

# The Muscular System

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**As with other units, it is important to use the activities in this unit as a basis for discussion and conversation. You are encouraged to work with your colleagues on aspects of the unit.**

Note on vocabulary: Throughout the unit, useful vocabulary words, both technical and non-technical have been placed in **BOLD** print. As you work through the unit, make sure that you take time to look-up or, better yet, discuss with a colleague the meaning of these terms.

## Reading

When people talk about the muscular system they are most often talking about skeletal muscles. It is important to recognize that the skeletal muscles are only one part of the **hierarchy** of the muscular system. The body is composed of four primary tissue types: (1) epithelial tissue, (2) connective tissue, (3) nerve tissue and (4) muscle tissue. Each has its own unique features that **distinguish** it from the other tissues. Tissues come together, both structurally and functionally to form organs. Organs that have related functions are grouped together and described as an organ system.

Muscle tissue is distinguished and characterized by: (1) contractility, (2) elasticity, (3) excitability and (4) extensibility. Muscle tissue is subdivided into three categories (1) skeletal muscle tissue, (2) cardiac muscle tissue and (3) smooth muscle tissue, based on its cellular structure and biochemistry. Additionally muscle tissue is sometimes described as striated or non-striated muscle tissue or voluntary or involuntary muscle tissue.

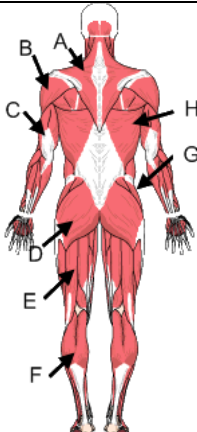
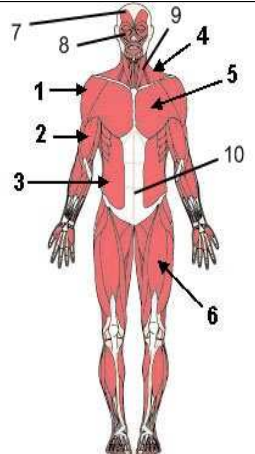
Each of these categories has additional distinguishing features which relate to its

function within the body. The organs referred to as (skeletal) muscles, like other organs, **consist** of all four primary tissue types, however muscle tissue, and in particular skeletal muscle tissue, **predominates** in these organs. When we speak of the muscular system we are usually speaking about the collection of skeletal muscles in the body and the specialized connective tissue elements, tendons, which connect muscles to bones. Most textbook authors **rarely concede** an exact number of muscles in the human body. Depending on the book you are using the number is usually stated as either less than 700 or more than 700. It is probably safe to say the number is around 700.

The collective functions of muscular system can be summarized as follows: (1) movement, (2) support, (3) form sphincters at body entrances and exits, (4) posture, (5) and temperature homeostasis; with each muscle contributing, in varying degrees, to these functions. Like the skeletal system, there is some logic to **subdividing** the muscular system in the axial muscle and appendicular muscles.

**Check Point** – Work with a partner and discuss and decide on the best classification for the muscles identified by the letters and numbers on the muscle figures.

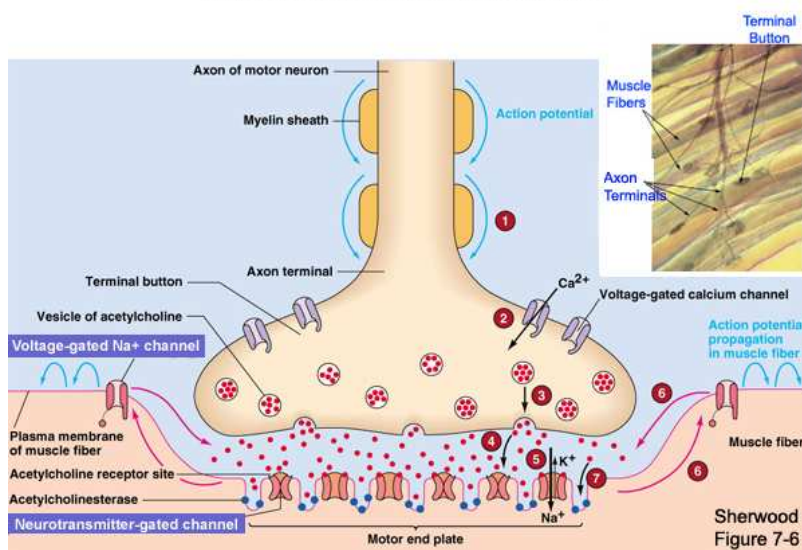
Categorization of Muscle Tissue			
Striated	Non-striated	Voluntary	Involuntary
Cardiac and Skeletal	Smooth	Skeletal	Cardiac and Smooth

		<p style="text-align: center;">Axial:</p>	<p style="text-align: center;">Appendicular:</p>
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## Reading

Medical conditions associated with the muscular system can be **categorized** as (1) neuromuscular, (2) motor end-plate or (3) myopathies. Diseases such as polio, and cerebral palsy, Parkinson's disease and

### The Neuromuscular Junction



conditions such as strokes are example of neuromuscular diseases. Myasthenia gravis is an example of a motor end-plate disease while muscular dystrophy is an example of a skeletal muscle myopathy. Others conditions are **associated** with damage to or failure of a muscle or a group of muscles or tendons. Injuries such as **strains**, tendonitis, **muscle cramps**, compartment syndrome and **hernias** fall into this category. Lastly muscle can be affected by chemicals or toxins that act at the motor end-plate or along the neuromuscular pathway. Tetanus toxin, botulism toxin, black widow spider **venom** and general anesthetics are examples.

The motor end-plate is the place where the skeletal muscle cell communicates with motor neurons. Neurons are not in direct contact with skeletal muscle cells; they meet at structures called synapses. Instead they communicate by **releasing** chemical messengers that **diffuse** across short distances (synaptic cleft) and bind with receptors on the surface of the muscle cell in specialized regions call the motor end-plate. Any disease or chemical which **interferes** with the transfer of information across the synapse will result in the dysfunction of the **affected** skeletal muscle.

### Check Point – Vocabulary

Instructions: work with a partner and based on their use in the two texts above, match the terms in column A with the meaning in column B.

