These review questions are for the Muscular system lecture topic. The questions were adapted from several sources, including 1700+ Review Questions for Anatomy and Physiology II (3rd edition) by R. Michael Anson, Ph.D.

You are required to know and understand all the material on the muscular system that is covered in the lecture and the laboratory. To aid in your review of muscular system anatomy, a list of major muscles in the body is given below. For each of the muscles listed below, be able to (a) state its location on the body, (b) name its insertion (the body part it moves), (c) describe the motion it causes (flexion, extension, abduction, adduction, etc.).

Abdominal muscle group
Adductor muscle group
Biceps brachii
Biceps femoris
Deltoid
Extensor carpi muscles
Extensor digitorium muscles
Externaloblique
Flexor carpi muscles
Flexor digitorium muscles
Frontalis
Gastrocnemius
Gluteus maximus
Gluteus medius
Hamstring muscle group
Iliopsoas muscle group
Internal oblique
Latissimusdorsi
Masseter
Orbicularisoculi
Orbicularisori
Pectoralismajores
Platysma
Quadricep muscle group
Rectus abdominus
Rectus femoris
Sartorius
Semimembranosis
Semitendinosis
Soleus
Sternocleidomastoid
Temporalis
Tibialis anterior
Transversusabdominus
Trapezius
Triceps brachii
Vastuslateralis
Vastusmedialis
Zygomaticus

<u>Multiple choice review questions:</u>

1) Another term for a muscle cell is a muscle _____
   A) myocyte
   B) sarcomere
   C) fiber
   D) fascicle

2) The major function of muscles is to
   A) Protect bones and organs
   B) Cause movement
   C) Digest substances
   D) Determine body tone

3) Skeletal muscles contract when they receive stimulation from _____.

A) The homeostasis system
B) The endocrine system
C) The skeletal system
D) The nervous system

4) Skeletal muscle cells are different from other cells in that they
A) lack smooth endoplasmic reticulum.
B) have no mitochondria.
C) have multiple nuclei.
D) depend entirely on anaerobic respiration.

5) Within a muscle organ the muscle cells are grouped into bundles called ____. Each bundle is surrounded by its own connective tissue sheath.
A) sarcomeres
B) sarcolemmas
C) myocells
D) fascicles

6) Muscle is connected to bones by
A) ligaments.
B) tendons.
C) adipose tissue.
D) epithelial tissue

7) When a skeletal muscle contracts, it usually moves one bone of a joint more than the other bone. The attachment of the muscle to the less movable bone is called its
A) ligament.
B) insertion.
C) flexor.
D) origin.

8) The thick filaments of muscle are composed of a protein called
A) tropomyosin.
B) actin.
C) troponin.
D) myosin.

9) The basic unit of muscle contraction is the sarcomere. Which choice below best describes the correct order of structures inside one sarcomere?
A) Z-disc, actin stack, myosin stack, actin stack, z-disc
B) Actin stack, myosin stack, actin stack, myosin stack, actin stack, etc.
C) Actin stack, myosin stack
D)Myosin stack, Z-disc, actin stack, Z-disc

10) Skeletal muscle cells are striated that is, they have alternating dark and light bands called ____, respectively.

A) A and I bands
B) H and M bands
C) Z and M lines
D) I and H bands

11) The I bands of skeletal muscle cells each have a dark line in the middle called a
A) D line.
B) H line.
C) Z line.
D) X line.

12) The region of the resting sarcomere where the actin and myosin filaments are overlapping is seen in the…
A) narrow dark line known as the Z line.
B) dark color of the I bands.
C) lighter region of the I bands.
D) dark color of the A bands.

13) Contraction in a muscle occurs because the
A) Actin filaments get shorter.
B) Myosin filaments get shorter.
C) Actin filaments slide between the myosin filaments.
D) Z-discs pull on opposite ends of the sarcomere.

14) During contraction the
A) actin filaments bind to myoglobin
B) I bands shorten.
C) sarcomeres do not change in length.
D) size of the H zone increases.

15) When a muscle cell is relaxed (not contracting), which proteins areblocking myosin from binding to actin (two answers)
A) tropomyosin.
B) Z-discane
C) troponin.
D) ATP

16) The ability of myosin to bind to actin (and therefore to contract the muscle) is regulated by the ion
A) Ca^{2+}
B) ATP
C) K^{+}
D) Na^{+}

17) Sustained muscle activity may consume ATP faster than aerobic and anaerobic cellular respiration can produce it. In such circumstances, ATP can be made by combining ADP with phosphate groups borrowed from

A) glucose phosphate
B) creatine phosphate
C) cyclic AMP
D) phospholipids

18) Aerobic exercise is defined as any exercise that…
A) increases muscle power (force per contraction)
B) increases muscle size
C) causes lactic acid build up in muscles while exercising
D) increases breathing and heart rate while exercising

19) A person with huge powerful muscles (such as a professional body builder) does a lot of
A) Resistance training
B) Aerobic respiration
C) Metabolism
D) Aerobic exercise

20) Most of the time, muscles usually use the process of _____ to recharge their ATP energy supply
A) Anaerobic respiration
B) Na^+ and K^+
C) Aerobic respiration
D) Electrical energy from neurons

21) What does the body use to change the contraction strength of a muscle organ (for example, to change the amount of force the bicep muscle generates)?
A) The number of muscle cells contracted.
B) The number of fascicles present.
C) The amount of calcium released into the cell.
D) The number of neurons present.

