PART I: MATCHING

DIRECTIONS: Each set of matching questions in this section consists of a list of lettered options or labeled diagrams followed by several numbered items. For each numbered item, select the ONE lettered option that is most closely associated with it. Each lettered option may be selected once, more than once, or not at all.

A. Muscle spindle
B. Ruffini endings
C. Free nerve endings
D. Pacinian corpuscle
E. Meissner’s corpuscle

18. Particularly abundant in dermal papillae at the tips of fingers and toes. They are most sensitive to rapid, irregular pressure.

19. The majority of sensory receptors in the skin are of this type. Some respond to pain, others to heat or cold.

A. Hyaline cartilage
B. Elastic cartilage
C. Fibrocartilage
D. All of the above

20. Contains primarily Type I collagen fibers

21. Does not typically have a perichondrium

22. Forms articular cartilage

23. Forms the cartilage of the epiglottis

24. Is the most abundant type of cartilage in body

Questions 25-28:
Where would you find each of the following numbered items?

A. In a peripheral nerve such as the ulnar nerve
B. In a dorsal root ganglion
C. Associated with skeletal muscle
D. Associated with smooth muscle
E. In the spinal cord gray matter
F. In an autonomic ganglion

25. Cell body of a pseudounipolar neuron

26. Cell body of a voluntary (somatic) motor neuron

27. Nerve terminal of a postganglionic autonomic neuron

28. Nerve terminal of voluntary (somatic) motor neuron
Questions 29-32:
For each of the numbered items below, select the lettered item that secretes it.

A. Hypothalamic neurons
B. Parafollicular cells
C. Parathyroid chief cells
D. Parathyroid oxyphil cells
E. Pars distalis
F. Pars intermedia
G. Pituicytes
H. Suprarenal (adrenal) cortex
I. Suprarenal (adrenal) medulla
J. Thyroid follicular cells

29. Aldosterone
A. Thyrotropin releasing hormone (TRH)
B. Calcitonin
C. Somatotropin (growth hormone)

PART II: MULTIPLE CHOICE

DIRECTIONS: Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that is BEST in each case.

33. The transverse portion of an intercalated disk is rich in:
   A. Calmodulin
   B. Dense bodies
   C. Desmosomes
   D. Gap junctions
   E. Mitochondria

34. What are Sharpey's fibers?
   A. Connective tissue layers lining the external surfaces of bone
   B. Remnants of old haversian systems
   C. Extensions of osteoclast cell membranes in the vicinity of Howship's lacunae
   D. Insertions of collagenous fibers into bone matrix
   E. Bony spurs formed at joint surfaces due to arthritis
35. Myoepithelial cells:
   A. Are abundant in the walls of hollow viscera
   B. Are active primarily in wound contraction
   C. Are typically indistinguishable from cardiac myocytes
   D. Form gap junctions with single-unit smooth muscle cells
   E. In the mammary gland contract in response to oxytocin

36. Which of the following is correct concerning secondary osteons (Haversian systems):
   A. They can be composed of either lamellar or woven bone
   B. They represent the typical organization of bone tissue in both cancellous and compact bone of adult humans
   C. You can tell how old an osteon is by counting the number of lamellae that it has
   D. Older Haversian systems will be more heavily mineralized than more recently formed Haversian systems
   E. Communication between Haversian canals of neighboring osteons occurs mainly via canaliculi

37. Which staining method might best confirm the presence of a demyelinating disorder in a biopsy of peripheral nerve:
   A. Periodic acid-Schiff (PAS)
   B. Silver
   C. Osmitol tetraoxide
   D. Masson's trichrome
   E. Nissl

38. Which of the following statements is true concerning lamellar bone:
   A. Lamellar bone is deposited in regions of rapid bone growth
   B. The regular orientation of collagen fibers in its matrix increases its ability to resist mechanical forces
   C. It can only be produced via the process of intracortical remodeling
   D. Lamellar bone is always organized into Haversian systems
   E. The only adult bone type that can be classified as lamellar is compact bone

39. Parafollicular cells of the thyroid gland:
   A. Aid the follicle cells of the thyroid by iodinating thyroglobulin
   B. Are derived from the endoderm of the third pharyngeal pouch
   C. Produce a hormone that is secreted in response to elevated blood calcium levels
   D. Synthesize their hormonal product in response to TSH produced in the anterior hypophysis
40. Which of the following is true of intramembranous ossification:
   A. Mixed spicules of bone, containing calcified cartilage matrix and woven bone will be formed
   B. The process begins with a condensation of the mesenchyme, followed by the differentiation of mesenchymal cells into osteoprogenitor cells
   C. It occurs primarily in weight bearing bones
   D. It will result in the production of cancellous bone but not compact bone
   E. It is the only method by which bony structures are formed

