BMEB216 2022 Spring

Homework 2

1. Multiple Choice Questions:

1) Which of the following is true of osteoclasts?
A) Osteoclasts maintain protein and mineral content of matrix.
B) Osteoclasts are responsible for laying down osteoid.
C) Osteoclasts form cytoplasmic extensions within canaliculi.
D) Osteoclasts are located within lacunae.
E) Osteoclasts secretes protein digesting enzymes and acids that dissolve matrix.
Answer: E
Learning Outcome: 6-3
Bloom's Taxonomy: Understanding

2) The most abundant cell type in bone is
A) osteoclasts.
B) osteoblasts.
C) osteolytes.
D) osteoprogenitor cells.
E) osteocytes.
Answer: E
Learning Outcome: 6-3
Bloom's Taxonomy: Understanding

3) The lining of the medullary cavity is called the
A) endosteum.
B) periosteum.
C) epiosteum.
D) mediosteum.
E) paraosteum.
Answer: A
Learning Outcome: 6-4
Bloom's Taxonomy: Remembering

4) The widest intervertebral discs are found in the _____ region.
A) cervical
B) thoracic
C) lumbar
D) sacral
E) coccygeal
Answer: C
Learning Outcome: 7-6
Bloom's Taxonomy: Understanding

5) Which of the following is **not** a function of synovial fluid?
A) shock absorption
B) increases osmotic pressure within joint
C) lubrication
D) provides nutrients
E) protects articular cartilages
Answer: B
Learning Outcome: 9-2
Bloom's Taxonomy: Understanding

6) Which of the following movements is a good example of supination?
A) opening the mouth
B) turning the hand palm upward
C) extreme bending of the head backwards
D) moving the hand toward the shoulder
E) spreading the fingers
Answer: B
Learning Outcome: 9-3
Bloom's Taxonomy: Understanding

7) Which statement is **true** regarding calcium in bone matrix?
A) Calcium is found in crystals called hydroxyapatite.
B) Calcium is secreted by osteoblasts into the matrix.
C) Once deposited, calcium cannot be removed from bone.
D) Calcium provides flexibility to the bone matrix.
E) Calcium is the organic part of the matrix.
Answer: A
Learning Outcome: 6-4
Bloom's Taxonomy: Understanding

8) Which of the following is a recognized function of skeletal muscle?
A) produce movement
B) maintain posture
C) maintain body temperature
D) guard body entrances and exits
E) All of the answers are correct.
Answer: E
Learning Outcome: 10-1
Bloom's Taxonomy: Remembering

9) Put the following structures in order from superficial to deep.

1. muscle fiber
2. perimysium
3. myofibril
4. fascicle
5. endomysium
6. epimysium

A) 1, 5, 4, 3, 2, 6
B) 6, 2, 5, 4, 1, 3
C) 6, 2, 4, 5, 1, 3
D) 1, 3, 5, 6, 4, 2
E) 2, 3, 1, 4, 6, 5
Answer: C
Learning Outcome: 10-2
Bloom's Taxonomy: Understanding

10) In a sarcomere, the central portion of thick filaments are linked laterally by proteins of the
A) Z line.
B) M line.
C) H band.
D) A band.
E) I band.
Answer: B
Learning Outcome: 10-3
Bloom's Taxonomy: Remembering

11) At rest, active sites on the actin are blocked by
A) myosin molecules.
B) troponin molecules.
C) tropomyosin molecules.
D) calcium ions.
E) ATP molecules.
Answer: C
Learning Outcome: 10-3
Bloom's Taxonomy: Remembering

12) A muscle produces its highest tension when in complete
A) recovery.
B) treppe.
C) wave summation.
D) aerobic metabolism.
E) tetanus.
Answer: E
Learning Outcome: 10-5
Bloom's Taxonomy: Remembering
A) tropomyosin rolls away from the active site.

B) active sites on the myosin are exposed.
C) actin heads will bind to myosin.
D) muscle relaxation occurs.
E) myosin shortens.
Answer: A
Learning Outcome: 10-3
Bloom's Taxonomy: Remembering

14) Each skeletal muscle fiber is controlled by a motor neuron at a single
A) synaptic knob.
B) sarcomere.
C) neuromuscular junction.
D) synaptic cleft.
E) transverse tubule.
Answer: C
Learning Outcome: 10-4
Bloom's Taxonomy: Remembering