22) Other than increasing the number of muscle cells contracted, what is another thing that the body uses to change the contraction strength of a muscle organ?
A) thefrequency of motor signals to the muscle.
B) the amount ATP inside each muscle cell.
C) theamount of connective tissue between neighboring muscle cells.
D) the number tendons that connect the muscle to the more movable bone.

23) A person continues breathing heavily for some time after exercising in order to "repay an oxygen debt." This oxygen debt includes the oxygen that is
A) left in the lungs but not transferred to the blood
B) released in the urine as oxygen ion
C) needed to oxygenate damaged muscle tissues
D) needed to metabolize the lactic acid produced by exercise.

24) The muscle that provides all or most of the force for a movement is called the _____ of the movement.
A) Energist

B) Insertion
C) Prime mover
D) First responder

25) A muscle that can reverse the movement of the prime mover is called a(n) _____ of the movement.
A) Secondary mover
B) Myoreversor
C) Retrograde mover
D) Antagonist

26) Muscles that assist the prime mover are called
A) Synergists
B) Co-movers
C) Secondary movers
D) Sub-prime lenders

27) Any movement that decreases the joint angle is called _____. (Hint: This type of movement is usually curling body parts in the frontal plane, such as curling your fingers).
A) Hyperextension
B) Extension
C) Abduction
D) Flexion

28) Any movement toward the midline of the body is called _____.
A) Adduction
B) Abduction
C) Mediation
D) colateralization

29) The muscle that covers the forehead
A) Zygomaticus
B) Frontal
C) Parietal
D) Tibialis anterior

30) The two major muscles used for generating chewing force (two answers)
A) Biceps brachii
B) Masseter
C) Temporalis
D) Zygomaticus

31) The muscle used for smiling
A) Placerus
B) Zygomaticus

C) Platysma
D) Sonreirus

32) The circular band of muscles that surround the eyes are the _____ oculi, while the circle muscle that surrounds the mouth is the _____oris. (the same answer for both blanks).
A) Orbicularis
B) Annualus
C) Circularis
D) Muscularis

33) The muscle that covers the front of the neck and that is used for frowning
A) Mandibularis
B) Tristariscervicii
C) Platysma
D) Dolarius

34) The pair of muscles (one on each side of the neck) that are used to flex the neck (as when looking down at the ground)
A) Sternocleidomastoids
B) Trapezius
C) Deltoids
D) Platysma

35) The pair of muscles that insert into the posterior of the skull. They are used to extend the neck (as when looking up into the sky)
A) Sternocleidomastoids
B) Trapezius
C) Deltoids
D) Platysma

36) The upper chest muscles that are underlie the breast
A) Pectoralis majores
B) Deltoids
C) Latisimus dorsi
D) Flexor carpidium

37) Which is **not** a layer of the abdominal muscles?
A) Internal oblique
B) Abdominislateralis
C) External oblique
D) Rectus abdominis
E) Transversusabdominis

38) Which muscle shrugs the shoulders?
A) Biceps brachii
B) Triceps brachii

C) Latissimusdorsi
D) Trapezius

39) Which muscle is used to do pull ups (to adduct the arms in the frontal plane)?
A) Trapezius
B) Triceps brachii
C) Zygomaticusbrachii
D) Latissimusdorsi

40) Which muscle abducts the arm in the frontal plane (such as when starting a jumping jack)?
A) Biceps brachii
B) Deltoids
C) Latissimusdorsi
D) Pectoralismajores

41) This muscle flexes the forearm at the elbow
A) Extensor carpiulnaris
B) Biceps brachii
C) Flexor carpidigitorium
D) Flexus Radialis

42) This muscle extends the forearm
A) Extensor carpiradialis
B) Triceps brachii
C) Extensor carpiulnaris
D) Deltoid

43) The muscles of the forearm move the ____ and _____ (two answers).
A) Wrist
B) Arm
C) Fingers
D) Elbow
E) Shoulder

44) Several muscles on the forearm curl the wrist. Almost all of these muscles all have the words _____ and _____ as part of their name (two answers)
A) Foramen
B) Ulnaris
C) Radialis
D) Flexor
E) Carpi

45) Several muscles on the forearm uncurl the fingers. Almost all of these muscles all have the words _____ and _____ as part of their name (two answers)
A) Extensor
B) Phalange

C) Flexor
D) Digitorium
E) Carpi

46) The large muscles that form most of the buttocks
A) Gluteus maximus
B) Iliopsoas
C) Quadriceps
D) Levatorspinosum

47) This muscle extends the thigh at the hip
A) Quadriceps
B) Hamstring
C) Gluteus maximus
D) Rectus femoris

48) These muscles cover the sides of the pelvis
A) Gluteus lateralis
B) Gluteus medius
C) Femorislateralis
D) Vastuslateralis

49) This muscle group flexes the thigh at the hip
A) Iliopsoas
B) Gastrocnemeus
C) Flexor femoris
D) Biceps femoris

50) The group of muscles in the inner pelvic region that bring the thigh inward (For example, when closing the legs when completing a jumping jack)
A) Adductors
B) Semimembranosus
C) Gluteus medius
D) Gluteus maximus

51) The group of muscles on the anterior of the thigh
A) Biceps femoris
B) Hamstrings
C) Quadriceps
D) Flexor femoris

52) Which muscle is **not** one of the quadriceps muscle group?
A) Rectus femoris
B) Vastuslateralis
C) Vastusmedialis

