ Provides a high yield of ATP slowly and steadily.

25. How do enzymes increase the rate of chemical reactions? _____________________________________________________
____________________________________________________________________________________________________

26. How does fever affect enzyme activity?
____________________________________________________________________________________________________

27. What are two factors in the human body that influence the activity of enzymes?
   a. ___________________________    b. ___________________________

28. Label the picture that shows a chemical reaction with an enzyme and which shows a chemical reaction without an enzyme.

Unit 3: Tissues

Matching: Use the terms below to identify the characteristics of each of the four types of tissue.

A. Connective  
   1. ____ Supports, protects, binds, insulates and transports
   2. ____ Avascular but innervated
   3. ____ Creates electrochemical impulses
   4. ____ Specialized to contract and shorten
   5. ____ Apical surface
   6. ____ Irritability and conductivity

B. Epithelial  
   7. ____ Cells fit closely together in sheets
   8. ____ Can be striated or non-striated
   9. ____ Consists of cells and extracellular matrix
10. ____ Covering/lining that provides protection, absorption, excretion, filtration, and secretion

C. Muscular  
D. Nervous
11. Fill in the following chart regarding the types of epithelial tissue.

<table>
<thead>
<tr>
<th>Name</th>
<th>Number of layers</th>
<th>Cell Shape</th>
<th>Function</th>
<th>Location in body</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple squamous</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simple cuboidal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simple columnar</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stratified squamous</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pseudostratified ciliated columnar</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Matching: Match the following types of connective tissue to their characteristics below.

A. Adipose       B. Blood       C. Bone       D. Cartilage       E. Ligaments/Tendons

13. ___ Extracellular matrix consists of calcium and collagen.
14. ___ Pulls bones.
15. ___ Transport vehicle for the cardiovascular system.
16. ___ Osteocytes, osteoblasts, osteoclasts.
17. ___ Very flexible and found at the ends of bones and in between vertebrae.
18. ___ Insulates and protects organs.
19. ___ Consists of dense rows of collagen fibers.
20. ___ Chondrocytes.
21. ___ Adipocytes store fat for cellular fuel.
22. ___ Only connective tissue that has a fluid matrix

23. Fill in the following chart on the types of muscle tissue.

<table>
<thead>
<tr>
<th>Muscle Type</th>
<th>Structure</th>
<th>Function</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skeletal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiac</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smooth</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

24. The cell cycle under normal circumstances will (loosely control/tightly control) cell division. When (carcinogens/mutations) occur in protein-encoding genes that regulate (cell growth/immunity) an abnormal cell mass will develop. If the abnormal cell mass is local, slow growing and surrounded by a capsule it is (benign/malignant). If the abnormal cell mass is non-encapsulated, fast growing and aggressively invading their surroundings then it is (benign/malignant).

25. What role do carcinogens play in cancer? ___________________________________________
Unit 4: Integumentary System

1. Label the diagram below using the word bank: Blood Vessels, Dermis, Epidermis, Hair, Hypodermis, Nervous structure, Sebaceous Glands, Sudoriferous Glands

2. What is the histology of the following layers of the skin?
   A. Epidermis-____________________________________________________
   B. Dermis-______________________________________________________
   C. Hypodermis-__________________________________________________

3. Identify which layers in question 2 are vascular and avascular.

Fill in the blank: Structures and functions of the skin

4. ________ Cell that produces a protein that gives the epidermis its protective properties.
5. ________ Cell that synthesizes a pigment that protects underlying cells from ultraviolet radiation.
6. ________ An oily substance that contains bactericidal enzymes to provide a chemical barrier to bacteria.
7. ________ Secretes sebum typically into a hair follicle.

8. ________ Body temperature regulation through secretions that evaporate heat off the skin.
9. ________ Cutaneous sensation.
10. ________ Aids in excretion of urea and uric acid.
11. ________ Ingest foreign substances and pathogens preventing them from penetrating into deeper body tissues.
12. ________ Controls blood flow in relation to heat loss and heat retention.

