

## Athletic Cheating

<p><b>Topic</b></p>	<p>The topic of athletic cheating (including the use of performance-enhancing drugs) is of high interest to many students, both athletes and fans. It represents a high-interest way to connect content on biological molecules (i.e., steroid lipids) with metabolism (such as cellular respiration) and with content on human body systems (particularly the circulatory, respiratory, muscular, and endocrine systems). New stories about another athlete caught in a cheating scandal and local stories that affect your community provide constant fodder for this topic. For a futuristic twist, connections can be made to human gene therapy.</p>
<p><b>Modules to assign</b></p>	<p>Assign the following modules to provide your students a broad overview of the core content on the topic of athletic cheating:</p> <ul style="list-style-type: none"> <li>• 2.1 All life is made of molecules, which are made of atoms.</li> <li>• 2.2 All matter consists of chemical elements.</li> <li>• 2.7 All life on Earth is based on carbon.</li> <li>• 2.8 Most biological macromolecules are polymers.</li> <li>• 2.10 Lipids are a diverse group of hydrophobic molecules.</li> <li>• 4.7 In cellular respiration, oxygen is used to harvest energy stored in sugar.</li> <li>• 11.1 Animal bodies are organized into a structural hierarchy.</li> <li>• 11.8 The respiratory system exchanges gases between the environment and the body.</li> <li>• 11.9 The circulatory system transports materials throughout the body.</li> <li>• 11.10 The heart is the hub of the human circulatory system.</li> <li>• 11.11 Blood contains cells in liquid.</li> <li>• 11.14 The endocrine system regulates the body via hormones.</li> </ul>
<p><b>Students' learning outcomes</b></p>	<ul style="list-style-type: none"> <li>• Describe the basic structure of atoms and how they participate in reactions essential to life. (Modules 2.1–2.3)</li> <li>• Describe the significance of carbon in forming the basis of the four classes of biological macromolecules. (Module 2.7)</li> <li>• Differentiate between hydrolysis and dehydration synthesis reactions as processes of metabolism. (Module 2.8)</li> <li>• Describe in specific terms the forms and functions of the four classes of biological macromolecules. (Modules 2.7, 2.9–2.13)</li> <li>• Describe the overall process of cellular respiration. (Modules 4.7, 4.8, 4.10)</li> </ul>

	<ul style="list-style-type: none"> <li>• Relate the concept of food calories to cellular respiration and the generation of ATP. (Modules 4.7, 4.10)</li> <li>• Outline the structural hierarchy of the human body systems, with particular emphasis on the different types of tissues. (Modules 11.1, 11.2)</li> <li>• Describe the main organs of the respiratory system with emphasis on how gases are exchanged between the body and the external environment. (Module 11.8)</li> <li>• Describe the main organs, vessels, and tissues of the circulatory system, and how they function to transport blood throughout the body. (Modules 11.9–11.11)</li> <li>• Describe the main organs of the endocrine system, and explain how hormones act on the body. (Module 11.14)</li> </ul>
<p><b>Key terms</b></p>	<p>Chemistry, matter, atoms, molecules, elements, compounds, chemical reactions, reactants, products, periodic table of elements, atomic number, symbol, atomic weight, trace elements, organic compounds, functional groups, cellulose, glucose, coconut oil, cholesterol, hexokinase, keratin, DNA, RNA, macromolecules, polymers, monomers, hydrolysis reactions, dehydration synthesis reaction, metabolism, lipids, hydrophobic, phospholipid bilayers, phospholipid, triglyceride, fatty acid, steroid, anabolic steroids, aerobic respiration, ADP, ATP, anatomy, physiology, organism, organ system, organ, tissue, cells, respiratory system, pharynx, epiglottis, trachea, larynx, bronchi, bronchioles, alveoli, diaphragm, circulatory system, cardiovascular system, blood, heart, pulmonary circuit, arteries, arterioles, capillaries, systemic circuit, veins, venules, interstitial fluid, hypertension, anemia, cardiac cycle, SA (sinoatrial) node, diastole, AV (atrioventricular) node, heart attack, plasma, red blood cells, platelets, white blood cells, endocrine system, endocrine glands, hormones, hypothalamus, pituitary, thyroid gland, parathyroid glands, pancreas, testes, adrenal glands, ovaries, human growth hormone (hgh).</p>
<p><b><u>Student support, applications, and further exploration:</u></b></p>	
<p><b>Guided reading</b></p>	<p>A one-page Guided Reading Activity in PDF format is provided for each module in the textbook. Students can download and print these from the MasteringBiology Study Area and complete them as they read each module. The instructor may wish that the completed activities be handed in for cursory grading. An answer key can be found in the Instructor Resource area in MasteringBiology.</p>