D) Biceps femoris

53) The group of muscles on the posterior of the thigh
A) Rectus femoris
B) Hamstrings
C) Quadriceps
D) Flexor femoris

54) Which muscle is **not** one of the hamstring group?
A) Biceps femoris
B) Rectus femoris
C) Semimembranosus
D) Semitendonosus

55) A thin muscle that runs diagonally across the thigh and is used to cross the leg
A) Gracalis
B) Iliopsoas
C) Sartorius
D) Gastrocnemius

56) The majority of the calf is this muscle
A) Sartorius
B) Gastrocnemius
C) Tibialis anterior
D) Tibialus posterior

57) This calf muscle is deeper and inferior to the gastrocnemius
A) Sartorius
B) Soleus
C) Tibialis anterior
D) Tibialus posterior

58) The calf muscles cause this movement
A) Abduction of the foot at the ankle
B) Adduction of the ankle at the knee
C) Plantar flexion
D) Plantar extension

59) The _____ muscle is located on the front side of the leg
A) Quadriceps
B) Hamstring
C) Tibialis anterior

D) Soleus

60) The tibialis anterior cause this movement:
A) Plantar extension
B) phalangeal extension
C) Soleus flexion
D) Dorsiflexion

61) This hormone increases the size and strength of muscles
A) Glucose
B) ATP
C) Testosterone
D) Iron

62) As we become senior citizens, our muscles lose _____ but gain _____. (two answers)
A) Cartilage
B) Connective tissue
C) Fat
D) Muscle cells
E) Blood vessels

63) A fatal muscular disease of children
A) Muscular dystrophy
B) Testosterone absence
C) Anemia
D) Leukemia

64) A muscular disease of adults caused by the immune system attacking the junction between the nerves and the muscles
A) Leukemia
B) Sarcoma
C) Grave's disease
D) Myasthenia gravis

Answers to multiple choice questions:

1) C 2) B 3) D

4) C
5) D
6) B
7) D
8) D
9) A
10) A
11) C
12) D
13) C
14) B
15) A and C
16) A
17) B
18) D
19) A
20) C
21) A
22) A
23) D
24) C
25) D
26) A
27) D
28) A
29) B
30) B and C
31) B
32) A
33) C
34) A
35) B
36) A
37) B
38) D
39) D
40) B
41) B
42) B
43) A and C
44) D and E
45) A and D
46) A
47) C
48) B
49) A
50) A
51) C
52) D
53) B
54) B
55) C
56) B
57) B
58) C
59) C
60) D
61) C
62) D and B
63) A
64) D

Fill-in-the-blank review questions:

1) _____ are the organs that provide force for movement.

2) Muscles cause movement by _____, which means getting shorter.

3) In addition to movement, muscle tissue is also responsible for generating much of the body's _____.

4) (True/False) A muscle cannot lengthen itself.

5) (True/False) After a muscle contraction ends and the muscle relaxes, it automatically recoils (returns) to its resting length.

6) Each muscle cell is also called a muscle _____.

7) What sends muscles the signal to contract? _____

8) There are two major types of protein filaments in muscle cells: _____ and _____.

9) The thin protein filaments in muscle cells are _____ protein.

10) The thick protein filaments in muscle cells are _____ protein.

11) Striations (stripes) are seen in _____ and _____ muscle cells.

12) Skeletal muscle cells are formed during the embryonic stage of development when several stem cells merge: as a result, skeletal muscle cells have many _____, as opposed to smooth and cardiac muscle cells, which have only one.

13) Two unique characteristics of cardiac muscle cells include _____ shape and _____; the latter contain Tiny holes called gap junctions which allow contraction signals to move between cardiac muscle cells.

14) _____ muscle cells lack striations and have only one nucleus.

15) The striations that are seen in cardiac and skeletal muscle cells are the aligned stacks of _____ and _____ protein filaments.

16) The one type of muscle cell that does not have striations is _____ muscle cell.

17) True or false: Smooth muscle cells have actin and myosin proteins. _____

18) _____ muscle is found in hollow organs to propel substances through the organ.

19)The diameter of blood vessels is controlled by _____ muscle in the blood vessel wall.

20)Smooth muscle tissue does not have striations because, unlike skeletal muscle, itssarcomeresare arranged _____.

21) In cardiac muscle tissue, each muscle cell has disc-shaped structures called _____ located at the boarders between neighboring muscle cells. These structures allow cardiac muscle cells to _____. This allows large sections of the heart to contract in unison.

22)You can voluntarily control when you contract your bicep muscle. The bicep must therefore be made of _____ muscle tissue. (Note: understand the concept, the muscle organ named may be different on the exam.)

23) Each skeletal muscle organ, such as the biceps, is made of several groups of muscles cells bundled together by dense connective tissue. Each bundle of muscle cells is called one _____, which means "bundle".

24) Skeletal muscle organs are connected to bones by _____, which are rope-like structures made of dense connective tissue.

25) Most skeletal muscle organs are attached to two bones of a joint. When the muscle contracts, it applies force to both bones but usually only one bone moves. The muscle's attachment to the more movable bone is called its _____. The muscle's attachment to the less movable bone is called its _____.

26) The movement of a joint's bones by a skeletal muscle organ is described by the phrase "The _____ moves towards the _____."

27) A _____ is the smallest contractile unit of a skeletal muscle cell.