13. Why is it important for skin to synthesize vitamin D by sunlight?_______________________________________________
Unit 5: Skeletal System

1. Label the bones on the skeleton to the right using the following words: carpals, clavicle, coccyx, cranium, fibula, femur, humerus mandible, metacarpals, metatarsals, patella, phalanges, phalanges, pelvis, radius, ribs, sacrum, scapula, sternum, tarsals, tibia, ulna, vertebral column
   a. Color code the bones that belong to the appendicular skeleton and those that belong to the axial.
2. Label the bones of the cranium using the following words: foramen magnum, frontal, mandible, occipital, parietal, temporal, zygomatic

3. Label the sections of the vertebral column using the following words: cervical, coccyx, lumbar, sacrum, thoracic,

4. Classify the bones labeled in question 1, 2 and 3 according to their shape and list them in the chart below.

<table>
<thead>
<tr>
<th>Long</th>
<th>Short</th>
<th>Irregular</th>
<th>Flat</th>
</tr>
</thead>
</table>

5. Which shape was predominant in the appendicular skeleton? Axial skeleton?

6. What is the difference in function between the axial and appendicular skeleton?

7. What is an articulation?

8. Classify the bones labeled in questions 1, 2, and 3 according to their joint classification and list them in the chart below.

<table>
<thead>
<tr>
<th>Fibrous</th>
<th>Cartilaginous</th>
<th>Synovial</th>
</tr>
</thead>
</table>
9. List three reasons why bone markings are important anatomical landmarks (HONORS)
   a. ____________________________________________________________________________________
   b. ____________________________________________________________________________________
   c. ____________________________________________________________________________________

Bone Marking Matching: Match the bone marking with its description below (HONORS)

<table>
<thead>
<tr>
<th>A. Head</th>
<th>B. Foramen</th>
<th>C. Fossa</th>
<th>D. Process</th>
<th>E. Sinus</th>
<th>F. Tubercle</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. ___ Shallow depression, often for articular surfaces</td>
<td>11. ___ Bony expansion carried on a narrow neck to help form joint</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. ___ Small rounded projection for muscle attachment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. ___ Any bony prominence</td>
<td>14. ___ Round/oval openings for nerves or blood vessels</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. ___ Air filled cavity lined with mucous membrane</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

16. Which bone markings create the following types of synovial joints (HONORS)?
   a. Ball and socket:__________________________
   b. Hinge:_________________________________
   c. Gliding:_______________________________
   d. Saddle:_______________________________

17. Identify the following structures on the long bone below: articular cartilage, compact bone, diaphysis, distal epiphysis, epiphyseal plate/line, foramen, medullary cavity, periosteum, proximal epiphysis, spongy bone, yellow marrow

18. List the function for the following parts of a long bone
   a. Red marrow:__________________________________
b. Yellow marrow:

c. Articular cartilage:

d. Periosteum:

e. Ligaments:

19. Use the following terms to describe the diagram of the microscopic anatomy of compact bone: blood vessel, central (Haversian) canal (used twice), lacuna, lamellae (used twice), osteocyte, osteon, perforating (Volkmann’s) canal, periosteum

20. Next to each of the structures labeled on the diagram of the histology of the bone, briefly describe its function.

21. What is the difference in structure and function of compact and spongy bone?

22. List the organic and inorganic components of the bony matrix. Describe how these components contribute to the function.
Unit 6: Muscular System

1. Use the following terms to label the diagram of the anatomy of the belly of a skeletal muscle: actin myofilaments, bone, cross bridge, endomysium, epimysium, fascicle, muscle fiber, myosin myofilaments, perimysium, sarcolemma, sarcomere, sarcomere, sarcomplasmic reticulum, tendon, Z disc, Z disc

2. What is the function of the three layers of connective tissue (epimysium, perimysium, endomysium) surrounding the belly of the muscle and how do they work with tendons to create movement? ____________________________________________________________________________________________
3. Label the diagram below with the following words: belly, insertion, origin

4. When observing skeletal muscle underneath a microscope it appears (non-striated/striated). The cells of a muscle are (cylindrical, spindle) shaped, (involuntary/voluntary), and (multinucleate/uninucleate).

5. Fill in the flow chart of muscle organization from largest to smallest.
   Muscle Belly → ______________ → ______________ → Myofibril → ______________

6. Label the diagram below of the neuromuscular junction with the following terms: axon, axon terminal, muscle fiber, myofibril, neuromuscular unit, neurotransmitter, sarcolemma, synaptic cleft.