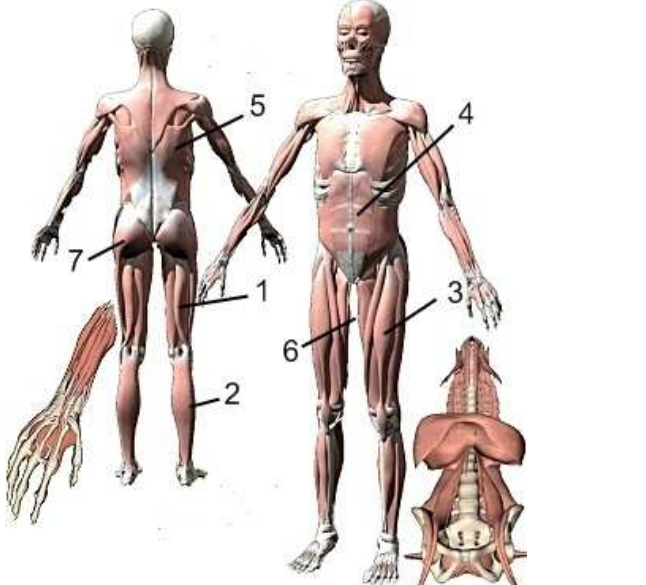
A	B
1. <b>hierarchy</b>	A. is made up of
2. <b>distinguish</b>	B. to admit something is true
3. <b>consist</b>	C. an order to things
4. <b>predominates</b>	D. to prevent something from working properly
5. <b>rarely</b>	E. something that does not happen often
6. <b>concede</b>	F. to be able to tell one thing from another
7. <b>subdividing</b>	G. to put things into groups based on some characteristic
8. <b>categorized</b>	H. in larger quantities compared to other things
9. <b>interferes</b>	I. to create 2 or more groups of things from a larger group

**Check Point – Vocabulary**

Technical Vocabulary	Specialized Vocabulary
Cardiac muscle tissue Connective tissue Contractility Elasticity Epithelial tissue Excitability Extensibility Motor Neuron Muscle tissue Myopathy Nerve tissue Sarcolemma Skeletal muscle tissue Smooth muscle tissue Synapse Synaptic cleft Synaptic End Bulb	Categorized Concede Consist Distinguish Dominates Hierarchy Interferes Involuntary Non-striated Rarely Striated Subdividing Voluntary

**Check Point – Common Names for Muscles**

**Instructions:** Work with a partner and match the number with the common name.

	Common Names
	⇒ six pack _____ ⇒ lats _____ ⇒ quadriceps _____ ⇒ groin _____ ⇒ hamstrings _____ ⇒ butt _____ ⇒ calf _____

## Reading

### Muscles in Motion

Muscles are named based on several criteria. They can be named based on (1) the shape of the muscle, (2) special feature of the size of the muscle, (3) the location of the muscle in the body, (4) origin of the muscle, (5) orientation of muscle relative to axis of the body and (6) action of the muscle. Frequently when a muscle name has more than one part it is because the muscles name is based on more than one criterion i.e. Rectus (orientation) abdominis (location). In English, muscle names are often Americanized Latin.

### Check Point – Comprehension

Instructions: work with a partner and match the muscle with its criterion or criteria. More than one blank indicates more than one criterion.




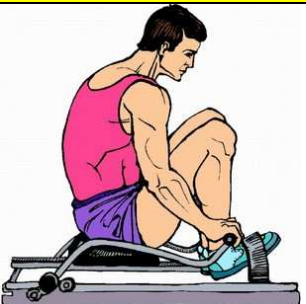
Muscle Name	Criteria for Naming
1. Tibialis anterior _____	A. the shape of the muscle B. special feature of the size of the muscle C. the location of the muscle in the body D. origin of the muscle E. orientation of muscle relative to axis of the body F. action of the muscle
2. Gluteus medius _____	
3. Deltoid _____	
4. Pectorialis major _____	
5. Rectus femoris _____	
6. Triceps brachii _____	
7. Trapezius _____	
8. Frontalis _____	
9. Flexor carpi ulnaris _____	
10. Vastus medialis _____	

Instructions: Work with a partner and match the muscle actions in column A with the general descriptions in column B. Discuss the meanings of the words in bold print and create your own sentences using these words.

A	B
1. Abduction _____	A. <b>Bending</b> over at the <b>waist</b> to pick up something from the floor. (vertebral column) B. Turing your head from left to right to say “no.” (vertebral column) C. Bringing your hand up to <b>rub</b> your eye. (elbow) D. Lifting a bag of groceries out from your side. (shoulder) E. Turing a <b>knob</b> on a radio <b>counter clockwise</b> . (wrist) F. Pushing a door open. (elbow) G. Turing a knob on a radio clockwise. (wrist)
2. Adduction _____	
3. Extension _____	
4. Flexion _____	
5. Rotation _____	
6. Pronation _____	
7. Supination _____	

**Check Point – Muscles in Action**

Instructions: Work with a partner and examine the four pictures and then decide which of the descriptions below match what is seen in the pictures. Discuss with your partner the exact meaning of the words in bold print. Number 1 has been done as an example.

Muscle Actions			
			
A	B	C	D
<ol style="list-style-type: none"> <li>1. Elbows <b>fully extended</b>. A, B, C (not D)</li> <li>2. Knees <b>flexed</b>.</li> <li>3. Spine extended.</li> <li>4. <b>Neck rotated</b>.</li> <li>5. Digits of the hand extended.</li> <li>6. Knees flexed.</li> <li>7. Spine flexed anteriorly.</li> <li>8. <b>Wrists hyper-extended</b>.</li> <li>9. Neck <b>partially</b> hyper-extended.</li> </ol>		<ol style="list-style-type: none"> <li>10. Spine flexed laterally.</li> <li>11. Arms <b>abducted</b>.</li> <li>12. Digits of the hand flexed.</li> <li>13. Neck partially flexed.</li> <li>14. <b>Thighs</b> flexed.</li> <li>15. Thighs extended.</li> <li>16. Digits of the hand abducted.</li> <li>17. Digits of the hand <b>adducted</b>.</li> </ol>	

## Clinical Corner

**Botulism:** Caused by a neurotoxin of the anaerobic bacteria *Clostridium botulinum*. The toxin binds to motor neurons supplying the muscle of the respiratory system and the other skeletal muscles of the body and prevents normal impulse transmission from reaching the muscles. The paralysis of respiratory muscles leads to death. Botulism is generally a food borne illness, however in rare cases it can grow in release toxin in the digestive tract infants who have consumed *C. botulinum* spores, leading to Infant Botulism. {*botulus* = sausage}

**Cerebral palsy:** A non-progressive non-contagious impairment of the muscle function stemming from damage to the motor cortex of the brain. Damage can occur during fetal development (most common), during childbirth (least common) or during early post-natal development. {*palsy* = paralyzed}

**Charlie horse:** A common non-technical name for a muscle cramp, especially of the leg and frequently associated with the calf muscle at night. The most common causes are mineral or vitamin deficiencies.