28) By definition, the length of one sarcomere extends from one _____ to the next _____.

29) The proteins in one sarcomere are (in this order): Z disc, then a stack of _____ protein, then a stack of _____ protein, then another stack of _____ protein, then a Z disc.

30) Inside muscle cells, there are structures called _____ which are made of hundreds of sacromeres are linked end to end.

31) Within a sarcomere, the dark bands are designated by the letter ___ , and the light bands are designated by the letter ___.

32) Dark striations called A bands are formed by the _____ protein filaments.

33) Light striations called I bands are formed by the _____ protein filaments.

34) In the description of a sarcomere, the center of each I band has a thin, dark line called a ____ line .

35) The Z discs attach to and hold the _____ proteins of the sacromere.

36) In the blank space after each muscle term on the left, write the letters of all descriptions on the right that match it. Some descriptions may match more than one term. Write the letters of all matching descriptions.

A band _____

I band _____

Z line _____

H zone _____

a) A small light band in the middle of an an A band

b) It is a disc where the actin filaments are attached

c) It gets smaller when a muscle contracts

d) It is an area of myosin filaments not overlapping with actin filaments

e) It is an area of actin filaments not overlapping with myosin filaments

f) It marks the end of a sarcomere

g) It is caused by (and as long as) the myosin filaments

37) Place the following in order from smallest to largest: myofibril, actin, myosin, muscle organ, fascicle, muscle cell, sarcomere.

38) In a skeletal muscle cell, extensions of the myosin molecules called _____ can bind to grooves in the actin proteins.

39) When a muscle cell is relaxed, the myosin heads are blocked from binding to actin because of two proteins: _____ and _____.

40) One of the first steps in muscle contraction is when _____ (an ion) causes the troponin and tropomyosin proteins to detach the actin protein.

41)Once the troponin and tropomyosin have moved out of the actin grooves, the myosin heads are free to bind to the actin. Once the myosin heads bind to actin, the myosin heads pull the actin inward/outward (circle one). This movement requires _____, the molecule that directly supplies energy to cellular proteins.

42) Indicate the size of the following muscle components from smallest to largest, by writing the numbers 1 - 8 after each term.

Actin _____
Myosin heads _____

Myofibril _____
Muscle cell _____
Myosin _____
Sacromere _____
Fascicle _____
Calcium ions _____

43) A muscle contraction involves all of the following events. Using the numbers 1-7, indicate the order they occur in.

H zones decreasing in size_____

Calcium levels increase_____

Myosin heads bind actin_____

ATP is consumed_____

Nerve signal reaches muscle_____

Actin and myosin at maximum overlap_____

Tropomyosin protein detaches from actin_____

44) Three methods used by muscle cells to regenerate ATP are _____, _____ and _____.

45)The fastest way muscles can recharge their ATP is by transferring phosphates from _____ directly to ADP.

46) To test if a person has had a heart attack, doctors check the blood for the presence of a heart enzyme that transfers phosphates from _____ to ADP. If this enzyme is found in the blood, it indicates a heart attack because during a heart attack the enzyme leaks out of the damaged heart tissue.

47) Muscles can recharge their ATP supply using a process called _____, wherein energy from glucose is used to recharge the ATP; No oxygen is needed and lactic acid is made as a product.

48) Muscles can recharge their ATP supply using a process called _____, wherein energy from glucose is used to recharge ATP; Oxygen is needed. CO_2 and H_2O are made as products.

49) As exercise gets very intense, the muscles use more aerobic/anaerobic (circle one) respiration.

50) The major health benefit of aerobic exercise is to increase the efficiency and health of the body's _____ system.

51)The term for the decrease in a muscle's force because of prolonged use (in other words, the term for a muscle getting tired) is _____. One source of muscle fatigue is an increase in _____, a

molecule that builds up in the muscle from prolonged anaerobic respiration. Another cause for muscle fatigue is using up the _____ that is stored in the muscle for fuel.

52) The endurance of a muscle (how long you can use the muscle before it fatigues) is increased/decreased (circle one) when the muscle relies on anaerobic respiration instead of aerobic respiration).

53) In _____ exercise, the muscle contracts against a large load (Example: Trying to lift a very heavy weight).

54) In _____ exercise, the person's heart rate and breathing are increased throughout the entire exercise session (Example: jogging or riding a bicycle).

55) The two major direct effects of resistance training (which is usually anaerobic exercise) on muscle are to increase the _____ and _____ of the muscle cells.

56) In the blank space after each term on the left, write the letters of all descriptions on the right that match it.Some descriptions may match more than one term. Write the letters of all matching descriptions.

Aerobic respiration _____	a) Causes lactic acid in muscles
Anaerobic respiration _____	b) Increases muscle size but not endurance
Lightexercise _____	c) Mostly aerobic respiration is used
Intense exercise _____	d) Usually involves contractions against heavy weight
Resistance training _____	e) Lowers chances of heart attack and stroke
	f) Produces 36 ATP per glucose
	g) Produces 2 ATP per glucose

57) The ability of a muscle organ to change the amount of force it generates is called its ability to perform _____ contractions.

58) Within a muscle organ, the greater the number of muscle cells that contract, the greater/smaller (circle one) force that the muscle produces.
59) A _____ means the amount that a muscle cell contracts due to one single nerve signal.