7. The following statements are steps in the stimulation and contraction of a skeletal muscle. Organize the letters into their correct order in the blanks below.
   A. Myosin forms a cross bridge with actin.
   B. Sarcoplasmic reticulum releases calcium.
   C. Action potential is propagated down the axon of a motor neuron.
   D. Acetylcholine diffuses into synaptic cleft.
   E. Action potential stimulates the release of acetylcholine.
   F. Myosin requires ATP to release from actin.
   G. Action potential across sarcolemma stimulates sarcoplasmic reticulum.
   H. Action potential reaches the axon terminal.
   I. Calcium exposes actin.
   J. Myosin pulls actin towards the center of the sarcomere.
   K. Muscle relaxes.
   L. Exchange of sodium and potassium propagates an action potential across the sarcolemma.
   M. Muscle contracts.
   N. Action potential ceases across sarcolemma and sodium and potassium move back.
   O. Calcium returns to sarcoplasmic reticulum.
   P. Acetylcholine causes sodium to rush into the muscle cell and potassium to rush out.
   Q. Acetylcholine attaches to receptors on the sarcolemma.
   R. Actin is covered and myosin can no longer attach.
   S. Acetylcholine is removed from the receptors of the sarcolemma.
8. Use the table below to explain the role of the following molecules in myoneural signaling and muscle contraction (HONORS).

<table>
<thead>
<tr>
<th>Molecule</th>
<th>Role in myoneural signaling and muscle contraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATP</td>
<td></td>
</tr>
<tr>
<td>Toponin</td>
<td></td>
</tr>
<tr>
<td>Tropomyosin</td>
<td></td>
</tr>
<tr>
<td>Calcium</td>
<td></td>
</tr>
<tr>
<td>Potassium</td>
<td></td>
</tr>
<tr>
<td>Sodium</td>
<td></td>
</tr>
</tbody>
</table>

9. Fill in the following terms on the diagram to the right: Aerobic respiration, anaerobic respiration, and glycolysis (HONORS)

10. Label which of the processes labeled in previous question occurs in the cytoplasm on the cell and which occurs in the mitochondria (HONORS).

11. How does aerobic and anaerobic respiration work together to generate ATP during muscle contraction (Honors)?

12. Use the following terms to label the muscle man below: Masseter, Platysma, Sternocleidomastoid, Pectoralis major, Rectus abdominis, External and internal obliques, Trapezius, Latissimus dorsi, Deltoid, Biceps brachii, Triceps brachii, Gluteus maximus, Adductor group, Hamstring group, Quadriceps group, Tibialis anterior, Gastrocnemius
13. Match the antagonistic pairs below with the following movements.
   A. Flexion/Extension  B. Medial/Lateral Rotation  C. Abduction/Adduction
   ____ Biceps brachii/Triceps brachii
   ____ Deltoid/Pectoralis major
   ____ Right/Left Sternocleidomastoids
   ____ Hamstring group/Quadriceps group

**Unit 7: Fundamentals of Nervous System**

1. The diagram to the right demonstrates the functional classification of the nervous system. Label each classification and provide an explanation for each part below.
   A. __________________________
   __________________________
   __________________________
   B. __________________________
   __________________________
   __________________________
   C. __________________________
   __________________________
   __________________________

2. Fill in chart below on the structural organization of the nervous system.

3. For the three functional classifications of the nervous system in question 1, indicate if the functional classification is part of the central or peripheral nervous system.

4. The (autonomic/somatic) nervous system innervates skeletal muscles. The (autonomic/somatic) nervous system innervates smooth and cardiac muscles. The (parasympathetic/sympathetic) nervous system stimulates an organ while the (parasympathetic/sympathetic) nervous system inhibits an organ.

5. What is a neuron? __________________________
   __________________________
   __________________________

Match the parts of the neuron with their function below:
   A. Axon  B. Cell body  C. Dendrites  D. Myelin sheath  E. Axon terminal
6. _____ increase the transmission rate of nerve impulses
7. _____ conductive region; generates an action potential
8. _____ contains neurotransmitters
9. _____ input area; receives signals from other neurons
10. _____ input area; main nutritional and metabolic area
11. Label the following terms on the diagram below: Cell body, Myelin sheath, Dendrites, Axon, Axon terminal.

12. In the diagram in question 11, label where the sensory portion and motor portion of the neuron.
13. How is the transmission of nerve impulse created across an axon?

14. Label the diagram below of synapse using the following words: Axon terminal, neurotransmitters, receiving neuron, synaptic cleft, transmitting neuron.
15. Use the terms in question 14 to explain the process of communication between neurons.

