Anatomy & Physiology of Domestic Animals: Exam 2

Section I – True/False (explain if false)

_____ Bone is classified as a connective tissue. T

_____ The appendicular skeleton includes the skull and ribs. F – The skull and ribs belong to the axial skeleton.

_____ The periosteum covers the inner surface of bones. F – It covers the outer surface.

_____ Synarthroses joints are freely movable. F – They are immovable joints.

_____ The sacroiliac joint connects the sacrum and ilium. T

_____ Compact bone is less dense than spongy bone. F – Compact bone is denser and forms the outer layer.

_____ The autonomic nervous system controls voluntary movement. F – It controls involuntary functions.

_____ Afferent pathways carry information away from the CNS. F – They carry information to the CNS.

_____ The sympathetic nervous system is responsible for the "fight or flight" response. T

_____ Cardiac muscle contractions depend completely on nervous input. F – They are influenced but can contract without it.

Section II – Multiple Choice

Which type of joint allows free movement?
a) Synarthroses
b) Amphiarthroses
c) Diarthroses
d) Fibrous

Which of the following bones are part of the axial skeleton?
a) Femur, tibia, fibula
b) Skull, vertebral column, ribs
c) Scapula, humerus, ulna
d) Pelvis, femur, radius

Which bone cell is responsible for building bone?
a) Osteoclast
b) Osteocyte
c) Osteoblast
d) Osteoprogenitor

Which part of the long bone is the shaft?
a) Epiphysis
b) Diaphysis
c) Metaphysis
d) Medullary cavity

Which ossification process forms flat bones?
a) Endochondral
b) Intramembranous
c) Periosteal
d) Osteogenic

Which division of the nervous system consists of the brain and spinal cord?
a) CNS
b) PNS
c) Somatic
d) Autonomic

Which part of a neuron receives incoming information?
a) Axon
b) Dendrite
c) Myelin sheath
d) Axon terminal

Which of the following neurotransmitters stimulates skeletal muscle contraction?
a) Dopamine
b) Norepinephrine
c) Acetylcholine
d) Serotonin

Which ion initiates muscle contraction by binding to troponin?
a) Sodium
b) Potassium
c) Calcium
d) Chloride

Which connective tissue surrounds the entire muscle?
a) Endomysium
b) Perimysium
c) Epimysium
d) Sarcolemma

Which muscle type is involuntary and non-striated?
a) Skeletal
b) Smooth
c) Cardiac
d) Both b and c

Which of the following best describes the function of the nervous system?
a) Structure and protection
b) Regulation, integration, and response
c) Hormone production
d) Blood circulation

Which of the following is not part of the appendicular skeleton?
a) Scapula
b) Pelvis
c) Femur
d) Sternum

Which layer of the meninges lies closest to the brain and spinal cord?
a) Dura mater
b) Arachnoid
c) Pia mater
d) Neural cortex

Which of the following is a function of bone?
a) Conduction
b) Filtration
c) Protection
d) Reproduction

Section III – Matching

Match the term with its correct description:

A. Osteocyte
B. Myelin Sheath
C. Sympathetic Nervous System
D. Sarcomere
E. Compact Bone
F. Spongy Bone
G. Osteoblast
H. Cartilage
I. Synovial Joint
J. Reflex Arc

_____ Dense, strong bone forming the outer layer of bone - E

_____ Mature bone cell that maintains bone tissue - A

_____ Unit of muscle contraction - D

_____ Found in ends of long bones; contains red marrow - F

_____ Connective tissue providing smooth surface for movement - H

_____ Joint with fluid-filled cavity allowing free motion - I

_____ Rapid, automatic response to a stimulus - J

_____ Insulating layer that speeds nerve transmission - B

_____ Builds new bone tissue - G

_____ Controls “fight or flight” responses - C

Section IV – Short Answer

What are the six types of bones, and give an example of each.

- Long (femur), Short (carpal), Flat (ribs), Irregular (vertebra), Sesamoid (patella), Pneumatic (bird bones)

Explain the steps of intramembranous ossification.

- Ossification center forms in fibrous tissue → Osteoid secreted and calcified → Woven bone and periosteum form → Lamellar bone replaces woven bone.

List and describe the three types of joints based on movement.

- Synarthroses (immovable), Amphiarthroses (slightly movable), Diarthroses (freely movable)

Describe the structure and function of the meninges.

- Layers: dura mater (outer), arachnoid (middle), pia mater (inner). They protect the brain/spinal cord and deliver nutrients.

Explain the difference between afferent and efferent pathways.

- Afferent: carry signals to CNS. Efferent: carry signals from CNS to effectors.

List three functions of the skeletal system.

- Support, protection, mineral storage, movement, blood cell formation.