60) One twitch only causes partial contraction of the sarcomeres, not full contraction. To cause fullcontraction of the sarcomeres in the muscle cell, what must occur (in regards to nerve signals)?
_____

61) If the frequency of nerve signals increases beyond a certain point, the muscle cell reaches its maximum contraction force (because its sarcomeres are fully contracted). The term _____ refers this state of sustained maximum muscle contraction.

62)In summary, there are two ways muscles can vary the amount of force they generate. The force can be changed by increasing the number of _____ that are recruited within the muscle organ, and the force can be changed by increasing the _____ of nerve signals reaching each muscle cell in the organ.

63) In general, each skeletal muscle organ connects to two bones of a joint. Its connection to the more movable bone is called the muscle's _____, and the muscle's connection to the less movable bone is called the muscle's _____.

64) As a general rule, when a muscle contracts, the _____ moves toward the _____.

65) When a muscle causes movement at a joint of the body, the muscle is almost always located on the proximal/distal (circle one) side of the joint.

66) If you flex your leg at the knee, the muscle that causes the movement is found above/below (circle one) the knee.

67) Sometimes a movement is caused by a group of muscles pulling in unison. The muscle that causes the majority of the movement force is called the _____.

68)A(n) _____ is a muscle thatcan oppose another muscle's movement (in other words, a muscle that can pull a joint in the opposite direction).

69) _____ are muscles which are not prime movers but that instead assist in a particular movement by adding force, stability, or direction.

70) Synergists which stabilize a muscle's origin so that it does not move during contraction are called _____.

For questions 71 – 84, choose from the following answers: Flexion, extension, hyperextension, dorsiflexion, plantarflexion, abduction, or adduction.

71) Bending a leg at the knee is _____ of the knee.

72) Straightening a bent knee is _____ of the knee.

73)Starting from anatomical position, if you swing your straightened arm forward, you are doing ____ of the arm at the shoulder. When you lower the arm back into anatomical position, you are doing _____ of the arm at the shoulder.

74) Bending forward at the waist is _____ of the trunk. From this bent position, when you return to anatomical position, this is _____ of the trunk.

75) Starting from anatomical position, bending backward at the waist is _____ of the trunk.

76) Tilting the chin downward is _____ of the neck. Returning it to anatomical position is _____ of the neck.

77)From anatomical position, tilting the chin upward is _____ of the neck.

78) Tilting your foot so that your toes come off the ground and you are standing on the heel of the foot, is called _____ of the foot.

79) Tilting your foot so that your heelcomes off the ground and you are standing on your toes (e.g., tip-toeing) is called _____ of the foot.

80) Moving the limbs (or fingers) apart, away from the midline, is _____.

81) Moving the limbs (or fingers) together or toward the midline is _____.

82) If your elbow starts bent and you straighten it, you are _____ the forearm at the elbow joint. If your elbow starts straight and you bend it, you are ____ the forearm at the elbow joint.

83) When you pick up an apple, you are _____ the finger joints. When you let go of the apple, you are _____ the finger joints.

84) From anatomical position, if you raise your arms sideways (such as starting to do a jumping back), you are _____ your arms at the shoulder joint. When you return your arms to anatomical position, you are _____ your arm at the shoulder joint.

85) The _____ muscle raises the eyebrows.

86) The muscles that allow us to wink, blink, or squint are the _____.

87) The corners of the mouth are raised during a smile by the _____ muscle.

88) To pull the outer corners of the mouth down into a frown, we contract the _____.

89) To purse the lips when we want to kiss or whistle, we contract the _____ muscle.

90) The _____ is the prime mover of the jaw bone for chewing.

91) The temporalis originates from the ____ bone and it is a synergist (assistant muscle) to the masseter for the chewing movement of the ____ bone.

92) When you bow your head forward (as if in prayer), you are flexing/extending (circle one) the head at the neck. Which neck muscle is the prime mover? _____ Which is the antagonist? _____

93)Rotating the head left and right (as if shaking the head "No") is done by contracting the _____ muscle on one side of the body first and then relaxing that muscle while contracting the _____ on the other side.

94) The _____ muscles insert into the back of the neck. They pull on the upper vertebrae, which causes the neck to extend or hyperextend (as in looking up into the sky).

95) The muscles that make a protective cage for the digestive organs are the _____.

96) How many layers of muscle are there in your abdomen? ___

97) The four abdominal muscles (from innermost to outmost) are the _____, _____, _____, _____

98) To twist the thorax (as when you look fully behind you), the prime mover is the _____ muscle. (Be as specific as possible in your answer).

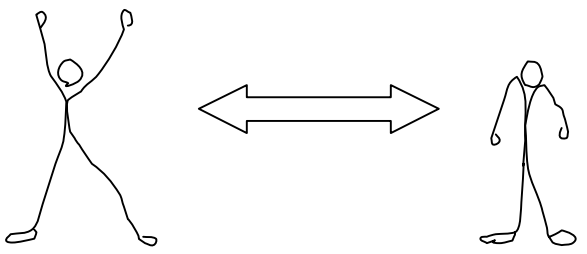
99) When doing a sit up, the _____ muscles pull the thorax toward the pelvic region. (Be as specific as possible in your answer).

100) Contraction of the _____ muscles adduct the arms at the shoulder in the transverse plane. These muscles can also flex the arms upward.

101) The _____ muscles abduct the arms in the frontal plane.

102)The _____ muscles shrug the shoulders upward.

103) The two stick figures below represent a person doing jumping-jacks.



(a) (b)

The movement of the arms from (a) –> (b) is a type of movement called _____.