16. A/an (action/graded) potential is short-lived, localized membrane potential that is found in (motor/sensory) receptors (HONORS).
17. A/an (action/graded) potential causes (complete/partial) depolarization of the membrane that is then propagated down the (axon/dendrites) of a (motor/sensory) neuron (HONORS).
18. How do graded potentials, action potentials and synapses work together to create communication between neurons and organs (HONORS)?
19. Membrane Potentials (HONORS)

<table>
<thead>
<tr>
<th>Type of Membrane Potential</th>
<th>Role in nerve impulse conduction</th>
<th>Na concentration inside neuron</th>
<th>K concentration inside neuron</th>
<th>Charge inside neuron</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resting Membrane</td>
<td></td>
<td>(High/Low)</td>
<td>(High/Low)</td>
<td></td>
</tr>
<tr>
<td>Depolarization</td>
<td></td>
<td>(High/Low)</td>
<td>(High/Low)</td>
<td></td>
</tr>
<tr>
<td>Hyperpolarization</td>
<td></td>
<td>(High/Low)</td>
<td>(High/Low)</td>
<td></td>
</tr>
</tbody>
</table>

Unit 9: Central Nervous System

1. Label the following structures on the diagram below: Cerebrum, Medulla oblongata, Pons, Midbrain, Hypothalamus, Thalamus, Epithalamus, Cerebellum, and Pituitary Gland.

Use the structures in question 1 to identify their functions below.

10. _______________ Houses the pineal gland that regulates sleep wake cycles.
11. _______________ Control of breathing.
12. _______________ Relay center for sensory impulses
13. _______________ Regulation of body temperature, water balance and metabolism.
14. _______________ Provides precise timing for skeletal muscle activity and controls our balance and equilibrium.
15. _______________ Endocrine gland that releases hormones that regulate various bodily functions.
16. _______________ Speech, memory logical and emotional response as well as consciousness, interpretation of sensation and voluntary movement.
17. _______________ Reflex center involved with vision and hearing.
18. _______________ Control heart rate, blood pressure, breathing, swallowing, and vomiting.
19. Fill in the functions of the lobes of the cerebrum and use directional terms to describe where they are located.

<table>
<thead>
<tr>
<th>Lobe of Cerebrum</th>
<th>Function</th>
<th>Location (using directional terms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frontal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parietal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occipital</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temporal</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
20. Compare and contrast the function and structure of meninges with cerebrospinal fluid.
_____________________________________________________________________________________________________
_____________________________________________________________________________________________________

21. What are the two major functions of the spinal cord?
   A. _____________________________________________________________
   B. _____________________________________________________________

22. What are the structural differences between gray and white matter?
_____________________________________________________________________________________________________

23. Label the steps of the reflex arc below.

   ![](image)

Unit 9: Special Senses

1. Identify the following structures of the eye: aqueous humor, cornea, lens, optic nerve, pupil, retina (photoreceptors), sclera, vitreous humor

   ![](image)

Fill in the blank: Use the words from the diagram in question one to fill in the blanks for the definitions below.
2. ___________ Firm, white fibrous layer that protects and maintains eyeball shape.
3. ___________ An opening in the center of the iris that regulates the amount of light entering the eye.
4. ___________ and ___________ Prevents the eyeball from collapsing inward.
5. Transparent, protective layer that allows light to enter the eye.
6. Light sensitive layer of the eye that contains rods and cones.
7. Convex structure that focuses the light entering the eye on the retina.
8. Transmits nerve impulses to the optic cortex which results in vision.

9. Label the diagram of the ear using the following words: Tympanum, Incus, Malleus, Stapes, Cochlea, Semicircular Canal, Pharyngotympanic (auditory) tube, Vestibule, Vestibulocochlear nerve.

Write the structure from question 9 that corresponds with its function below.
10. In many animals it collects and directs soundwaves, in humans it’s something to pierce.
11. Connects ear to throat and when we swallow or yawn it equalizes the pressure in the middle ear cavity with the external environment.
12. Where sound waves enter and is lined with ear wax which traps foreign bodies and repels insects.
13. , , and transmit the vibratory motion of the eardrum to the fluids in the inner ear.
14. Sound waves hit this and cause it to vibrate.
15. Houses the hearing receptors.
16. and help with balance.
17. What is a chemoreceptor?

18. What is the function and location of olfactory receptors and taste buds in the body?