

## Skeletal Muscle Physiology

### OBJECTIVES

1. To define these terms used in describing muscle physiology: multiple motor unit summation, maximal stimulus, tetanus, wave summation, and tetanus.
2. To identify two ways that the mode of stimulation can affect muscle force production.
3. To plot a graph relating stimulus strength and twitch force to illustrate graded muscle response.
4. To explain how slow, smooth, sustained contraction is possible in a skeletal muscle.
5. To graphically understand the relationships between passive, active, and total forces.
6. To identify the conditions under which muscle contraction is isometric or isotonic.
7. To describe in terms of length and force the transitions between isometric and isotonic conditions during a single muscle twitch.
8. To describe the effects of resistance and starting length on the initial velocity of shortening.
9. To explain why muscle force remains constant during isotonic shortening.
10. To explain experimental results in terms of muscle structure.

**S**keletal muscles are composed of hundreds to thousands of individual cells, each doing their share of work in the production of force. As their name suggests, skeletal muscles move the skeleton. Skeletal muscles are remarkable machines; while allowing us the manual dexterity to create magnificent works of art, they are also capable of generating the brute force needed to lift a 100-lb. sack of concrete. When a skeletal muscle from an experimental animal is electrically stimulated, it behaves in the same way as a stimulated muscle in the intact body, that is, *in vivo*. Hence, such an experiment gives us valuable insight into muscle behavior.

This set of computer simulations demonstrates many important physiological concepts of skeletal muscle contraction. The program graphically provides all the equipment and materials necessary for you, the investigator, to set up experimental conditions and observe the results. In student-conducted laboratory investigations, there are many ways to approach a problem, and the same is true of these simulations. The instructions will guide you in your investigation, but you should also try out alternate approaches to gain insight into the logical methods used in scientific experimentation.

Try this approach: As you work through the simulations for the first time, follow the instructions closely and answer the questions posed as you go. Then try asking "What if . . . ?" questions to test the validity of your hypotheses. The major advantages of these computer simulations are that the muscle cannot be accidentally damaged, lab equipment will not break down at the worst possible time, and you will have ample time to think critically about the processes being investigated.

Because you will be working with a simulated muscle and an oscilloscope display, you need to watch both carefully during the experiments. Think about what is happening in each situation. You need to understand how you are experimentally manipulating the muscle in order to understand your results.

# Skeletal Muscle Physiology Computer Simulation Answers

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Smith**



## **Skeletal Muscle Physiology Computer Simulation Answers:**

*PhysioEx for Human Physiology Stand-Alone* Timothy Stabler, 2002-11 This special edition of PhysioEx TM has been specifically written for use with Germann Stanfield Principles of Human Physiology PhysioEX TM consists of nine physiology lab simulations that may be used to supplement or substitute for wet labs This easy to use software allows readers to repeat labs as often as they like perform experiments without harming live animals and conduct experiments that may be difficult to perform in a wet lab environment due to time cost or safety concerns Readers also have the flexibility to change the parameters of an experiment and observe how outcomes are affected Available in both CD ROM and web [www.physioex.com](http://www.physioex.com) formats PhysioEx TM is fully supported by a written lab manual that walks readers through each lab step by step It is an ideal complement to any physiology course PhysioEx 5. 0 Peter Zao, Timothy Stabler, Greta Peterson, 2004-05 Includes 36 laboratory simulations and a histology slide tutorial Cover **PhysioEx 6. 0 for A and P** Peter Zao, Timothy N. Stabler, 2006 Physioex 6 0 Laboratory Simulations In Physiology With Worksheets For A And P Cd rom Version PhysioEx 7.0 for A&P Peter Z. Zao, 2008 *Cumulated Index Medicus* ,1979 Handbook of Physiology John Field, 1996 **Computer Simulation of Physiological Systems** Thomas G. Coleman, 1978 PhysioEx for Human Physiology Timothy Stabler, 2003 *From Guinea Pig to Computer Mouse* Ursula Zinko, Nick Jukes, Corina Gericke, 1997 Alternatives to Laboratory Animals ,1988 **Physioex 6. 0** Timothy Stabler, Greta Peterson, Lori Smith, 2005-03 KEY BENEFIT PhysioExtrade 6 0 for Human Physiology consists of 13 modules containing 40 physiology lab simulations that may be used to supplement or substitute for wet labs KEY TOPICS Cell Transport Mechanisms and Permeability Skeletal Muscle Physiology Neurophysiology of Nerve Impulses Endocrine System Physiology Cardiovascular Dynamics Frog Cardiovascular Physiology Respiratory System Mechanics Chemical and Physical Processes of Digestion Renal System Physiology Acid Base Balance Blood Analysis Serological Testing Histology Tutorial For all readers interested in lab simulations **Research Grants Index** National Institutes of Health (U.S.). Division of Research Grants, 1975 **Dissertation Abstracts International** ,1989 **Canadian Journal of Physiology and Pharmacology** ,1992 **Mercury in Water** ,1975 Research Awards Index ,1976 *Microcomputers and Physiological Simulation* James Edwin Randall, 1987 Mercury in Water Water Resources Scientific Information Center, 1975 Federation Proceedings Federation of American Societies for Experimental Biology, 1986 Vols for 1942 include proceedings of the American Physiological Society **The Olympic Textbook of Science in Sport** Ronald J. Maughan, 2009-01-26 This new volume in the Encyclopaedia of Sports Medicine series published under the auspices of the International Olympic Committee delivers an up to date state of the art presentation of the scientific aspects of conditioning injury prevention and competition The book covers the key areas of scientific knowledge in sport and is divided into physiology and biochemistry nutrition anthropometry immunology cell biology biomechanics engineering and ergonomics psychology pharmacology limitations to performance special populations and exercise and

health Presented in a clear style and format The Olympic Textbook of Science in Sport draws on the expertise of an international collection of contributors who are recognized as leaders in their respective fields It will be indispensable for all sport scientists and medical doctors who serve athletes and sports teams and is an invaluable reference for students of sport and exercise science

## Whispering the Techniques of Language: An Emotional Journey through **Skeletal Muscle Physiology Computer Simulation Answers**

In a digitally-driven world where screens reign supreme and immediate communication drowns out the subtleties of language, the profound techniques and mental subtleties hidden within phrases frequently get unheard. Yet, situated within the pages of **Skeletal Muscle Physiology Computer Simulation Answers** a charming fictional value pulsing with raw feelings, lies an exceptional journey waiting to be undertaken. Written by an experienced wordsmith, that wonderful opus invites visitors on an introspective journey, delicately unraveling the veiled truths and profound affect resonating within the material of each word. Within the mental depths with this moving evaluation, we shall embark upon a genuine exploration of the book is key styles, dissect its fascinating writing style, and yield to the powerful resonance it evokes heavy within the recesses of readers hearts.

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