Name _____ Period _____ Date _____

Topic 11.2 Movement

11.2.U1 Bones and exoskeletons provide anchorage for muscles and act as levers.

1. Outline the roles of bones, joints, muscles, tendons, ligaments, and nerves in the musculoskeletal system.
2. Outline the three classes of levers. Give an example of each class in the human body.

11.2.A1 Antagonistic pairs of muscles in an insect leg.

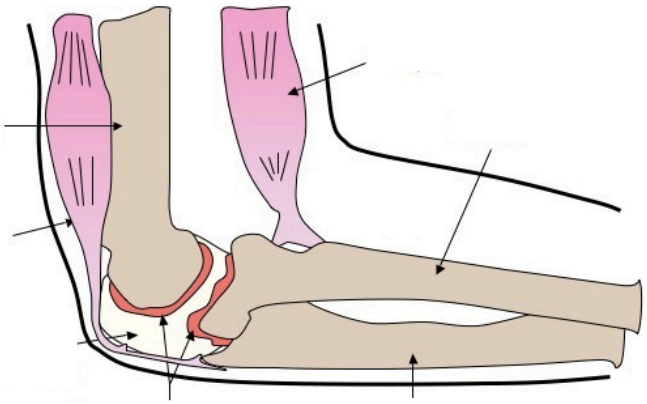
3. State the names and roles of the two muscles groups in the leg.
4. Explain why the muscles are regarded as being antagonistic. Use a specific example in the body.

11.2.U3 Movement of the body requires muscles to work in antagonistic pairs.

5. Give an example of antagonistic muscles in humans.
6. Suggest the benefits of having a pair of antagonistic muscles rather than a single muscle.
7. Describe the role of extensor and flexor muscles.

11.2.S1 Annotation of a diagram of the human elbow.

8. Label and annotate the functions of the different structures in the human elbow.



11.2.U2 Synovial joints allow certain movements but not others.

9. Describe the purpose of a joint. Compare immovable, slightly movable and freely moveable joints.
10. Describe the range of movement allowed by 'hinge' and 'ball and socket' joints.

11.2.U4 Skeletal muscle fibers are multinucleate and contain specialized endoplasmic reticulum. AND 11.2.U5 Muscle fibers contain many myofibrils.

11. Outline the function of the specialized structures (myofibrils, sarcoplasmic reticulum, mitochondria, sarcolemma) within muscle fiber cells.

11.2.U6 Each myofibril is made up of contractile sarcomeres. AND 11.2.S2 Drawing labeled diagrams of the structure of a sarcomere.

12. Draw, label and annotate a diagram of a sarcomere.

11.2.U7 The contraction of the skeletal muscle is achieved by the sliding of actin and myosin filaments.

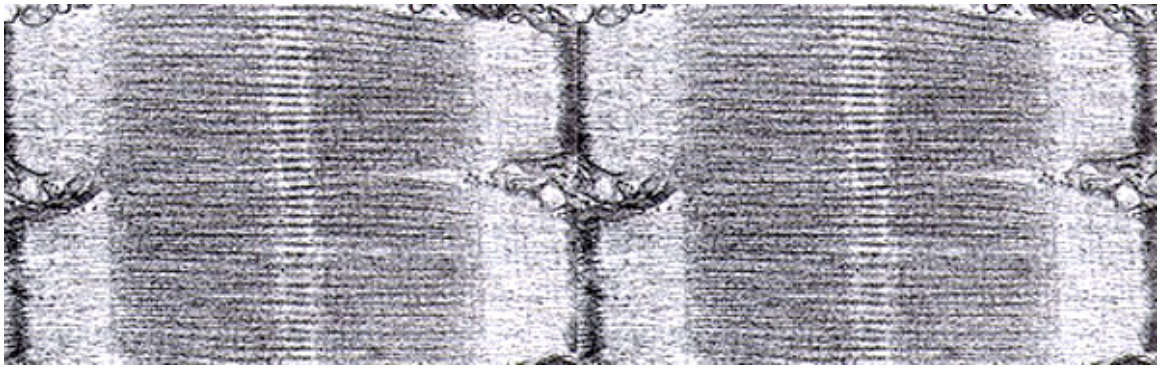
13. Draw and label diagrams of sarcomeres to show myofibrils in state of contraction and relaxation.

11.2.U8 ATP hydrolysis and cross bridge formation are necessary for the filaments to slide. AND 11.2.U9 Calcium ions and the proteins tropomyosin and troponin control muscle contractions.

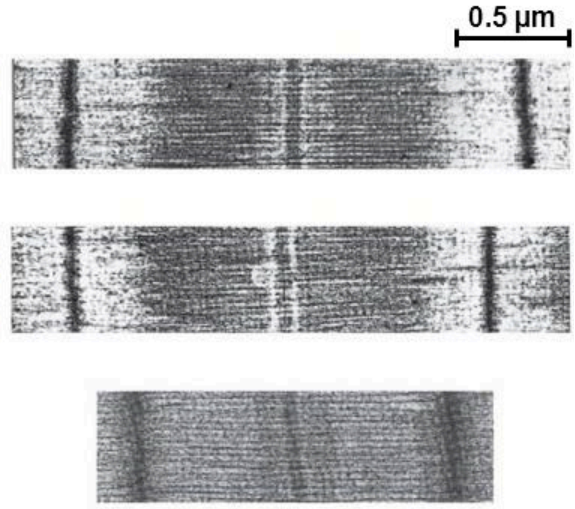
14. Explain in detail how the sliding of sliding of actin and myosin filaments is achieved, referring to cross-bridges, ATP, tropomyosin, troponin in your explanation.
15. Describe the role of calcium in muscle contraction.

11.2.S3 Analysis of electron micrographs to find the state of contraction of muscle fibers.

16. Identify and label electron micrographs with the same information in your diagram of a sarcomere.



17. Relate the micrograph to the sarcomeres showing myofibrils in state of contraction and relaxation.



Nature of science: Developments in scientific research follow improvements in apparatus - fluorescent calcium ions have been used to study the cyclic interactions in muscle contraction. (1.8)

18. State the name and origin of the protein to which calcium ions binds causing it to fluoresce.
19. State the property of the protein makes it suitable for studying muscle contraction.
20. Outline the findings of the experiment and how they helped to identify the role of calcium ions in muscle contraction.