**Physiology of Muscle Contraction Notes**

A unit of muscle myofibril is called a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. It is composed of alternating bands of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ & \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. The “bands” are responsible for the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ appearance of muscle tissue and for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

A sarcomere is found between the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Myosin is approximately \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ microns in diameter, while actin is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ microns.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ & \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ must be present for muscle contraction to occur after a stimulus is received.

4 stimuli that may cause contraction include: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Tell the function served by each:**

1. ATP

2. Ca++2

3. Cross-bridges

4. T-Tubules

5. Sarcoplasmic reticulum

6. Acetylcholine

7. Acteylcholinesterase

Why is it important to try not to use a fatigued muscle?

The muscles use the following sources of energy {in order}:

* Normal: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Abnormal: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Muscle Contraction::

As part of the sliding filament theory (Huxley’s theory), we learned that when a stimulus is received, the Z lines move inward, pushing the actin filaments together and holding them together with cross-bridges on myosin.

As this occurs, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ travels over the axon to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ generating an action potential. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is then released from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and travels into the muscle cells & binds. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ diffuses from the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and travels deep into the muscles through the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. The sarcoplasmic reticulum then releases \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Actin moves inward, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ form on myosin in order to hold the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ filaments together and the ***muscle contracts.***

Muscle Relaxation::

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is released from the nerve ending. It travels into the muscle cells and neutralizes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. This breaks the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ions move back into the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Actin filaments move apart and the ***muscle relaxes***.

**Summarize each as it pertains to muscle contraction:**

1. All or None Law

2. Threshold Stimuli

3. Summation

**Energy for Muscle Contraction**

In order for muscle fibers to shorten (contract) there must be some \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ source of energy for contraction. This process occurs in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Write out the formula for respiration:

How many ATP are formed from 1 molecule of glucose? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ATP

Why is this process called “aerobic” respiration?

Tell the role of these organic compounds found in the mitochondria of muscle cells:

1. ATP-

2. CP-

3. ADP-

4. Glycogen-

How is glycogen formed? Write out the formula

Write out the process of anaerobic respiration:

Why is it called “anaerobic” respiration?

Tell how the body rids itself of Lactic Acid:

a.

b.

What happens if muscle contraction is continuous and lactic acid accumulates?

Why is oxygen intake important during muscular exercise?

**Types of Muscle Contractions**

The same principles apply to contraction of both single fibers and whole muscles. Contraction produces \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and may/may not \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ muscle.

Force & duration of contraction vary in response to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of different frequencies and intensities.

Each muscle is served by at least 1 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ nerve. A motor unit consists of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and all \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ it supplies.

**Tell what happens in each phase in the contraction of a muscle**

1. Latent period

2. Contraction period

3. Relaxation period

4. Recovery period

Total time for a human muscle twitch varies from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ sec to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ sec.

**Identify what occurs in each specific type of contraction:**

1. Isometric

2. Isotonic

3. Twitch

4. Fibrillation

5. Convulsion

6. Tone

7. Tetanus