**Topic Review Guide**: Cellular Energy (Topic 3.4)

**To Think About**: The highly complex organization of living systems requires a constant input of energy and the exchange of macromolecules.

**Watch:** [AP Daily Video 3.4](https://apclassroom.collegeboard.org/d/lcrjn9yiyk?sui=6,3)

**Read:** Chapter 6.1-6.3, pages 116-124, Biology in Focus

**Supplementary Resources**: Click the links below for more information to help you learn more about this lesson.

* [Guided Notes](https://static1.squarespace.com/static/50d5cc57e4b0e383f5b1eb34/t/53c955efe4b00bfba5cb610b/1405703663486/AP+Bio-012+Life+Requires+Free+Energy+Worksheet-WL.pdf)
* [Mr. Andersen’s “Life Requires Free Energy” video](http://youtu.be/JBmykor-2kU)
* Hillis, et al.: [ATP and Coupled Reactions](http://bcs.whfreeman.com/hillis1e/#667501__708801__)
* Wiley Publishing: [Interactive Concepts in Biochemistry-Catalysis](http://www.wiley.com/legacy/college/boyer/0470003790/animations/catalysis_energy/catalysis_energy.htm)
* Sumanas, Inc:  [Activation Energy and Enzymes](http://www.sumanasinc.com/webcontent/animations/content/enzymes/enzymes.html)

**Recall and Review:** Use the lecture in the video and your textbook to help you answer these questions in your BILL. Before you start, mark your level of understanding. After you have completed the questions, then check to see what level of understanding you have achieved. If you’re still at a level N or level A after in-class activities and before quizzes, it is **highly** recommended that you stop in for office hours.

| **Essential Knowledge:**  What You Absolutely Must Know and Understand | | | | |
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| Levels of Mastery | | | | *I can describe the role of energy in living systems. (Topic 3.4)* |
| **N** | **A** | **E** | **M** | **Questions You Should Be Able to Answer** |
|  |  |  |  | 1. **Identify** the ultimate source of energy for the Earth. |
|  |  |  |  | 1. **Explain** why living things require a constant input of energy. |
|  |  |  |  | 1. The Second Law of Thermodynamics states that the entropy of the universe is increasing. **Explain** why living things DO NOT violate this law. |
|  |  |  |  | 1. **Describe** how energy can be transferred efficiently in living things. |
|  |  |  |  | 1. **Explain** where organisms store energy. |

| Learn More: For more information about free energy and how thermodynamics applies to biology, check out the links below:   * Boundless Biology: [Free Energy](https://courses.lumenlearning.com/boundless-biology/chapter/potential-kinetic-free-and-activation-energy/) * [University of Wisconsin, Fox Valley: Exergonic and Endergonic Reactions](http://www.uwfox.uwc.edu/users/joyperry/bot130/Chapter08/Animations_videos/8_1_2_exer_endergonic.swf) * Hyperphysics: [Free Energy](http://hyperphysics.phy-astr.gsu.edu/hbase/chemical/gibbspon.html) |
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