41. Which of the following correctly describes cartilage:
   A. Though predominantly avascular, it can be perforated by vascular canals in areas of rapid growth
   B. Its extracellular matrix is characteristically hydrophobic
   C. It maintains a low level of calcification to aid in its ability to resist compressive forces
   D. It can undergo interstitial growth but not appositional growth
   E. It is capable of extensive regeneration through chondrogenic peristernal activity throughout life

42. Satellite cells associated with muscle:
   A. Are found surrounding individual cardiac muscle fibers
   B. Contain rudimentary contractile elements that resemble the organization seen in smooth muscle
   C. Are located within the same basal lamina (external lamina) that surrounds an individual skeletal muscle fiber
   D. Are small modified skeletal muscle cells that form part of the muscle spindle
   E. Represent common precursor cells that can differentiate into any muscle type

43. Which of the following is true concerning motor innervation of skeletal muscle:
   A. Each motor unit may contain a mixture of slow and fast twitch muscle fibers
   B. Axons from several motor neurons innervate each muscle fiber
   C. Adjacent muscle fibers form gap junctions with one another, so that nerve impulses can be transmitted from one cell to the next
   D. The neurotransmitter is usually norepinephrine
   E. The motor neurons that innervate skeletal muscle (somatic motor neurons) have myelinated axons
44. Which histological change suggests a reduced capacity for protein synthesis by neurons:
   A. Reduced osmium tetroxide stain of peripheral nerves
   B. Reduced silver stain at the neuromuscular junction
   C. Reduced Nissl stain
   D. Increased silver stain at the neuromuscular junction
   E. Increased Nissl stain

45. Which of the following is correct concerning woven bone:
   A. Its collagen fibers are oriented in circumferential sheets
   B. It is unmineralized
   C. It can be deposited where no bone or cartilage had existed previously
   D. It is the only kind of bone that is found in the growing skeleton
   E. It contains many fewer cells than other bone types because it proliferates so rapidly

46. In human skeletal muscle:
   A. The triad is located at the Z-line
   B. An ATP-dependent pump in the sarcoplasmic reticulum (SR) is responsible for the reuptake of calcium ions into the SR lumen
   C. T-tubules contain voltage-gated calcium release channels (ryanodine receptors)
   D. Terminal cisternae are dilations of the T-tubule opening
   E. The sarcoplasmic reticulum is continuous with the cell surface

47. Which of the following is correct concerning the primary ossification center in a bone undergoing endochondral ossification:
   A. Ossification begins with the death of cartilage at the periphery of the diaphysis and replacement by a periosteal collar of bone
   B. Lamellar bone is laid down on remnants of calcified cartilage to form mixed spicles
   C. As the cartilage matrix calcifies, chondrocytes differentiate into osteocytes
   D. Invasion by an osteogenic bud follows the death of chondrocytes located in the center of the cartilage model
   E. Hypertrophy of chondrocytes leads to a proliferation of cartilage matrix, accounting for increasing width of the long bone
48. Which of the following is true of the chromaffin cells of the suprarenal (adrenal) medulla:
   A. They are derived from mesoderm of the posterior body wall
   B. They produce hormones that mimic the activity of the sympathetic division of the autonomic nervous system
   C. Epinephrine-secreting cells are bathed by sinusoids that carry blood from long cortical arteries
   D. Norepinephrine-secreting cells have homogenous appearing granules that contain a centrally placed dense core

49. The fibrous capsule of a synovial joint:
   A. Consists of a layer of dense connective tissue covered by a simple squamous epithelium
   B. Covers the entire articular surface of a joint
   C. Is continuous with the periosteum
   D. Is synonymous with the synovial membrane
   E. Is composed of fibrocartilage intermixed with dense connective tissue

50. Which of the following is correct concerning fracture repair:
   A. It includes intramembranous ossification since there is osteogenic activity from the periosteum
   B. It includes endochondral ossification that follows early chondrogenic activity
   C. It includes the formation of fibrous connective tissue to form a soft callus
   D. All of the above

51. Chief cells of the parathyroid glands:
   A. Are derived from the endoderm of the floor of the oral cavity
   B. Are less numerous than oxyphil cells in the young adult
   C. Have an acidophilic cytoplasm due to a large accumulation of mitochondria in the cytoplasm
   D. Produce a hormone that results in elevation of blood calcium levels by promoting the breakdown of bone
   E. Release their hormone in response to secretions produced in the anterior pituitary
52. Osteocytes:
   A. Are attached to one another via tight junctions
   B. Are actively mitotic and are responsible for interstitial growth of bone matrix
   C. Have cytoplasmic projections that are surrounded by extracellular fluid within canalicular spaces
   D. Have parathyroid hormone receptors that are involved in the stimulation of osteoclast activity
   E. Are only found in lamellar bone, not in woven bone

53. In the thyroid gland:
   A. Thyroid peroxidase plays a key role in the synthesis of hormones by follicular cells
   B. An inactive precursor of T3 & T4 is stored extracellularly
   C. Lysosomes are involved in producing the active forms of thyroid hormones
   D. The thyroid hormones are iodinated derivatives of tyrosine
   E. All the above

DIRECTIONS: Each of the numbered items or incomplete statements in this section is negatively phrased, as indicated by a capitalized word such as INCORRECT, FALSE, or EXCEPT. Select the ONE lettered answer or completion that is BEST in each case.