15) The following is a list of the events that occur during a muscle contraction. What is the correct sequence of these events?
1. Myosin cross-bridges bind to the actin.
2. The free myosin head splits ATP.
3. Calcium ion is released from the sarcoplasmic reticulum.
4. The myosin head pivots toward the center of the sarcomere.
5. Calcium ion binds to troponin.
6. The myosin head binds an ATP molecule and detaches from the actin.
A) 1, 3, 5, 4, 6, 2
B) 5, 1, 4, 6, 2, 3
C) 3, 5, 1, 2, 4, 6
D) 3, 5, 1, 4, 6, 2
E) 1, 4, 6, 2, 3, 5
Answer: D
Learning Outcome: 10-4
Bloom's Taxonomy: Understanding

16) The cytoplasm of the neuromuscular terminal contains vesicles filled with molecules of the neurotransmitter
A) epinephrine.
B) norepinephrine.
C) acetylcholine.
D) antidiuretic hormone.
E) adrenaline.
Answer: C
Learning Outcome: 10-4
Bloom's Taxonomy: Remembering

17) At rest, active sites on the actin are blocked by
A) myosin molecules.
B) troponin molecules.
C) tropomyosin molecules.
D) calcium ions.
E) ATP molecules.
Answer: C
Learning Outcome: 10-3
Bloom's Taxonomy: Remembering

18) Which of the following types of muscle fibers are best adapted for prolonged contraction such as standing all day?
A) uninucleated fibers
B) striated fibers
C) fast fibers
D) slow fibers
E) intermediate fibers
Answer: D
Learning Outcome: 10-8
Bloom's Taxonomy: Remembering

19) During anaerobic glycolysis,
A) ATP is produced.
B) pyruvic acid is produced.
C) oxygen is not consumed.
D) carbohydrate is metabolized.
E) All of the answers are correct.
Answer: E
Learning Outcome: 10-7
Bloom's Taxonomy: Remembering

20) The _____ nervous system controls the skeletal muscles.
A) sympathetic
B) parasympathetic
C) afferent
D) somatic
E) autonomic
Answer: D
Learning Outcome: 12-1
Bloom's Taxonomy: Remembering

21) The myelin sheath that covers many CNS axons is formed by
A) astrocytes.
B) satellite cells.
C) oligodendrocytes.

D) microglia.
E) ependymal cells.
Answer: C
Learning Outcome: 12-3
Bloom's Taxonomy: Remembering

22) Which of the following is **not** true regarding the establishment of a neuron's resting membrane potential?
A) Chemical and electrical forces both favor sodium ions entering the cell.
B) Electrical forces do not push sodium ions into the cell.
C) The chemical gradient for potassium ions tends to drive them out of the cell.
D) Ion pumps in the plasma membrane eject sodium ions as fast as they cross the membrane.
E) Resting membrane permeability to Na^+ is very low.
Answer: B
Learning Outcome: 12-4
Bloom's Taxonomy: Understanding

23) When potassium channels open and the ions diffuse through the membrane,
A) the inside of the membrane will become more positive.
B) the inside of the membrane will become more negative.
C) there will be almost no effect on transmembrane potential.
D) the membrane will become depolarized.
E) the membrane will depolarize to threshold.
Answer: B
Learning Outcome: 12-4
Bloom's Taxonomy: Understanding

24) Which of the following is **true** about threshold for an action potential?
A) It is more positive than the resting membrane potential.
B) Voltage-gated potassium channels begin to close.
C) Voltage-gated potassium channels begin to open.
D) The membrane begins to hyperpolarize.
E) Threshold for a typical neuron is approximately -30 mV.
Answer: A
Learning Outcome: 12-5
Bloom's Taxonomy: Remembering

25) How would a chemical that prevents the opening of voltage-regulated Na+ channels affect the function of a neuron?
A) The neuron will only be able to hyperpolarize.
B) The neuron will depolarize more rapidly.
C) Action potentials will lack a repolarization phase.
D) The neuron will automatically and repeatedly produce graded potentials.
E) The neuron will only be capable of producing graded potentials.

Answer: E
Learning Outcome: 12-5
Bloom's Taxonomy: Understanding

26) Puffer fish poison blocks voltage-gated sodium channels like a cork. What effect would this neurotoxin have on the function of neurons?
A) Neurons would depolarize more rapidly.
B) Action potentials would lack a repolarization phase.
C) The absolute refractory period would be shorter than normal.
D) The axon would be unable to generate action potentials.
E) None, because the chemically gated sodium channels would still function.
Answer: D
Learning Outcome: 12-5
Bloom's Taxonomy: Applying

27) Which of the following types of nerve fiber possesses the fastest speed of impulse propagation?
A) type A
B) type B
C) type C
D) type D
E) type E
Answer: A
Learning Outcome: 12-5
Bloom's Taxonomy: Remembering