The movement of the arms from (b) –> (a) is a type of movement called _____.

For each of the two movements described above, name the muscle that moves the arms and give its origin and it insertion.

(a) –> (b) arm movement:

Muscle: _____
Origin: _____
Insertion: _____

(b) –> (a) arm movement:

Muscle: _____
Origin: _____
Insertion: _____

104) When you are doing a push up, and your chest is touching the ground and you are pushing yourself upward off the floor, what muscle is the prime mover of the arm (at the shoulder joint) and what muscle is the antagonist? For each one, state where its insertion and origin are.

Prime mover = _____

Insertion: _____

Origin: _____

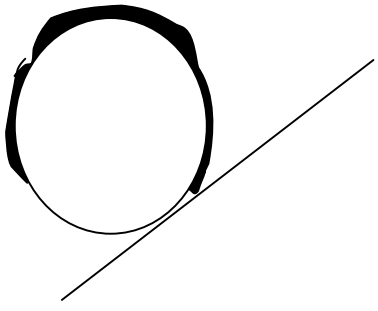
Antagonist = _____

Insertion: _____

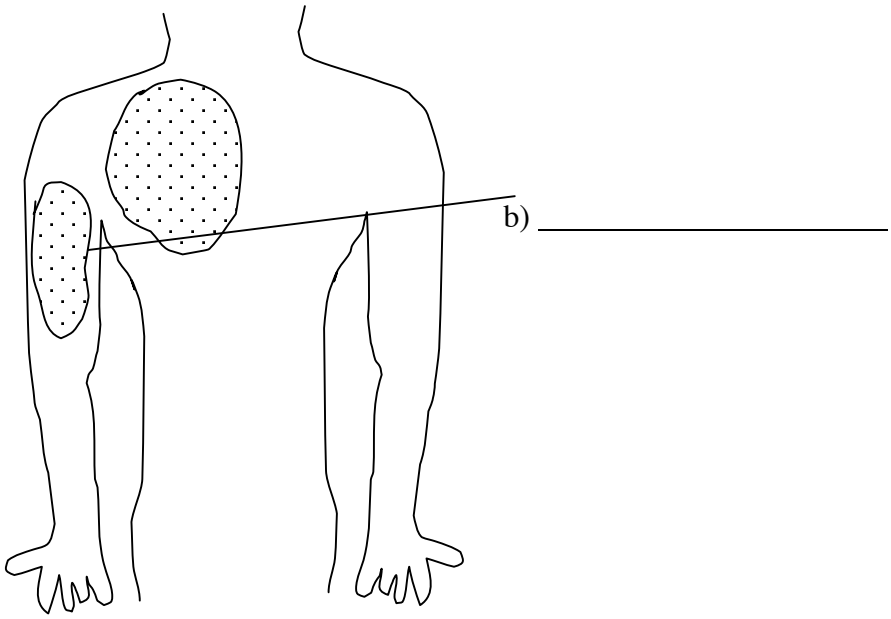
Origin: _____

105)Theglenoid cavity is the socket in the scapula (shoulder blade) where the humerus (arm bone) articulates. The glenoid cavity is so shallow and the range of arm motion so great that the humerus and scapula are held together primarily by the muscles and tendons that surround the shoulder. All muscles that surround the shoulder joint and contribute to its stability are together called the _____ muscles.

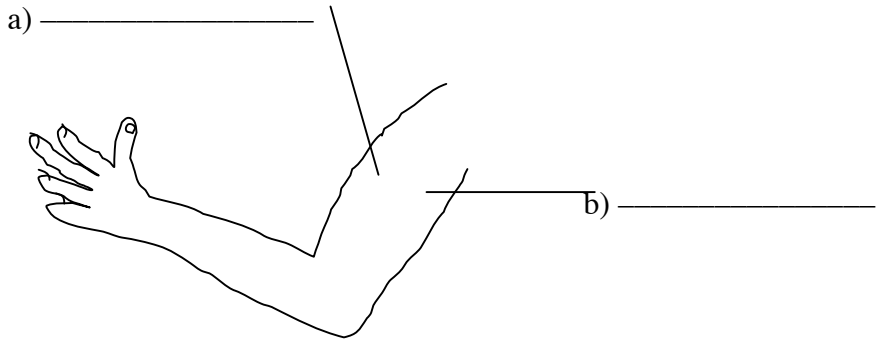
106) Name these two anterior muscles. Circle the one that flexes that arm.



a) _____



107) Name the muscles that are located in the two indicated regions of the arm. Under each muscle's name, write whether it extends or flexes the forearm at the elbow.



108)The _____ muscles adduct the arms at the shoulder in the frontal plane. These muscles are used when doing pull ups.

109)The _____ muscle flexes the forearm at the elbow joint.

110)The _____ muscle extends the forearm at the elbow joint.

111) Theflexorcarpiradialis muscle originates in the _____ bone and causes flexion of the ____.

112) The extensordigitorum muscle originates in the _____ (a body region) and causes extension of the ____.

113) Flexor musclesof the wrist are mostly locate on the anterior/posterior (circle one) side of the forearm.

114) Extensors muscles of the wrist are mostly located on the anterior/posterior (circle one) side of the forearm.

115) The _____ muscle group pulls the femur upward toward the front of the pelvis, thus flexing the thigh at the hip.

116) The _____ pulls the raised femur downward back into anatomical position, thus extending the thigh at the hip.