**Compartment Syndrome:** A condition in which a muscle's ability to swell or hypertrophy is limited by its outer connective tissue covering (sheath). The sheath effectively creates a compartment in which the muscle is located. When swelling or hypertrophy occurs the muscle is compressed which results in decreased blood supply and can also compress nerves leading to the muscle.

**Muscle cramp:** A forceful, sustained spasm of a muscle or a part of a muscle.

**Muscle spasm:** A temporary involuntary contraction of a skeletal muscle.

**Muscle strain:** An over extension or over exertion injury in which the muscle is torn. There is usually some degree of bleeding into the injured tissue. {*stringere* = to draw tight}

**Muscular dystrophy:** A genetic condition in which there is progressive destruction of muscle tissue which is replaced by scar (connective) tissue. {*dys* = bad; *trophy* = nourishment}

**Myasthenia gravis:** An autoimmune disease in which the body's immune system attacks the acetylcholine receptors at the neuromuscular junction. The loss of receptors results in muscle weakness and easy fatigability of the involved muscles. The condition is most pronounced in facial muscles, muscles that move the jaw, the tongue and the muscles involved with respiration. {*my/myo* = muscle; *asthenia* = weakness}

**Myositis:** Inflammation of skeletal muscle tissue.

**Pinched nerve:** When a nerve is compressed between two structures it can be referred to as a pinched nerve. If a motor nerve exiting the spinal cord is pinched between two vertebral vertebrae the nerve can become inflamed and can lead to muscle spasms of the affected muscles. Vertebral compression of spinal nerves is often due to collapsing intervertebral discs. {*myo* = muscle; *itis* = inflammation}

**Parkinson's Disease:** A progressive neurological disease that affects muscle movement. The disease is caused by a loss of neurons in the substantia nigra of the brain. These cells produce the neurotransmitter dopamine. Symptoms include muscle tremors, slowed movement, difficulty in initiating purposeful movement, partial paralysis of the facial muscles and a shuffling gait. The condition usually occurs after age 50.

**Pulled muscle:** Another term for a muscle strain.

**Rigor mortis:** A post mortem condition in which the skeletal muscles temporarily contract as the endoplasmic reticulum breaks down releasing calcium ions into the myoplasm. The  $Ca^{++}$  ions lead to a short burst of contractile activity. However, the burst of activity uses up the limited amount of available ATP there is no ATP left to initiate muscle relaxation. Therefore the muscles remain contracted until the contractile proteins begin to break down. {*rigor* = stiffness; *mortis* = death}

**Tetanus:** Caused by the neurotoxin from the anaerobic bacteria *Clostridium tetani*. This condition (not a disease) is most commonly caused by spores of *C.*

*tetani* entering a deep wound. Once in the wound the spores germinate producing a colony of growing bacteria. The bacteria release neurotoxin as they grow. The neurotoxin prevents the release of inhibitory neurotransmitter substances within the CNS. This results in a state of contraction in the major muscle groups of the body. This condition is prevented with the Tetanus vaccine and is first given as part of the DPT vaccine, with the "T" standing for Tetanus. Booster vaccinations should be given every 10 years to maintain protection. This condition is also called "lockjaw."

**Tendon:** Connective tissue (dense regular connective tissue) structure which attaches muscles to bones. {*tendere* = to stretch}

**Tendonitis:** Inflammation of a tendon.

**Torticollis:** A contracted state of the muscle associated with the cervical spine. The chronic contraction can cause an unnatural position of the neck or it can cause pain whenever the head is moved. {*tort* = twist; *coll* = neck}

**Wry Neck Syndrome:** Common name for Torticollis. "Wry" means abnormally bent or distorted.

**Check Point – Vocabulary**

Instructions: Work with a partner and match the terms in column A (taken from Clinical Corner) with descriptions in column B.

A	B
1. Binds	A. to attach to
2. Break down	B. originating from / coming from
3. Burst	C. unusual / uncommon
4. Fatigability	D. to increase in size
5. Gait	E. covering / shroud
6. Pinched	F. tendencies to get tired easily or quickly
7. Progressive	G. obvious / most visible
8. Pronounced	H. squeezed
9. Rare	I. get worse with time
10. Sheath	J. uncontrolled, rhythmic muscle movements
11. Shuffling	K. walking without completely picking up the feet between steps
12. Stemming	L. the manner or way a person walks or runs
13. Swell	M. sudden event / something that happen quickly
14. Tremors	N. to become dysfunctional

**Check Point – Articles**

Instructions: Fill in the blanks with articles ‘a’ / ‘an’ / ‘the’ – in some cases no article is needed.

**Focus on Myasthenia gravis:**

Myasthenia gravis is \_\_\_\_\_ autoimmune disease in which \_\_\_\_\_ body’s immune system attacks \_\_\_\_\_ acetylcholine receptors located on \_\_\_\_\_ motor end plate. \_\_\_\_\_ neural message coming from \_\_\_\_\_ brain causes \_\_\_\_\_ motor neuron to release acetylcholine which diffuses across \_\_\_\_\_ synaptic cleft and binds to receptors on \_\_\_\_\_ motor end plate of \_\_\_\_\_ skeletal muscle cells. \_\_\_\_\_ binding between ACh and \_\_\_\_\_ receptors causes ion channels to open which, in turn, initiates muscle contraction. With \_\_\_\_\_ reduced number of receptors, \_\_\_\_\_ depolarization of \_\_\_\_\_ motor end plate is also reduced and \_\_\_\_\_ strength of contraction is diminished. \_\_\_\_\_ loss of receptors results in muscle weakness and quick fatigability of \_\_\_\_\_ involved muscles. \_\_\_\_\_ condition is most pronounced in facial muscles, muscles that move \_\_\_\_\_ jaw, \_\_\_\_\_ tongue and \_\_\_\_\_ muscles involved with respiration.

## Talking with the Patient

Instructions: work with a partner. One person can read the part of the doctor and the other person can read the part of the patient. Be sure to discuss any new vocabulary; give special attention to the words in bold print.

