

AP Biology Cellular Energetics Homework

Test Date: _____

Lesson 1: Enzymes

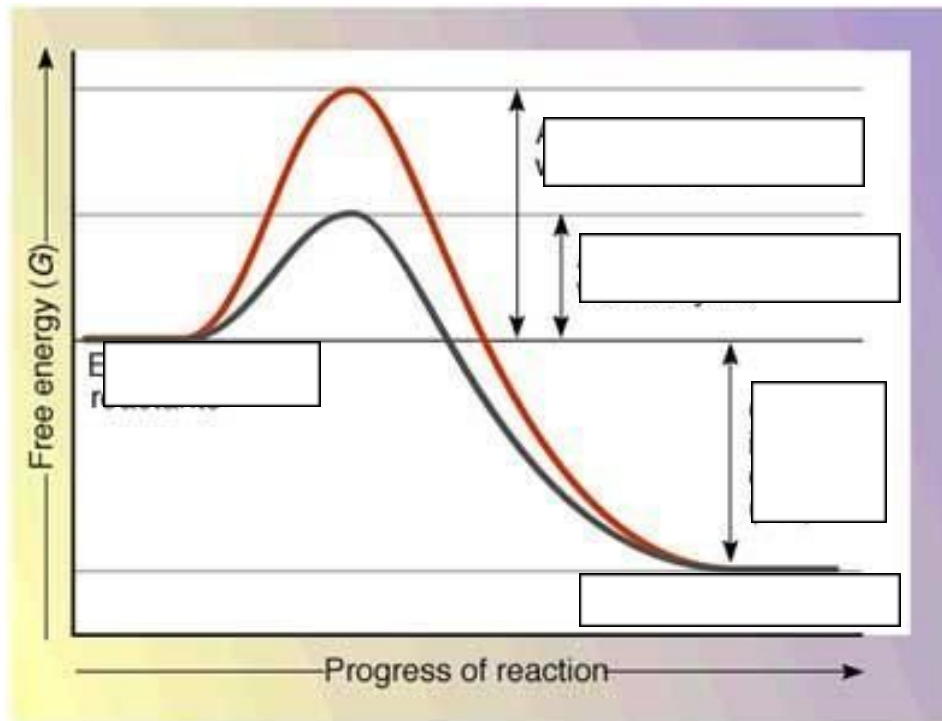
Begin by reading OpenStax Chapter 6, section 2 on Energy

<https://cnx.org/contents/bDluMp-w@18.4:KgNGX4wc@14/6-2-Potential-Kinetic-Free-and-Activation-Energy>, then read Chapter 6, section 5 on enzymes

<https://cnx.org/contents/bDluMp-w@18.4:mbmHAz-l@14/6-5-Enzymes>

Answer the following questions:

1. Compare and contrast endergonic and exergonic reactions.
2. Define catalyst in your own words.
3. Label the parts of this Activation Energy graphic: Is this an endergonic or exergonic reaction? How do you know?



Lesson 2: Enzyme Structure and Function

https://www.youtube.com/watch?v=pVoytz_3H_s and http://www.kscience.co.uk/animations/anim_2.ht

Work through the tutorials on enzymes, then play with the simulator at the bottom of the page. Use what you've learned to answer the following:

1. Draw a labeled picture to explain the *induced-fit* model of enzymes.
2. Name three factors that affect enzyme activity. Using the simulation on the page explain if each factor you listed increases or decreases the conversion of substrate to product.

3. Compare and contrast competitive and non-competitive inhibitors.
4. Competitive and non-competitive inhibitors are both SPECIFIC ways to limit an enzyme's function. Describe how enzymes, in general, could be denatured.
5. List 3 questions that you still have about enzyme structure and function. If you don't have 3 questions, write questions to predict how this material can show up on your test.

Lesson 3: Bioenergetics

Begin by reading Chapter 6, section 1 of the OpenStax Textbook:

<https://cnx.org/contents/bDluMp-w@18.4:dYwvbaxY@17/6-1-Energy-and-Metabolism>

Answer the following questions:

1. Define *Bioenergetics* and, using the graphic 6.2, justify the idea that no energy conversion is 100% efficient.
2. List the types of energy found in bioenergetic reactions and give examples of when each type of energy is present in the ecosystem.
3. Describe what is meant by the term "pathway." Using examples, contrast anabolic and catabolic pathways.

