



## CASE TEACHING NOTES

for

### A Rigorous Investigation: The Relationships Between Cellular Respiration, Muscle Contraction, and Rigor Mortis



by

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## INTRODUCTION / BACKGROUND

This case is suitable for an introductory biology class and could be easily adapted for a more advanced biochemistry class. The goal of the case is to make the abstract concepts involved in cellular respiration more accessible to students. To achieve this goal, students must apply what they know about the characteristics of a dead body to the biochemistry of ATP production and muscle contraction.

As written, this case would be taught following several lectures on cellular respiration and as an introduction to muscle contraction. This is a directed case, that is, one in which there are correct answers to be given to the questions. Students are given the case and a series of questions that they research and answer outside of class. During the follow-up class period, the students discuss their answers, first in small groups and then with the entire class. The case is used in conjunction with a lecture on lactic acid fermentation and muscle contraction.

## Objectives

We have found that the students appreciate having the learning objectives given to them as part of the case. The objectives are as follows:

- Review the basic steps of ATP production (i.e., cellular respiration and fermentation).
- Identify the molecular steps involved in muscle contraction.
- State the importance of ATP generation to muscle contraction.
- Understand the relationship between rigor mortis and muscle contraction.

## CLASSROOM MANAGEMENT

The case is handed out a week before it is discussed in class. Students are asked to prepare for the class by reviewing cellular respiration and answering the homework questions. Because the concepts involved in cellular respiration have recently been covered in the preceding lectures, students can start the class by taking 15 to 20 minutes to discuss their answers to the homework questions in groups of two to four students. The concepts involved in fermentation and muscle contraction have not yet been covered in class, so some students will find the questions relating to these topics and rigor mortis difficult. This is good because the idea is to have them try to figure out the connection on their own.

When the 20 minutes are up, the instructor initiates a discussion with the entire class, going over the answers to the questions. After question 3, lecture briefly on fermentation. Then discuss the remaining questions and give a brief lecture on muscle contraction. After all of the homework questions have been discussed, return to the story and provide additional information about how Jackie died. Students must then figure out what makes the chemical in question so toxic.

## ANSWER KEY

Answers to the questions posed in the case study are provided in a separate answer key to the case. Those answers are password-protected. To access the answers for this case, go to **the key**. You will be prompted for a username and password. If you have not yet registered with us, you can see whether you are eligible for an account by reviewing our **password policy and then apply online**.

Following a discussion of the answers to the case questions and a brief lecture on muscle contraction, the instructor asks the class as a whole a series of follow-on questions, or these questions could be assigned as homework. The questions and their answers are also password-protected. These questions relate to how Jackie died. The Answer Key also includes a list of references and resources instructors can refer to as they prepare to teach this case.

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