1. D: Hello – I'm Doctor Smith.
2. P: Hello doctor, I'm Ms. Patterson.
3. D: Well Ms. Patterson what can I do for you?
4. P: There seems to be something wrong with my **jaw**. I'm having a hard time **chewing** my food. I'm also having some problems **swallowing** my food as well.
5. D: Okay, before we go into more detail about your complaint, I want to get some basic information about you.
6. P: Okay.
7. D: How old are you?
8. P: I am 57 years old.
9. D: Can you tell me your birthday for my records?
10. P: Sure – its 11-6-1949.
11. D: Thanks. Where were you born?
12. P: I was born in Paris France.
13. D: How long have you live here?
14. P: Oh, it's been over 20 years.
15. D: How tall are you?
16. P: 165 cm.
17. D: And your weight?
18. P: 59 kilograms.
19. D: Are you married?
20. P: No, I'm single.
21. D: Do you smoke?
22. P: No.
23. D: Do you drink alcohol?
24. D: Yes – I have a glass or two of wine with my evening meals – I would say – 2 or 3 times a week.
25. D: What do you do for a living?
26. P: I work in a bank – I'm a loan manager.
27. D: Would you describe your job as **stressful**, **moderately** stressful or not particularly stressful.
28. P: I would say that it is not particularly stressful.
29. D: And your lifestyle – would you describe it as active, moderately active or **sedentary**.
30. P: Well for the most part I would say moderately active. I do a lot of walking and until recently I enjoyed playing tennis on the weekends.
31. D: Until recently – why did you stop?
32. P: I just don't have the energy to play – I get tired easily and I just don't think I could finish a game.
33. D: Okay, now I want to ask you a few questions about your current health condition.
34. P: Okay.
35. D: Do you have any current health problems – things like diabetes or high blood pressure?
36. P: The only thing I have is high cholesterol.
37. D: When was this discovered?
38. P: About 10 years ago.
39. D: Are you taking any medication for it?
40. P: Yes – I take Sortis.
41. D: Do you **recall** the **dose**?
42. P: Yes – I take 20 mg each evening.
43. D: Okay – do you take any other medications?
44. P: Yes – I take estrogen and a calcium supplement each day.
45. D: Are you taking estrogen for **menopause** related problems?
46. P: Yes – I was getting terrible **hot flashes** and my **mood** was off.
47. D: How long have you been on the estrogen?
48. P: About 5 years.
49. D: Have you been in the hospital recently?
50. P: No – the last time I was in the hospital was about 10 years ago.
51. D: What was the problem?
52. P: I had a procedure to repair my bladder.
53. D: Can you tell me a little more?
54. P: I was having **episodes** of incontinence because my bladder wasn't in the right position. The surgeon repositioned it to help eliminate the problem.
55. D: Was the procedure successful?
56. P: Yes – I was and still am please with the results – the incontinence it gone.

## Talking with the Patient

**Instructions:** working with a partner, try to recreate the interview. Don't just reread it – try to do the interview using your own question and answer variations while using the same basic case profile.

**Instructions:** Review the interview and find line numbers that correspond to the interview elements listed below. In some cases different aspects of the same interview element may be addressed in different parts of the interview. The questions in the table below are not in the sequence of the interview.

Interview element	Line numbers
Patient greeting.	
Request for information about chief complaint.	
Patient's description of their complaint.	
Doctor changing the direction of the interview.	
Request of age and date of birth.	
Request of lifestyle information (smoking, drinking habits)	
Request for information about job stress.	
Request for information about physical activity.	
Patient information regarding change in physical activity.	
Request for information regarding current health problems.	
Request for information regarding medications.	
Request for addition information regarding a medication.	
Request for information regarding hospital admissions.	
Request for addition information regarding a hospital admission.	
Request for patient's assessment of a surgical procedure.	

### Check Point – Comprehension

Instructions: Work with a partner. Takes turns asking and answering the questions below.

1. How does the patient describe their work situation?
2. How does the patient describe their level of physical activity?
3. What is the reason the patient gives for their change in physical activity?
4. What current health problems does the patient have?
5. What medications is the patient currently taking?
6. Why is the patient taking estrogen? Sortis?
7. What was the problem that required hospitalization 10 years ago?
8. Was the surgical procedure successful?

## Talking with the Patient

### Asking Questions and Giving Answers

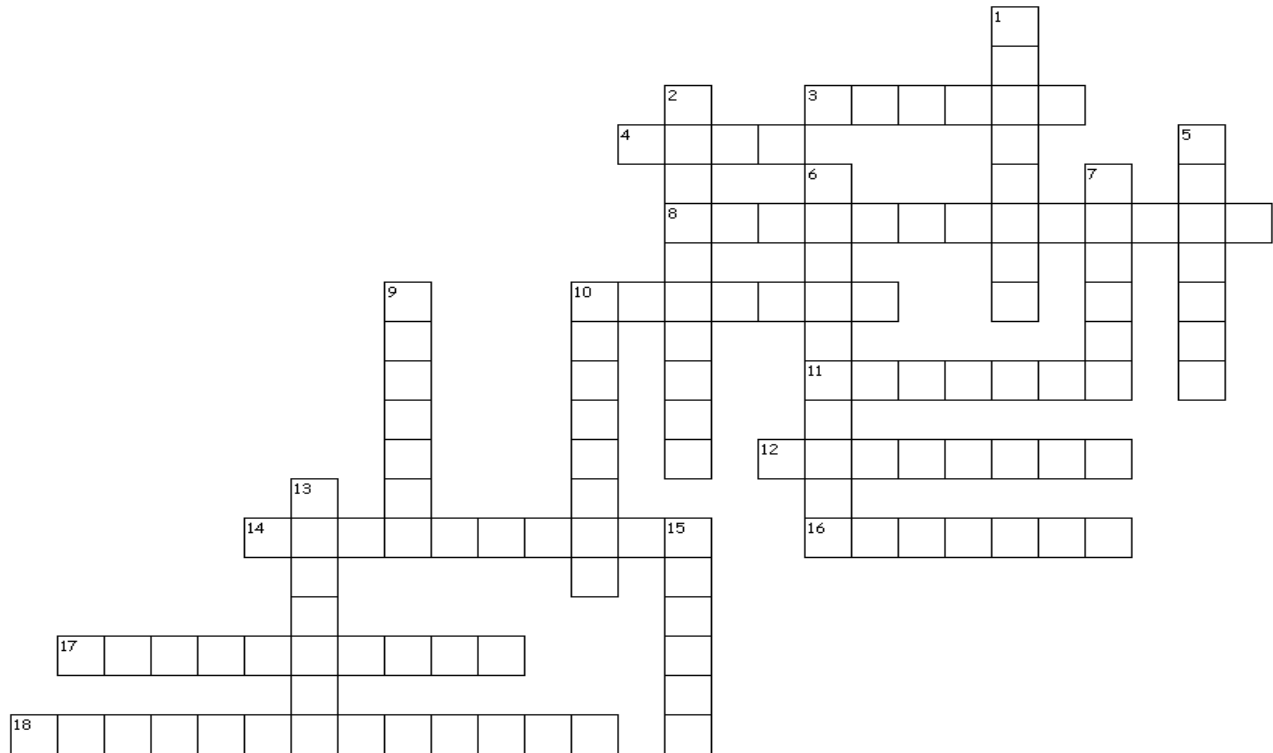
Instructions: Work with a partner and take turns asking and answering the question in column A. Then work together to create questions that would produce the responses shown in column B.