117)The _____ pulls the femur outward to the side of the body, thus abducting the thigh at the hip.

118) A group of muscles called the _____ pull the medial surface of the femur toward the midline of the body, thus adducting the thigh at the hip.

119) The _____ muscle is used to cross the leg over the opposite thigh (usually called "crossing the legs")

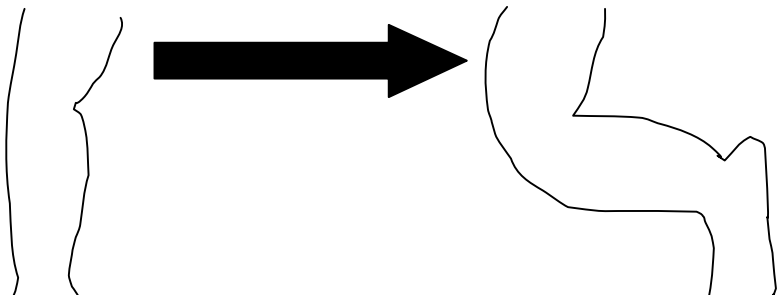
120)The _____, _____ and _____ (a group of muscles collectively called the _____ group) pull on the posterior side of the tibia, flexing the leg at the knee joint.

121)The _____, _____ and _____ (a group of muscles collectively called the _____ group) pull on the anterior side of the tibia, extending the leg at the knee joint.

122) The quadriceps are located on the anterior/posterior (circle one) side of the _____ (a body region).

123) The hamstrings are located on the anterior/posterior (circle one) side of the _____ (a body region).

124) Above each arrow, write the muscle group that causes the movement.

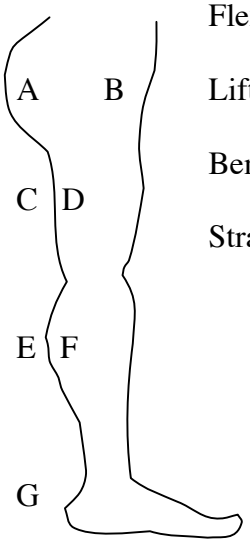


125) The _____ muscle pulls the posterior end of the calcaneus(the heel bone) upward, plantar flexing the foot at the ankle. Another muscle that does the same movement is the _____.

126) Thegastrocnemius and the soleus are both located on the anterior/posterior (circle one) side of the _____ (a body region).

127)The _____ muscle dorsiflexes the foot at the ankle. This muscle is located on the anterior/posterior (circle one) side of the _____ (a body region).

128) The drawing below shows the lower half of a person standing in anatomical position. Which location (a, b, c, d, e, f, or g) is the muscle that…



Flexes your ankle so that you can stand on your tip-toes? _____

Lifts your thigh so you can put your foot on a stair step? _____

Bends your knee? _____

Straightens your knee? _____

129) When males reach puberty, they get stronger because the hormone _____ causes their muscles to grow. When a person reaches old age, they get weaker because some of their muscle tissue has been replaced by _____ tissue.

130) Name two diseases related to the muscles. Which one is most common in children? Which one is an autoimmune disease?

131) _____ is a fatal muscle disease that involves a defective protein in the muscle
.
132) Disuse and aging both result in weaker muscles because they cause replacement of muscle cells with _____ tissue

Answers to fill-in-the-blank review questions:

1) Muscles
2) Contracting
3) Heat
4) True
5) False
6) Fiber
7) Neurons
8) Actin and myosin
9) Actin
10) Myosin
11) Skeletal muscle
Cardiac muscle
12) Nuclei
13) Branched
Intercalated discs
14) Smooth muscle
15) Actin
Myosin
16) Smooth
17) True
18) Smooth
19) Smooth
20) At several different angles
21) Intercalated discs
Share contraction signals
22) Skeletal muscle
23) Fascicle
24) Tendons
25) Insertion
Origin
26) Insertion
Origin
27) Sarcomere
28) Z-disc
Z-disc
29) Actin
Myosin
Actin
30) Myofibrils
31) A
I
32) Myosin
33) Actin
34) Z-line
35) Actin
36) G
CE
BF
ACD
37) Actin
Myosin
Sarcomere
Myofibril
Muscle cell
Fascicle
Muscle organ
38) Myosin heads
39) Troponin
Tropomyosin
40) Ca^{2+}
41) Inward
ATP
42) 3
2
6
7
4
5

8
1

43) 6
2
4
5
1
7
3

44) Creatine phosphate
Aerobic respiration
Anaerobic respiration
45) Creatine phosphate
46) Creatine phosphate
47) Anaerobic respiration
48) Aerobic respiration
49) Anaerobic respiration
50) Cardiovascular
51) Fatigue
Lactic acid
Glycogen
52) Decreased
53) Resistance training
54) Aerobic exercise
55) Size
Power
56) EF
AG
CE
AB
ABD
57) Graded contractions
58) Greater
59) Twitch
60) The frequency of nerve signals must increase
61) Tetanus
62) Muscle cells
Frequency
63) Insertion
Origin
64) Insertion
Origin
65) Proximal
66) Above
67) Prime mover
68) Antagonist
69) Synergists
70) Fixators
71) Flexion
72) Extension
73) Flexion
Extension
74) Flexion
Extension
75) Hyperextension
76) Flexion
Extension
77) Hyperextension
78) Dorsiflexion
79) Plantar flexion
80) Abduction
81) Adduction
82) Extending
Flexing
83) Flexing
Extending
84) Abducting
Adducting
85) Frontalis
86) Orbitularisoculi
87) Zygomaticus
88) Platysma
89) Orbicularisoris
90) Masseter
91) Temporal
Mandible
92) Flexing
Sternocleidomastoid
Trapezius
93) Sternocleidomastoid
94) Trapezius
95) Abdominal girdle muscles
96) Four layers
97) Rectus abdominis
Transversusabdominis
Internal obliques
External obliques
98) Transversusabdominis
99) Rectus abdominis

