COURSE: Honors Biology

I. Grade Level/Unit Number: 9 - 12 Unit 4

Chapters and sections that go with our book:

2.4 – Chemical Reactions and Enzymes
3.2 – Food web/Energy flow
8 – Photosynthesis
9.1 – Cellular Respiration

II: Unit Title: Energy in Living Systems

III. Major Learning Outcomes:

The student will gain an understanding of

- how homeostasis can be maintained within a living system
- the movement of molecules into and out of a living system (cellular transport)
- how changes in osmotic pressure can affect cells
- ATP as a source of energy
- the structure of enzymes as it relates to enzymes' ability to function
- how enzymes influence biochemical reaction
- the reactants and products associated with aerobic respiration, anaerobic respiration (lactic acid and alcoholic fermentation) and photosynthesis
- investigations associated with bioenergetic reactions with emphasis on factors that affect the rate of reactions
- the carbon cycle as it relates to photosynthesis and respiration
- the energy efficiency comparison of aerobic and anaerobic respiration
- the flow of energy as well as the efficiency of energy transfer within ecosystems

IV. Content Objectives Included (with RBT Tags):

Objective Number	Objective	RBT Tag
2.03	Investigate and analyze the cell as a living system including: • Maintenance of homeostasis. • Movement of materials into and out of cells. • Energy use and release in biochemical reactions.	B4
2.04	Investigate and describe the structure and function of enzymes and explain their importance in biological systems.	B2
2.05	Investigate and analyze the bioenergetic reactions: • Aerobic respiration • Anaerobic respiration • Photosynthesis	B4
5.02	Analyze the flow of energy and the cycling of matter in the ecosystem.	B4

	• Relationship of the carbon cycle to photosynthesis and respiration • Trophic levels- direction and efficiency of energy transfer	
1.00	Learner will develop abilities necessary to do and understand scientific inquiry. Goal 1 addresses scientific investigation. These objectives are an *integral* part of *each of the other goals*. Students must be given the opportunity to design and conduct their own investigations in a safe laboratory. The students should use questions and models to formulate the relationship identified in their investigations and then report and share those findings with others.	
1.01	Identify biological problems and questions that can be answered through scientific investigations.	B1
1.02	Design and conduct scientific investigations to answer biological questions. • Create testable hypotheses. • Identify variables. • Use a control or comparison group when appropriate. • Select and use appropriate measurement tools. • Collect and record data. • Organize data into charts and graphs. • Analyze and interpret data. • Communicate findings	B6
1.03	Formulate and revise scientific explanations and models of biological phenomena using logic and evidence to: • Explain observations. • Make inferences and predictions. • Explain the relationship between evidence and explanation.	B6
1.04	Apply safety procedures in the laboratory and in field studies: • Recognize and avoid potential hazards. • Safely manipulate materials and equipment needed for scientific investigations.	C3
1.05	Analyze reports of scientific investigations from an informed scientifically literate viewpoint including considerations of: • Appropriate sample. • Adequacy of experimental controls. • Replication of findings. Alternative interpretations of the data.	B4

<u>Essential Questions for Unit Four:</u>
Following are the essential questions for this unit. Essential questions are those questions that lead to enduring understanding. These are the questions that students should be able to answer at some level years after the course. These questions are designed to incorporate multiple concepts. Students will work on answering these questions throughout the unit.

1) Why are enzymes important to biochemical reactions?
2) What factors can affect the rate of cellular respiration and photosynthesis?
3) How do energy and matter move differently through an ecosystem?

At the beginning of every class period, students will be given 15 minutes to work on their 4th nine weeks enrichment projects.

These Projects are due on May 27th

Monday, April 11

Activities:

EXPLORE:

This lab (Paperase- The Enzyme that Could) involves students in hypothesizing and experimenting. Students will examine some of the factors that affect enzyme (catalase) function – temperature, pH, surface area. They will also investigate enzyme features such as specificity, reusability, and commonality in various species. After carrying out the lab work, each group will present their results so that every student will have a complete lab summary to study from.

Guiding Question: What types of variable affect the rate of enzyme action?

EXPLAIN:

Allow students the opportunity to explain the characteristics of enzymes to each other. This can be accomplished through a Think-Pair-Share activity.

ELABORATE:

This (Park Bench Model of Enzyme Action) is an analogy that the teacher describes to students. The teachers asks inquiry questions which students answer - about the analogy and enzymes.

Guiding Question: How does the enzyme analogy illustrate the way that enzymes work and the variables that affect enzyme action?

Tuesday, April 12

Activities: (Chapter 9.1)

1. Explain: Overview of Cellular Respiration
2. Hand outs and charts…Cellular Respiration is defined as?

Wednesday, April 13

1. Engage: Teacher demo (air freshener and food coloring) this demo opens up the discussion of diffusion.

2. **EXPLORE:**

This lab (Osmosis and Diffusion) demonstration activity serves both as an engagement and an opportunity for students to collect data and analyze the results. Students will use eggs that have been soaked in vinegar to remove their shells. They will put the eggs in a water solution and in various sugar solutions. The eggs will be weighed before and after. The results will be discussed and analyzed. There are other activities in this lab that help students understand diffusion and osmosis at more depth.

Guiding Question: ***How does water move into and out of a system based on the solute concentration?***

Targeted *Standard Course of Study* Goals and Objectives:

Goal 1: The learner will develop abilities necessary to do and understand scientific inquiry.

Goal 2: Learner will develop an understanding of the physical, chemical and cellular basis of life.

2.03 Investigate and analyze the cell as a living system including:

- Maintenance of homeostasis.
- Movement of materials into and out of cells.

Essential Question(s):

What is the significance of scientific investigation?

How do organisms maintain homeostasis in changing conditions?

Differentiation from Standard-level:

Honors level students should be expected to understand and use the more technical terms associated with osmosis, diffusion and solutions. This lab requires more in depth analysis than is typical in standard level courses

Thursday, April 14

Activities: Finish lab

Think pair/share Quiz!!!!

Friday, April 15

Activities:

1. **ELABORATE:**
This is a worksheet guide that students will use to help them understand energy relationships.

Guiding Question: What are the reactants, products, energy production, and requirements of the bioenergetic reactions?

Before Activity: Explain to students that this worksheet will help them summarize the energy processes that are found in living things.

2. EXPLAIN
Lesson: Food webs and energy transfer

Guiding Question: In what form is the energy that is used and released by bioenergetic reactions?

Monday, April 25

Activities:

1. EXPLORE:
Students will go to two different websites that allow them to discover food webs by moving organisms around. Students will then diagram those food webs and identify the various levels of the ecosystems.

Guiding Question: What are the feeding relationships found in a food web?

Tuesday, April 26 1. **ELABORATE:**

Students will do an activity involving a simple food chain and energy pyramids/mass pyramids/ and numbers pyramids. This activity is a chance for the teacher connect the various topics covered in this unit

Guiding Question: What happens to matter as it cycles in a food web and what happens to energy as it flows through a food web?

Wednesday, April 27th Test Unit 4