A	B
<b>Practice asking and answering the following:</b>	<b>Formulate questions for the following answers:</b>
<ol style="list-style-type: none"> <li>1. What is the patient's problem?</li> <li>2. How old is the patient?</li> <li>3. How much does the patient weigh?</li> <li>4. Where was the patient born?</li> <li>5. How long as she live in this country?</li> <li>6. Does the patient smoke or drink alcohol?</li> <li>7. Is the patient physically active?</li> <li>8. What is the patient's job?</li> <li>9. What medication is the patient taking?</li> <li>10. Does the patient have any current health problems?</li> </ol>	<ol style="list-style-type: none"> <li>1. I am 57 years old.</li> <li>2. 165 cm.</li> <li>3. Yes – I sometimes have a glass or two of wine with my evening meals.</li> <li>4. I have high cholesterol.</li> <li>5. I've had it for about 10 years.</li> <li>6. I take Sortis -- 20 mg each evening.</li> <li>7. Yes – I also take estrogen.</li> <li>8. I was having problems with mood swings and hot flashes.</li> <li>9. Yes – I also take a calcium supplement each day.</li> <li>10. I had a procedure to repair the position of my bladder.</li> </ol>

Instructions: Work with a partner. Carry out an interview similar to the one above using the information provide. One person plays the role of the doctor and the other person plays the role of patient A using patient A's profile. Repeat the activity by reversing roles and using patient B's profile.

Patient A profile:	Patient B profile:
<ul style="list-style-type: none"> <li>⇒ Age: 75 years old</li> <li>⇒ Sex: female</li> <li>⇒ Ht: 168 cm, Wt: 82 kg</li> <li>⇒ Born in Prague, CZ</li> <li>⇒ Occupation: Retired school teacher</li> <li>⇒ Smokes 10 cigarettes /day</li> <li>⇒ Drinks 2-3 glasses of wine / day</li> <li>⇒ Sedentary lifestyle</li> <li>⇒ Complains of a <b>slight tremor</b> in their right hand</li> <li>⇒ Current medical problems: High cholesterol (25 years)</li> <li>⇒ Medications: Sortis</li> </ul>	<ul style="list-style-type: none"> <li>⇒ Age: 68 years old</li> <li>⇒ Sex: male</li> <li>⇒ Ht: 182 cm, Wt. 91 kg</li> <li>⇒ Born in Hamburg, D</li> <li>⇒ Occupation: Retired accountant</li> <li>⇒ Smokes 20 cigarettes / day</li> <li>⇒ Drinks 3 beers / day</li> <li>⇒ Sedentary lifestyle</li> <li>⇒ Complains of <b>stiff</b> muscles in neck and shoulders, preventing him for moving freely.</li> <li>⇒ Current medical problems: high blood pressure (20 years), high cholesterol (20 years)</li> <li>⇒ Medications: Micardis Plus, Sortis</li> </ul>

## Cross Word Puzzle



Across	Down
3. Connective tissue structure that attaches muscles to bones	1. inflammation of muscle tissue
4. Muscles on the back of the lower leg.	2. Cell membrane of a muscle cell.
8. Property of skeletal muscle that refers to its ability to shorten in length.	5. Do a push-up _____ the elbow.
10. Name of the triangular should muscle.	6. Microscopic features that appear as lines perpendicular to long axis of skeletal muscle cells
11. Uncontrollable rhythmic contractions and relaxation of skeletal muscles.	7. Touching your chin to your chest _____ your neck.
12. Turning the head from side to side	9. The T in the DPT vaccine.
14. Groups of muscles on the back of the thigh.	10. Deficient neurotransmitter associated with Parkinson's disease.
16. The junction between two neurons.	13. Type of muscle tissue making up the heart.
17. Property of skeletal muscle that refers to its ability to stretch and then return to its original length.	15. Type of muscle tissue found in the walls of arteries.
18. Transmitter substance released by motor neurons at neuromuscular junctions.	

**Check Point -- Grammar**

Instructions: Work with a partner and fill in the blank in each sentence with “some” or “any”

Some / Any	
1.	Do you have _____ pain in your shoulders?
2.	I think it will be helpful if you start doing _____ exercises.
3.	_____ muscle relaxants can make you very sleepy.
4.	Is there _____ one who can drive you home from the hospital?
5.	Is there _____ way you can start walking about 1 km per day?
6.	You need to try to find _____ time to relax. Stress is making your neck muscles stiff.
7.	Do you have _____ aspirin at home? You can take it to relieve the pain.
8.	If you have _____ problems with the medicine I want you to call me immediately.
9.	In _____ cases recovery is complete and there are no further problems.
10.	I will give you a double prescription – you can take the medicine if you have _____ future problems.

**Check Point – Phrases**

Instructions: Work with a partner and match the words in column A with the words in column B to make meaningful combinations.

A	B
1. Muscle	A. happens
2. Neuromuscular	B. muscle
3. Rarely	C. junction
4. Striated	D. cleft
5. Synaptic	E. relaxant
1. Hospital	A. cramp
2. Muscle	B. activity
3. Physical	C. admission
4. Stiff	D. tremor
5. Uncontrollable	E. muscle
1. Chronic fatigue	A. swing
2. Hot	B. flashes
3. Mood	C. weakness
4. Muscle	D. syndrome
5. Stiff	E. neck

## Check Point – Prepositions

Instructions: Work with a partner and fill in the blanks with prepositions. Some prepositions can be used more than once.