Name the three muscle types and their functions.

- Skeletal: locomotion, voluntary. Smooth: internal movement, involuntary. Cardiac: pump blood, involuntary.

What is the difference between the somatic and autonomic nervous systems?

- Somatic: voluntary skeletal muscle control. Autonomic: involuntary smooth/cardiac muscle and glands.

Describe how the Z-line moves during muscle contraction.

- Z-lines move closer as actin and myosin filaments slide past each other.

Explain the difference between depolarization and repolarization in an action potential.

- Threshold. Depolarization: Na^+ enters cell (inside positive). Repolarization: K^+ leaves (returns to negative).

What are the types of bone marrow and their functions?

- Red marrow (produces blood cells), Yellow marrow (stores fat).

Define hypertrophy, hyperplasia, and atrophy.

- Hypertrophy: increased cell size. Hyperplasia: increased number. Atrophy: decrease in size.

What is cerebrospinal fluid and its purpose?

- Clear fluid cushioning CNS, maintaining pressure, removing waste.

Describe how a neurotransmitter functions at a chemical synapse.

- Released from the presynaptic neuron → binds the receptor on the postsynaptic cell → triggers or inhibits next impulse.

List the layers of connective tissue surrounding muscles from inner to outer.

- Endomysium → Perimysium → Epimysium.

Section V – Extended Response

Describe the difference between spongy bone and compact bone in structure and function.

- Compact
    - Heavy, Dense, and Strong
    - Makes up long shaft of long bone and the outside of all bones
    - Composed of haversan canals
        - Blood, lymph Vessels
        - Nerves
- Cancellous
    - Helps reduce the weight of bones
    - House bone marrow

What is the process of Intramembranous Ossification?

- Ossification centers appear in the fibrous Connective Tissue Membrane, centrally located mesenchymal cell clusters differentiate into osteoprogenitor eventually osteoblast formation of ossification center.
- Osteoid is secreted within the fibrous membrane and calcifies. Trapped osteoblasts become osteocytes.
- Woven bone created and periosteum form, Osteoid is laid down between embryonic blood vessels in a random manner.
- Lamellar bone replaces woven bone, just deep to the periosteum. Red bone marrow appears.

Explain the process of endochondral ossification in long bones.

- Formation of bone collar around hyaline cartilage model
- Cavitation of hyaline cartilage within cartilage model
- Invasion of internal cavities by the periosteal bud and spongy bone formation
- formation of medullary cavity as ossification continues: appearance of secondary ossification centers in the epiphyses in preparation for stage 5
- Ossification of the epiphyses: when completed hyaline cartilage remains only in the epiphyseal plates and articular cartilage.

Discuss how the skeletal, muscular, and nervous systems work together to create movement.

- Nervous system sends impulse → muscle contracts → skeletal system provides framework → movement occurs.

Trace the reflex arc pathway from stimulus to response, including all steps.

- Stimulus → receptor → afferent neuron → spinal cord → interneuron → efferent neuron → effector organ → response.

Explain the process of an action potential using sodium and potassium movement.

- Resting (-70mV) → depolarization (Na^+ in) → repolarization (K^+ out) → hyperpolarization → return to rest.

Compare and contrast the parasympathetic and sympathetic nervous systems, including physiological responses.

- Parasympathetic: rest/digest, slows heart, constricts pupils, stimulates digestion, acetylcholine secreted.
- Sympathetic: fight/flight, raises heart rate, dilates pupils, inhibits digestion, norepinephrine, epinephrine secreted, glucose secreted.

Discuss the importance of calcium and ATP in muscle contraction.

- Calcium binds troponin → exposes actin → myosin binds → ATP powers cross-bridge cycling and relaxation.

Describe the sliding filament theory of muscle contraction in detail.

- Myosin heads bind to actin, pulling filaments inward using ATP → sarcomere shortens → muscle contracts.

There are four types of joint movements. What are the names of the movements and what direction/how are the limbs moving?

- Adduction: Medial movement
- Abduction: Lateral movement
- Flexion: Creates angles

Describe the main differences and similarities between chemical and electrical synapses. Include their structure, speed, direction of signal transmission, and function in your answer.

- Chemical Synapses:
    - Structure: Use neurotransmitters released into a synaptic cleft.
    - Speed: Slower.
    - Direction: Usually one-way (unidirectional).
    - Function: Allow precise control, learning, and complex processing.
    - Skeletal muscle

- Electrical Synapses:
    - Structure: Use gap junctions that directly connect cells.
    - Speed: Very fast.
    - Direction: Can be two-way (bidirectional).
    - Function: Enable rapid, synchronized responses
    - heart and smooth muscle, endo and exocrine glands

Draw an Action Potential graph, including all the key components of the sodium potassium pump.