28) A neuron that receives neurotransmitter from another neuron is called
A) the presynaptic neuron.
B) the motor neuron.
C) an oligodendrocyte.
D) a satellite cell.
E) the postsynaptic neuron.
Answer: E
Learning Outcome: 12-6
Bloom's Taxonomy: Remembering

28) Spinal nerves are
A) purely sensory.
B) purely motor.
C) both sensory and motor.
D) interneuronal.
E) involuntary.
Answer: C

Learning Outcome: 13-2
Bloom's Taxonomy: Remembering

29) If the posterior root of a spinal nerve is severed,
A) output to skeletal muscles would be blocked.
B) output to visceral organs would be blocked.
C) efferent fibers would be blocked.
D) the brain would not be able to communicate with that level of the spinal cord.
E) sensory input would be blocked.
Answer: E
Learning Outcome: 13-2
Bloom's Taxonomy: Applying

30) The outermost connective tissue covering of nerves is the
A) endoneurium.
B) endomysium.
C) perineurium.
D) epineurium.
E) epimysium.
Answer: D
Learning Outcome: 13-4
Bloom's Taxonomy: Remembering

31) A viral disease that destroys the cells of the anterior gray horn will
A) lead to skeletal muscle weakness or paralysis.
B) interfere with position sense.
C) mainly interfere with crude touch and temperature sense.
D) block autonomic regulation.
E) affect visceral motor function.
Answer: A
Learning Outcome: 13-4
Bloom's Taxonomy: Applying

32) A motor neuron typically receives input from neurons that originate in various areas of the brain. This type of circuit is a
A) divergent circuit.
B) convergent circuit.
C) serial processing circuit.
D) parallel processing circuit.
E) reverberating circuit.
Answer: B
Learning Outcome: 13-5
Bloom's Taxonomy: Understanding

33) _____ reflexes activate skeletal muscles.
A) Involuntary
B) Cranial
C) Spinal
D) Autonomic
E) Somatic
Answer: E
Learning Outcome: 13-6
Bloom's Taxonomy: Remembering

34) The _____ division of the autonomic nervous system is said to function during "rest and digest."
A) sympathetic
B) parasympathetic
C) thoracolumbar
D) visceral
E) somatomotor
Answer: B
Learning Outcome: 16-1
Bloom's Taxonomy: Remembering

35) Which of the following is **not** controlled by the ANS?
A) skeletal muscle system
B) cardiovascular system
C) respiratory system
D) digestive system
E) urinary system
Answer: A
Learning Outcome: 16-1
Bloom's Taxonomy: Understanding

36) Sympathetic preganglionic fibers are _____ and have _____ axons.
A) short; myelinated
B) short; unmyelinated
C) long; myelinated
D) long; unmyelinated
E) intermediate; small
Answer: A
Learning Outcome: 16-2
Bloom's Taxonomy: Remembering

37) The adrenal medullae secrete
A) medullin.
B) epinephrine.

C) norepinephrine.
D) renin.
E) both epinephrine and norepinephrine.
Answer: E
Learning Outcome: 16-2
Bloom's Taxonomy: Remembering

38) The _____ nervous system stimulates the arrector pili muscles and gives you "goosebumps."
A) parasympathetic
B) afferent
C) dorsal
D) sympathetic
E) somatic
Answer: D
Learning Outcome: 16-2
Bloom's Taxonomy: Remembering

39) Which of the following is a sympathetic neurotransmitter used for vasodilation?
A) acetylcholine
B) norepinephrine
C) dopamine
D) serotonin
E) nitric oxide
Answer: E
Learning Outcome: 16-3
Bloom's Taxonomy: Understanding

40) Nicotinic receptors
A) respond to epinephrine.
B) respond to norepinephrine.
C) open chemically-gated sodium ion channels.
D) can be either excitatory or inhibitory in function.
E) are found at synaptic junctions of the sympathetic nervous system.
Answer: C
Learning Outcome: 16-5
Bloom's Taxonomy: Remembering

2. Essay Questions:

1) What is a reflex arc? What components must be present to qualify?
Answer: A reflex arc is the wiring pattern of neurons that underlie a particular reflex. A reflex arc consists of three elements at the minimum: (1) a sensory receptor and neuron to carry afferent information to the CNS; (2) an excitatory synapse on a motor neuron; (3)

the motor neuron to generate an action potential and conduct the impulse to an effector such as a skeletal muscle motor unit.
Learning Outcome: 13-6
Bloom's Taxonomy: Applying