**with, on, to, over, with, in, between, across, of, at, under, against, into**

1. I have one or two glasses of wine \_\_\_\_\_ my evening meal.
2. I like \_\_\_\_\_ play tennis \_\_\_\_\_ the weekends.
3. It has been \_\_\_\_\_ 10 years since I was diagnosed \_\_\_\_\_ high blood pressure.
4. My muscle pain started \_\_\_\_\_ my upper back \_\_\_\_\_ my shoulder blades.
5. Acetylcholine diffuses \_\_\_\_\_ the synapse and binds \_\_\_\_\_ receptors \_\_\_\_\_ the motor end plate of the muscle cell.
6. The DPT vaccine consists \_\_\_\_\_ a diphtheria vaccine, a pertussis vaccine and a tetanus vaccine.
7. The muscle relaxants will make you sleepy, so you ought to take them \_\_\_\_\_ bedtime.
8. The cell bodies of most motor neurons are \_\_\_\_\_ the ventral gray horn of the spinal cord.
9. How long have you been \_\_\_\_\_ Sortis for your high cholesterol?
10. I want you to take the muscle relaxant \_\_\_\_\_ an anti-inflammatory drug.
11. \_\_\_\_\_ the future you need to try to avoid repetitive motions \_\_\_\_\_ your wrist.
12. I would like \_\_\_\_\_ see you again \_\_\_\_\_ 3 weeks.
13. The cold night air is part of the problem – you should move your bed from \_\_\_\_\_ the window.
14. You shouldn't lift anything \_\_\_\_\_ 5 kg for the next month.
15. Lean \_\_\_\_\_ the wall – put one leg back, about a meter from the wall and force your heel \_\_\_\_\_ the floor. This will stretch the muscles \_\_\_\_\_ the back of your leg.

## Check Point – Giving Advice

Review the statements above. Work with a partner and complete the 3 tasks below.

List the sentences that give advice. \_\_\_\_\_

What words or phrases indicate advice in the sentences you identified? \_\_\_\_\_

What is the difference between “advice” and “advise?” \_\_\_\_\_

**Check Point** – Phrasal Verbs

Instructions: Work with a partner and fill in the gaps with a phrasal verb from the box. Be sure to discuss the vocabulary in bold print.

bear with braking in calm down check with me close up	flare up bring up cut down call it off count on	breakdown come around burning up catch up move on	blow over bring it off back out of blow in
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- Please don't \_\_\_\_\_ the promise you made – you need to start exercising 3 or 4 times a week. Can I count on you?
- You're going to have to \_\_\_\_\_ the **stiffness** in your back for a few more days. Therapy will take that long before it has positive effects.
- I'm sorry I don't have time to see you today – you can't just \_\_\_\_\_ whenever you feel like it. You need to make an appointment before you come.
- I know this \_\_\_\_\_ of your condition has been **unpleasant**, but I expect it to \_\_\_\_\_ in a few days.
- Menopause can sometimes make you feel like you are having a \_\_\_\_\_, but it's just a feeling. The estrogen I prescribed should make you feel better soon.
- This is a big change you have to make in your lifestyle. But it's like \_\_\_\_\_ a new pair of shoes – it's painful at first, but before long you are **accustom** to them and you don't even notice.
- I think after you have tried exercising for a while you will \_\_\_\_\_ to my point of view.
- Reducing the amount of fat in your diet can be hard to do, but I think you can \_\_\_\_\_.
- I have finished my **preliminary** interview – is there anything you want to \_\_\_\_\_ before we \_\_\_\_\_?
- It's important that you \_\_\_\_\_ on the number of cigarettes you are smoking.
- A: Doctor! My son is extremely sick – feel his **forehead** – it feels like he's \_\_\_\_\_. B: \_\_\_\_\_ Ms Smith – your son does appear to have a high fever but it is not as serious when a child has a fever as it is when an adult has a high fever. We will be able to bring it down and treat the problem.
- A: It's the oncology department – they want to know if the meeting is still on? B: Please tell them I'm too busy today – we will have to \_\_\_\_\_ for now.
- Please schedule me for the conference on new treatments for asthma. I need to \_\_\_\_\_ the latest advances in the area.
- This is a strong medication, so I want you to \_\_\_\_\_ before taking any new medications – even **over the counter medications**.
- It's been a long day – I think we saw 40 patients. It's time to \_\_\_\_\_ and call it a day.

**Check Point – Phrasal Verbs**

Instructions: Work with a partner and match the phrasal verbs in column A with their descriptions in column B.

A	B
1. back out of	A. to continue doing something that is difficult
2. bear with (something)	B. to do something until it is comfortable (shoes) or normal
3. blow in	C. to relax / to stop being excited
4. blow over	D. confirm something with someone before doing it
5. brake in	E. to temporarily quite or suspend some business activity
6. breakdown	F. an exacerbation
7. bring it off	G. to make a point during a conversation
8. bring up	H. to reduce the quantity of something
9. burning up	I. to cancel something
10. call it off	J. to depend on somebody for something
11. calm down	K. to lose control of ones mind
12. catch up	L. to eventually believe in something
13. check with me	M. being very warm or having a high temperature
14. close up	N. to learn the latest information about some topic
15. come around	O. for a problem or issue to be resolve or to pass by
16. count on	P. to succeed in doing something difficult
17. cut down	Q. to fail to complete some activity
18. flare up	R. to visit unexpectedly
19. move on	S. to continue with some activity

**Check Point --** Pronunciation of words containing “C.”

**Instructions:** Review the list of words and pronounce each. Then put each word in the group that corresponds with the sound of the “C” in the word. Some words have two “Cs” in them – in some cases both have the same sound (the word only goes in one group) but in other cases each “C” has a different sound (the word will go into two different groups.) Several have been done as examples.

Words in which “C” has several different sounds.	
adduction associated back calcium cardiac categories	C sounds like K -- <u>cardiac</u>
cellular characterized check cholesterol communicates	C sounds like S -- <u>cellular</u>
composed concede consist deficiencies elasticity entrances excitability	C sounds like Sh -- <u>associated</u>
facial forceful functionally hacking (cough) hierarchy	C is silent -- <u>check</u>
incontinence medications muscles neck occur recognize	C+h sounds like K -- <u>cholesterol</u>
schedule specialized stomach structurally substances vaccine	C+h is a single unique sound -- <u>check</u>

**Check Point** – Grammar (3<sup>rd</sup> Conditional)

Instructions: Work with a partner and fill in the blanks. Use a word from column A for the first blank in each sentence and a word from column B for the second blank. Change the verbs to the correct tenses.