<p><b>MasteringBiology prebuilt assignments</b></p>	<p>MasteringBiology includes pre-built “Current Topic Homework” assignments for each topic. Instructors can copy the assignments, then customize the content and the due dates as needed.</p> <ul style="list-style-type: none"> <li>• Assignment name: <i>Topic: Athletic Cheating—Core Content</i> <ul style="list-style-type: none"> <li>○ This assignment presents the core content from the previously listed modules. The module(s) covered by each set of questions are clearly marked in the assignment, so the instructor can easily remove any part(s) of the assignment that he or she does not cover. This assignment may be given prior to the lecture on this topic.</li> <li>○ Approximate total time for this assignment: 30 minutes</li> </ul> </li> <li>• Assignment name: <i>Topic: Athletic Cheating—Applied Content</i> <ul style="list-style-type: none"> <li>○ The assignment presents content specifically written for the topic itself (and therefore may not be covered in any book module). This content should be assigned only after covering this topic in class. Not all of the information needed to complete this assignment successfully is found in the book.</li> <li>○ Approximate total time for this assignment: 30 minutes</li> </ul> </li> </ul>
<p><b>New York Times current events articles in MasteringBiology</b></p>	<p>Each of these articles is available in MasteringBiology with five auto-graded reading comprehension multiple-choice questions. These articles are updated frequently, so additional recent articles may be available in the MasteringBiology Item Library.</p> <ul style="list-style-type: none"> <li>• “Why Runners Get Slower With Age (and How Strength Training May Help)” (<i>New York Times</i>, 9/9/2015)</li> <li>• “Gene Therapy with a Difference” (<i>New York Times</i>, 9/23/2013)</li> <li>• “Human Muscle, Regrown on Animal Scaffolding” (<i>New York Times</i>, 9/16/2012)</li> <li>• “In Choosing a Sperm Donor, a Roll of the Genetic Dice” (<i>New York Times</i>, 5/14/2012)</li> </ul>
<p><b><u>Instructor support and in-class activities:</u></b></p>	
<p><b>PowerPoint</b></p>	<ul style="list-style-type: none"> <li>• Chapter-based PowerPoint lectures can be found in the Instructor Resource area of MasteringBiology and also on the Instructor Resource DVDs.</li> <li>• <i>Current Topics PowerPoint: Athletic Cheating</i> <ul style="list-style-type: none"> <li>○ Use this PowerPoint to deliver a topic-based high-interest lecture on this subject. This presentation offers content specific to the topic and goes beyond the material presented in the textbook.</li> </ul> </li> </ul>

	<p>To build an all-inclusive lecture that covers both the core and applied content on this subject, you may wish to combine the chapter-based PowerPoint slides covering the previously listed modules with the Current Topic PowerPoint.</p>
<p><b>Multimedia</b></p>	<ul style="list-style-type: none"> <li>• Guided Video Tour 2.8: Most biological macromolecules are polymers.</li> <li>• ABC News Video: The Effect of Exercise on Cells</li> </ul> <p>Multimedia content is added to MasteringBiology periodically, so check the Item Library for the most recent catalog.</p>
<p><b>Instructor Exchange resources and in-class activity ideas</b></p>	<p>The Instructor Exchange is updated regularly, so there may be additional resources available. Access the Instructor Exchange through the Instructor Resource area in MasteringBiology.</p> <ul style="list-style-type: none"> <li>• Blood Flow: Following a Single Red Blood Cell <ul style="list-style-type: none"> <li>○ 15 to 20-minute activity: Students are given a mini-lecture on how blood flows through the human circulatory system by following the diagram provided. Students will label the diagram during the lecture. You will then give students a location in the body and will ask a variety of questions. Students will work in pairs.</li> </ul> </li> <li>• Using Ropes to Demonstrate the Pulling Forces of Actin and Myosin <ul style="list-style-type: none"> <li>○ A 5-minute in-class activity: This activity works well in a cell biology discussion or in a discussion of muscle anatomy and physiology. Both topics require understanding of forces, mainly pulling forces driven by actin and myosin molecules. The instructor and students use ropes to demonstrate how actin and myosin involve two processes: cell shape change and muscle contractions.</li> </ul> </li> </ul>