2) Mr. Martin is suffering from a condition known as ventricular tachycardia, in which his heart beats too quickly. Would an alpha-blocker or a beta-blocker help alleviate his problem? Why?
Answer: You would want to use a beta-blocker, because the stimulation of beta-1 receptors increases heart rate. By blocking these receptors, parasympathetic influence will predominate and the heart will slow down.
Learning Outcome: 16-3
Bloom's Taxonomy: Applying

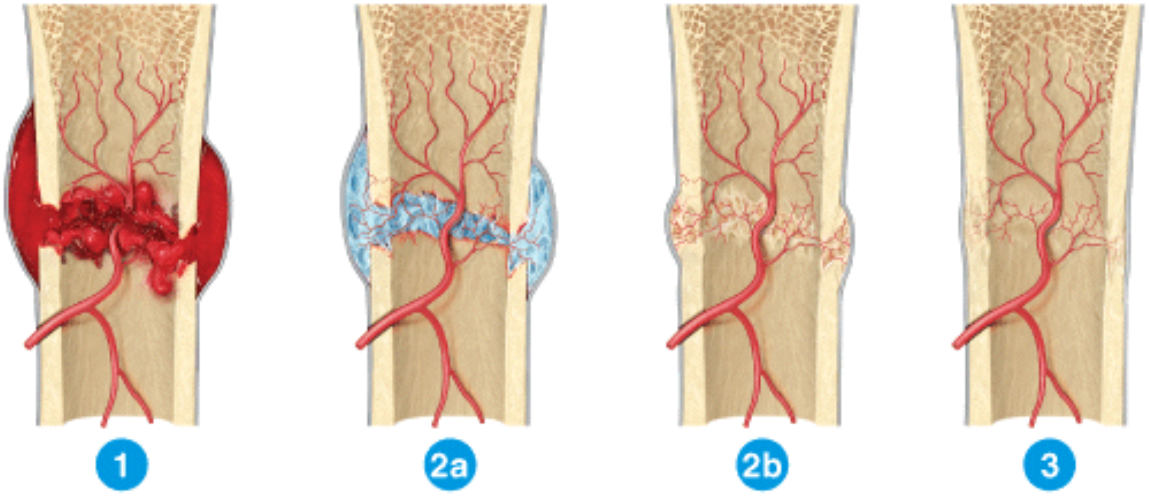
3) What is the difference between ossification and calcification?
Answer: Ossification means specifically the conversion of connective tissue into bone tissue. Calcification means the depositing of calcium salts in any tissue, including bone.
Learning Outcome: 6-5
Bloom's Taxonomy: Understanding

4) List the four steps of the contraction cycle in order of occurrence. What is needed for these steps to continuously repeat?

Answer:

Difficulty: Medium
Bloomcode: Analysis
Learning Objective 1: LO 10.3 Investigate the origination of muscle action potentials at the neuromuscular junction and the steps involved in the sliding filament mechanism of muscle contraction.
Learning Objective 2: LO 10.3.1 Outline the steps involved in the sliding filament mechanism of muscle contraction.
Section Reference 1: Sec 10.3 Contraction and Relaxation of Skeletal Muscle Fibers
Solution: ATP hydrolysis, attachment of myosin to actin forming crossbridges, the power stroke, then detachment of myosin from actin. The cycle will continue as long as ATP and calcium ions are available.

5) Briefly describe what is happening in each step of fracture repair shown in the diagram.



Answer:

Difficulty: Medium
Bloomcode: Application
Learning Objective 1: LO 6.6 Describe common types of fractures and the process of fracture repair.
Learning Objective 2: LO 6.6.2 Describe the sequence of events involved in fracture repair.
Section Reference 1: Sec 6.6 Fracture and Repair of Bone.
Solution: The diagram illustrates repair of a bone fracture. In step one, there is formation of a fracture hematoma. In step two, a fibrocartilaginous callus is formed. In step three, a bony callus is formed. In step four, bone remodeling begins.

6) A hypothetical genetic disease causes the body to produce antibodies that compete with acetylcholine for receptors on the motor end plate. Patients with this disease exhibit

varying degrees of muscle weakness in the affected muscles. If you could administer a drug that inhibits acetylcholinesterase or a drug that blocks acetylcholine, which one would you use to alleviate these symptoms?
Answer: This is a case of competition between acetylcholine and the antibody. To make the patient's acetylcholine more effective, a drug that inhibits acetylcholinesterase would slow the breakdown of acetylcholine, relieving some of the weakness. An acetylcholine blocker would be worse than doing nothing.
Learning Outcome: 10-4
Bloom's Taxonomy: Applying