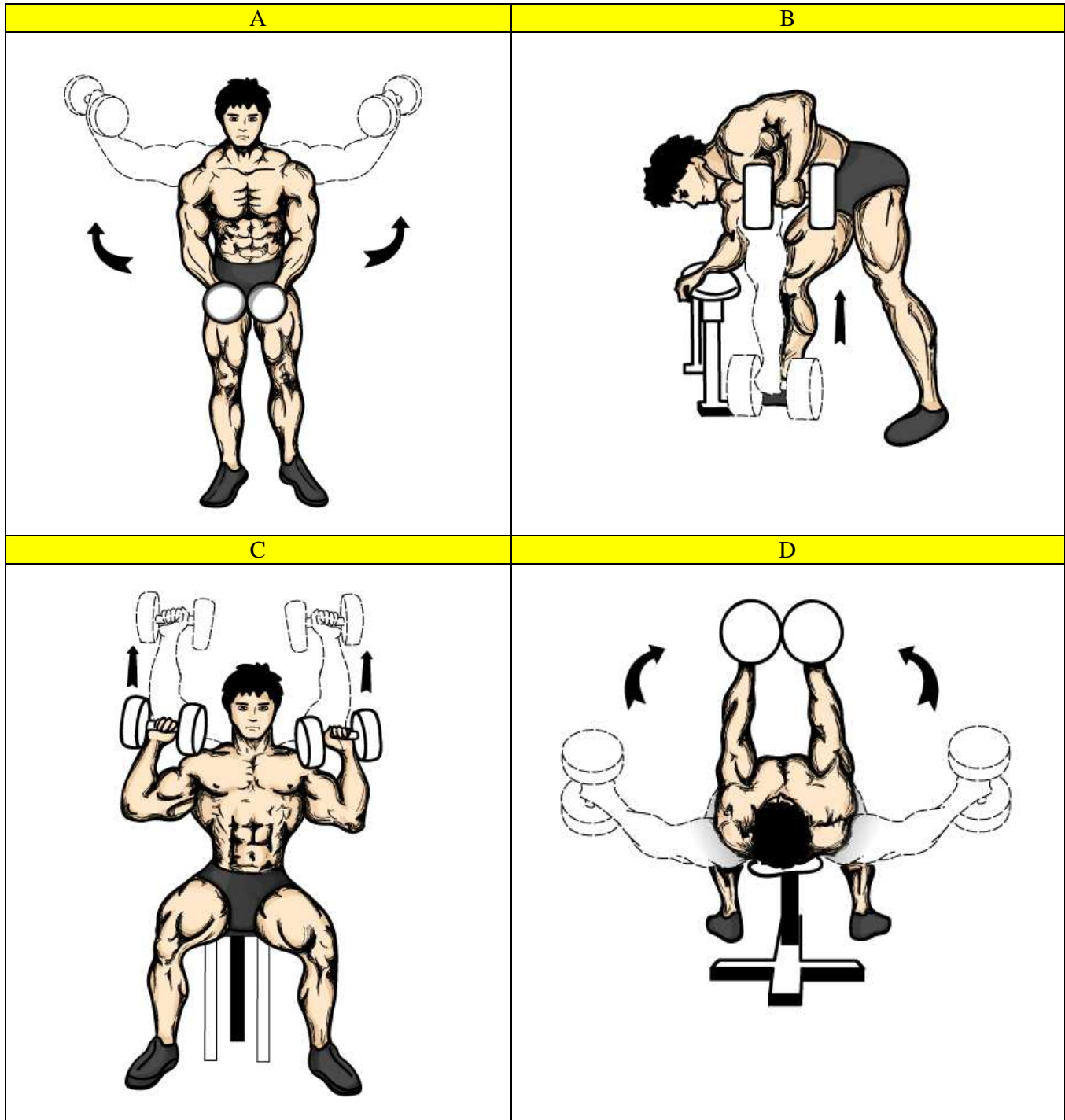
A	B
Be Break Come down Eat Get Go Pull See Sleep Take	Be Be Compete Finish Happen Have Make Save Survive Swerve
<p>1. If the operation had _____ well, he would have _____ out of the hospital by now.</p> <p>2. If he hadn't _____ his leg, he would have _____ in this year's championship.</p> <p>3. If he hadn't _____ his hamstring, he would have _____ the race.</p> <p>4. If I had _____ the ditch, I would have _____ to miss it.</p> <p>5. If I had _____ better the night before, I would have _____ such a stupid mistake.</p> <p>6. If he had _____ younger, he would have <b>probably</b> _____ the operation.*</p> <p>7. If she had not _____ with the Staph infection, she would have _____ an uneventful recovery.</p> <p>8. If he had _____ the medicine as prescribe, none of this would have _____.</p> <p>9. If he had _____ right, the diabetes would not have _____ so hard to control.</p> <p>10. If she had _____ to the hospital a little bit sooner, we <b>could</b> have _____ her life.**</p>	

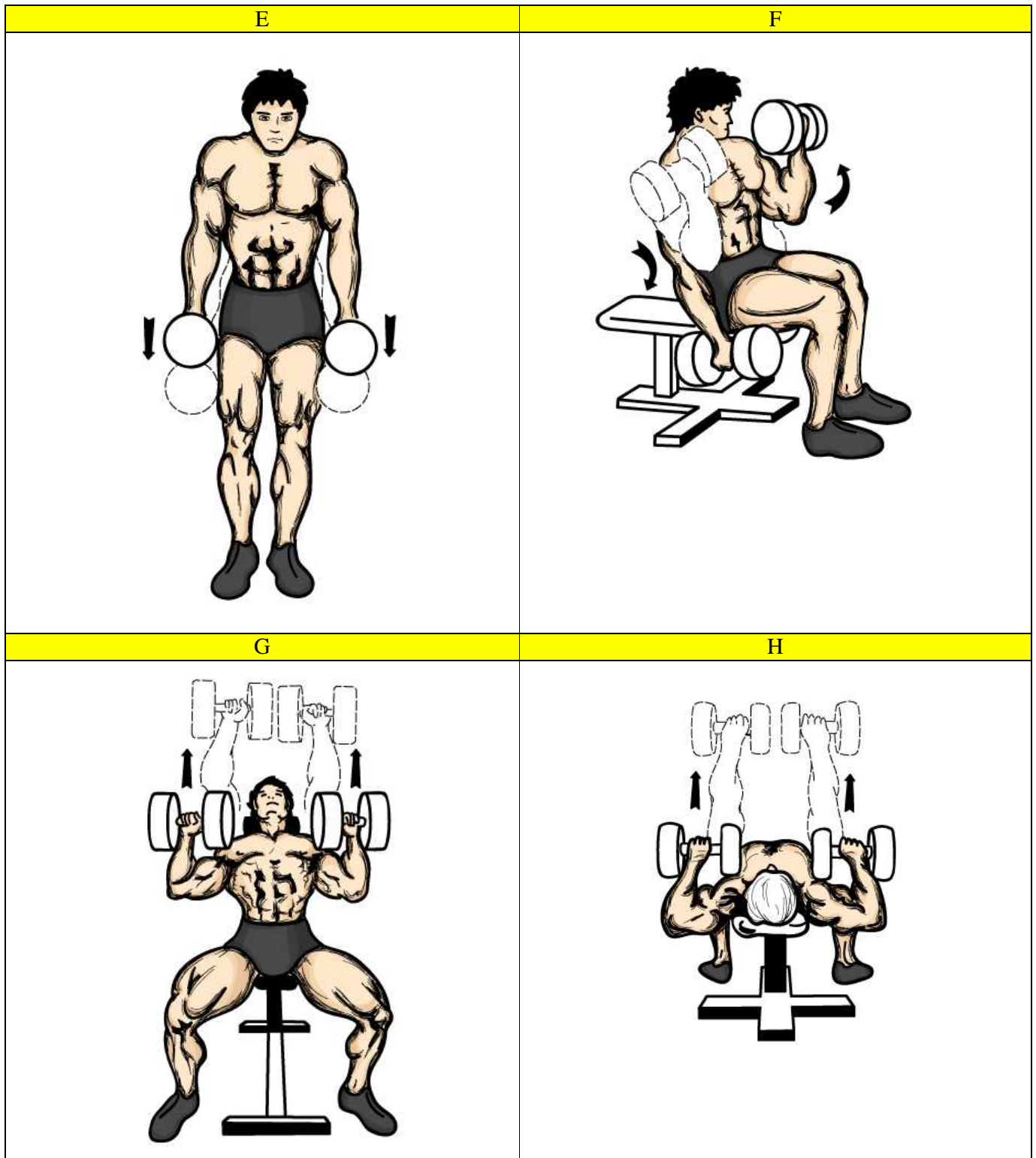
\* Note the use of the word “probably” in item 6. Discuss with a partner how this changes the meaning of the sentence. Try to use the word in some of the other sentences – see if it changes the meaning.