100) Pectoralis majors
101) Deltoids
102) Trapezius
103) Adduction
Abduction
(a) -> (b) = Latisimusdorsi
Origin = Vertebrae
Insertion: Humerus
(b) -> (a) = Deltoids
Origin = Scapula and clavicle
Insertion: Humerus
104) Prime mover = Pectoralis majors
Insertion: Humerus
Origin = Sternum and ribs
Antagonist = Deltoids
Insertion: Humerus
Origin = Vertebrae
105) Rotator cuff
106) Pectoralis majors
Biceps brachii
107) a) Biceps brachii (flexes forearm)
b) Triceps brachii (extends forearm)
108) Latisimusdorsi
109) Biceps brachii
110) Triceps brachii
111) Radius
Wrist
112) Forearm
Fingers
113) Anterior
114) Posterior
115) Iliopsoas
116) Gluteus maximus
117) Gluteus medius'
118) Adductors
119) Sartorius
120) Biceps femoris
Semimembranosus
Semitendinosus
Hamstrings
121) Rectus femoris
Vastuslateralis
Vastusmedialis
Quadriceps
122) Anterior
Thigh
123) Posterior
Thigh
124) Hamstrings (above top arrow)
Quadriceps (above bottom arrow)
125) Gastrocnemius
Soleus
126) Posterior
Leg
127) Tibialis anterior
Anterior
Leg
128) E
B
C
D
129) Testosterone
Connective tissue
130) Muscular dystrophy (most common in children)
Myasthenia gravis (autoimmune disease)
131) Muscular dystrophy
132) Connective tissue

Short answer review questions:

1) In the space below, sketch the three types of muscle cells. In each drawing, show the nucleus (or more than one, if appropriate) and the striations (if present). Under each drawing, write the correct name of the muscle cell type and name an organ in the body where that muscle cell type is found.

2) The diagram below shows a sacromere. Follow the directions below the drawing.

a) Circle one actin protein. b) Draw a T on the region that has tropomyosin.

c) Draw an X on one region that uses ATP to contract the muscle. d) Draw a Z on one Z-disc.

3) Fill in the table below about the three ways muscles recharge their ATP supply. In each blank, write Yes if the recharge method has that trait, write No if it does not have the trait.

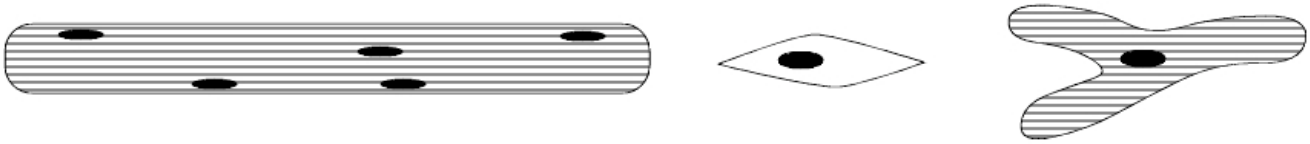
	Creatine phosphate	Anaerobic respiration	Aerobic respiration
Requires O_2?	_____	_____	_____
Requires glucose?	_____	_____	_____
Makes lactic acid?	_____	_____	_____
Makes CO_2?	_____	_____	_____

4) There are two ways we can change the amount of force a muscle generates. Describe both ways. For each way, be sure to state how it increases the force of the muscle.

5) Soon after a person dies, their muscles contract very strongly. This condition is called *rigor mortis*. *Rigor mortis* begins when calcium levels inside the cells increases. Explain how the increased calcium leads to *rigor mortis*.

Answers to short answer review questions:

1)



Skeletal muscle
Example organs:
Bicep, quadriceps

Smooth muscle
Example organ:
Stomach, intestines

Cardiac muscle
Example organ:
Heart

2)

3) Fill in the table below about the three ways muscles recharge their ATP supply. In each blank, write Yes if the recharge method has that trait, write No if it does not have the trait.

	Creatine phosphate	Anaerobic respiration	Aerobic respiration
Requires O_2?	No	No	Yes
Requires glucose?	No	Yes	Yes
Makes lactic acid?	No	Yes	No
Makes CO_2?	No	No	Yes

4) One way we change the amount of force a muscle generates is by changing the number of muscles cells we recruit for the contraction. Each muscle organ has many muscle cells. The more muscle cells recruited the more force is generated.

The second way we change the force a muscle generates is by changing the frequency of nerve signals sent to the muscle cells. The greater the frequency of nerve signals, the more fully the sarcomeres in each muscle cell, and therefore the greater the contraction force.

5) Calcium ions play an important role in muscle contraction. Ca^{2+} ions cause the proteins troponin and tropomyosin to detach from actin. Once these two proteins have detached from actin, the heads of myosin protein are able to attach to actin in their place and slide the actin inward, thus contracting the muscle. The increased calcium ions after death in all body cells causes sustained contraction of all muscles in the body, which is *rigor mortis*.