Next, go to Chapter 6, section 3 of the OpenStax textbook:

<https://cnx.org/contents/bDluMp-w@18.4:5LzZUT8D@12/6-4-ATP-Adenosine-Triphosphate>

Answer the following questions:

1. Describe and/or draw the structure of ATP. What type of energy is found in ATP and where is it found?
2. What two purposes does ATP serve?

Lesson 4: Respiration

Read Chapter 7, section 1 in the OpenStax textbook:

<https://cnx.org/contents/bDluMp-w@18.4:fnJzfqQ1@13/7-1-Energy-in-Living-Systems>

Answer the following questions:

1. Photosynthesis and Cellular respiration are considered to be redox reactions. Explain why.
2. Describe the purpose of reducing agents.
3. Contrast substrate-level and oxidative phosphorylation.

Next, read Chapter 7, sections 2-7, beginning at:

<https://cnx.org/contents/bDluMp-w@18.4:LSMfE4mW@12/7-2-Glycolysis>

Answer the following questions:

1. What is the purpose of glycolysis and why is it generally described as having two “phases”?
2. What happened to the pyruvates that were created at the end of glycolysis before they reach the Citric Acid cycle?
3. What’s the purpose of the Citric Acid (Krebs) cycle? What remains of the original sugar molecule by the end of the cycle?
4. Why are glycolysis and the Citric Acid cycle necessary in order to complete the electron transport chain and oxidative phosphorylation?
5. What parts of cellular respiration are common to both aerobic and anaerobic respiration? Why does fermentation occur?
6. Describe how the steps of cellular respiration relate to carbohydrates, lipids and proteins.
7. Relate enzymes to cellular respiration pathways.

Watch the Respiration overview and lab preparation:

https://www.youtube.com/watch?v=r9o_VdToCIE

Make Notes.

Lesson 5: Photosynthesis

Read Chapter 8 in the OpenStax textbook, starting at:

<https://cnx.org/contents/bDluMp-w@18.4:jE0DfTLF@12/8-1-Overview-of-Photosynthesis>

Answer the following questions:

1. It can be said that photosynthesis makes life on Earth possible. Justify this statement with evidence from the chapter.
2. Draw and label the internal anatomy of the chloroplast. Describe what features of this organelle make it ideal for performing photosynthesis.
3. Describe the relationship between light wavelengths, energy, and color.
4. Chlorophyll is the dominant pigment in plants. List the other pigments found in plants, and, using evidence from the chapter and this BLOG post: <https://blogs.plos.org/ecology/2016/10/07/the-ecology-and-economics-of-autumn-leaves/> describe the importance of these pigments.
5. Describe the purpose of the light-dependent reactions of photosynthesis.
6. Describe the purpose of the Calvin Cycle (Light independent/Dark Reactions). What is G3P?

Finally, watch the video on Photorespiration at:

<https://www.khanacademy.org/science/biology/photosynthesis-in-plants/photorespiration--c3-c4-cam-plants/v/photorespiration> and read the article about Alternate Photosynthetic pathways at: <https://www.khanacademy.org/science/biology/photosynthesis-in-plants/photorespiration--c3-c4-cam-plants/a/c3-c4-and-cam-plants-agriculture>

1. What is Photorespiration and why is it wasteful?

2. Contrast C3, C4, and CAM photosynthesis. Which represents a physical separation of carbon fixation and the Calvin Cycle? Which represents a temporal separation of carbon fixation and the Calvin Cycle?
3. Relate enzymes to photosynthesis.

Lab preparation: Watch the video at https://www.youtube.com/watch?v=ZnY9_wMZZWI
Make Notes.

Lesson 6: AP Progress Check

Log in to your AP Classroom account and complete the Unit 3 Progress Check: MCQ (Note: This assignment will not open for you until 2 class days before the Unit test)