54. Which of the following statements about osteoclasts is FALSE:
   A. Osteoclasts are derived from osteoprogenitor cells
   B. Osteoclasts have multiple nuclei
   C. Osteoclasts can be found on bone surfaces in spaces known as Haversian lacunae
   D. Osteoclasts are closely related to macrophages and monocytes
   E. Osteoclasts can digest the organic matrix of bone with lysosomal proteolytic enzymes

55. Identify the FALSE statement regarding cardiac muscle:
   A. Mitochondria are abundant and have many cristae
   B. Gap junctions between cells make cardiac muscle a functional syncytium
   C. Triads are absent or rare
   D. The main energy source for cardiac muscle is glycogen, whereas for skeletal muscle it is fatty acids
56. Identify the **FALSE** statement regarding neuromuscular junctions on skeletal muscle:

A. One axon innervates a number of muscle fibers in the adult  
B. A terminal Schwann cell caps the nerve ending  
C. Synaptic vesicles selectively fuse with areas of the neuronal membrane called active zones  
D. Active zones are aligned with the junctional folds of muscle membrane  
E. Acetylcholine receptors are located mainly in the synaptic basal lamina

57. The primary capillary plexus of the hypothalamic-hypophyseal portal system:

A. Is located mainly in the pars distalis  
B. Is located mainly in the pars nervosa  
C. Is the site where hypothalamic neurons release antidiuretic hormone  
D. Is the site where releasing factors are secreted by hypothalamic neurons  
E. Is the site where the acidophils and basophils of the pituitary secrete their hormonal products

58. Identify the **FALSE** statement concerning smooth muscle contraction:

A. Excitation-contraction coupling is more rapid in smooth muscle than in striated  
B. Phosphorylation of myosin by myosin light chain kinase is required for actin-myosin binding in smooth muscle  
C. Sympathetic innervation of smooth muscle cells involves "en passant" axonal swellings  
D. The nucleus of a smooth muscle cell can become distorted into an irregular, "corkscrew" shape as a result of cell contraction

59. Identify the **FALSE** statement. Golgi Tendon organs:

A. Are composed of processes of sensory neurons interwoven around intrafusal muscle fibers  
B. Are encapsulated receptors  
C. Are innervated only by afferent neurons  
D. Are located at myotendinous (musculotendinous) junctions  
E. Detect changes in muscle tension
60. Which of the following is a feature of cardiac and skeletal muscle, but NOT smooth muscle:
   A. An endomysium
   B. Cisternae that store calcium
   C. Centrally located nuclei
   D. Intercalated disks
   E. Myofibris

61. Which of the following statements concerning the Z-line is FALSE:
   A. It provides attachment for thin filaments via α-actinin
   B. Intermediate filaments anchor the Z-lines of neighboring myofibrils to one another
   C. Thick filaments are bound to the Z-line by myomesin and C-protein
   D. The protein nebulin anchors to the Z-line and extends the entire length of the thin filament
   E. The distance from one Z-line to the next is considered to be the functional unit of skeletal muscle

62. Which of the following is FALSE concerning remodeling of compact bone:
   A. It is a two stage process consisting of bone resorption & bone deposition
   B. It ceases to occur after the fusion of the epiphysis and diaphysis
   C. It allows bone to reorient itself in response to mechanical stimuli
   D. It is the process by which haversian systems (secondary osteons) are formed
   E. It functions to replace old and/or damaged areas of bone tissue

63. All the following are caused by local inhibition of neuromuscular synaptic transmission EXCEPT:
   A. Botulism
   B. Lambert-Eaton syndrome
   C. Myasthenia gravis
   D. Rigor mortis
   E. Tetanus

64. Which of the following is FALSE concerning the epiphyseal growth plate:
   A. It is an example of a synchondrosis, a type of cartilaginous joint
   B. It will eventually osseously form a synchondrosis
   C. It permits growth in length of the long bone, through proliferation of the cartilage on one side, and replacement by bone on the other
   D. The metaphysis of the growing long bone lies between the growth plate and the diaphysis
   E. It is synonymous with the secondary ossification center