\*\* Note the use of the word “could” in item 10. How does the use of this word instead of “would” change the meaning of the sentence? Try to use the word in some of the other sentences – what affect does it have on the meaning?

## Check Point – Giving Instructions and Giving Directions

Instructions: Work with a partner – have your partner use one or two small objects to simulate the dumbbells. Take turns giving detailed instructions for correct body position and movements needed to do the exercises shown in pictures A – H. **Make sure to describe the desired starting and ending positions, distance between arms, legs, feet and hands, palms forward, palms backward, elbows bent, elbow straight, knees bent, knees straight, etc.**





## Self-test

Instructions: Work with a partner. Take turns asking and answering the questions. Discuss questions and review wherever needed.

1. There are \_\_\_ primary tissue types on the human body.
  - a. 2
  - b. 3
  - c. 4
  - d. 5
2. There are \_\_\_ types of muscle in the body.
  - a. 2
  - b. 3
  - c. 4
  - d. 5
3. Both cardiac and skeletal are considered to be:
  - a. Striated
  - b. Voluntary
  - c. Non-striated
  - d. Involuntary
4. Both cardiac and smooth muscle are considered to be:
  - a. Striated
  - b. Voluntary
  - c. Non-striated
  - d. Involuntary
5. The main neurotransmitter between motor neurons and skeletal muscle cells is:
  - a. Dopamine
  - b. Serotonin
  - c. GABA
  - d. Acetylcholine
6. The reduction in the amount of \_\_\_\_\_ is the underlying cause of Parkinson's disease.
  - a. Dopamine
  - b. Serotonin
  - c. GABA
  - d. Acetylcholine
7. Sortis is used to treat:
  - a. High blood pressure
  - b. Problems associated with menopause
  - c. High cholesterol
  - d. Headaches
8. Which of the following statements about the number of muscles in the human body is most accurate?
  - a. There are between 300 and 400,
  - b. The number depends on which book you read.
  - c. There are about 700.
  - d. There are more than 1000.
9. Myasthenia Gravis is a:
  - a. Degenerative muscle disease
  - b. An autoimmune disease
  - c. Is contagious
  - d. Can be prevented with a vaccine.

10. Which of the following statements about tetanus are true?
  - a. It is caused by a bacteria
  - b. The main symptoms are produced by a toxin
  - c. The diseases and its symptoms can be prevented with a vaccine.
  - d. All the above statements are true.
11. After exercising a person is most likely to use which of the following words to describe how their muscles feel?
  - a. Sore
  - b. Stiff
  - c. Smooth
  - d. Painful
12. A person in their 70s is most likely to which of the following words to describe how their joints feel?
  - a. Sore
  - b. Stiff
  - c. Locked
  - d. Strained
13. A person who gets little exercise is said to be:
  - a. Lazy
  - b. Sedentary
  - c. Moody
  - d. Fatigued
14. \_\_\_?\_\_\_ involves mainly skeletal muscle and \_\_\_?\_\_\_ involves both skeletal and smooth muscle.
  - a. Chewing / swallowing
  - b. Swallowing / chewing
15. The part of the leg between the hip and the knee is the:
  - a. Calf
  - b. Neck
  - c. Thigh
  - d. Waist
16. Turing the head back-and-forth in a “no” motion is:
  - a. Flexion
  - b. Extension
  - c. Hyper-extension
  - d. Rotation
17. The Vulcan greeting is: (trick question)
  - a. Abduction of digits 3 and 4
  - b. Abduction of digits 1, 2 and 3
  - c. Adduction of digits 4 and 5
  - d. Adduction of digits 3 and 4
18. Lockjaw is a condition caused by:
  - a. Snake venom
  - b. Spider venom
  - c. Bacteria
  - d. A disease process
19. During a marathon in hot weather, which of the following would you most expect to see happen?
  - a. Wry neck syndrome
  - b. Pulled muscles
  - c. Charlie horses
  - d. Muscle strains
20. Which muscle is most likely to be associated with a stiff neck?
  - a. Trapezius
  - b. deltoid
  - c. Teres major

## Suggested Mini-Lectures

The mini-lectures listed below can be used as topics for instructors to add additional information to this unit or the topics can be assigned to students for classroom presentations.

- Further discussion of the three types of muscle tissue
- Basic cell structure of skeletal muscle cells
  - Sarcolemma
  - Sarcoplasmic reticulum
  - T-tubules
  - Myofibrils
    - Actin
      - Troponin
      - Tropomyosin
    - Myosin
- Basics of muscle cell contraction
  - Interactive between actin and myosin
- Synaptic transmission
  - Release of neurotransmitter for motor neuron
  - Motor end-plate potential
  - Excitation-Contraction coupling
- Further discussion of Myasthenia Gravis
- Further discussion of Parkinson's disease
- Further discussion of Tetanus or Botulism