https://bioweb-cfs.cas.okstate.edu/info/requiredreadings/Out%20of%20the%20Rainforest.pdf

Out of the Rainforest

An aboriginal fishing expedition in the rain forest is explored in terms of the action of a toxin produced by plants. Pesticides, coevolution, cell membrane function and cell respiration are discussed.

Readings about **Natural Selection** can be found in **Chapter 12.**

- We introduced the term **adaptation**, when we discussed the mechanisms by which organisms thermoregulate and osmoregulate during Fire & Ice. You can review a definition on p. 8 as part of a nice introduction to **Evolution and Natural Selection** on pp. 7-8 and again or on p. 244 as your read about natural selection.
- The **Concept of Natural Selection** is described on p. 241 in the context of Darwin's voyage and the observations that supported his ideas. The definition given on that page includes the word genotype, which Darwin would not have known. If that is true for you too, then perhaps you should read pp. 190-191. For now, we will focus on the effect of natural selection on variation in a population (not sure what a population is? See pp. 238 or 750).
    - We will discuss natural selection and other mechanisms of evolution when we are "Marooned in the Galapagos" later this semester. However, we want to introduce you to natural selection now because it such an important concept. You can read how **natural selection** works on **pp. 244-245**.
    - If you are not sure what is meant by **phenotype**, see p. 190
    - If you are confused by our constant reminder that natural selection (and evolution in general) has no **purpose, goa**l, does not result from **need** or a **desire** to survive and is not a way for species to survive, read the explanation on p. 246.
    - If you want to see the importance of understanding evolution and natural selection on human welfare decisions, you might want to read "**The Unending War with Bacteria**" (p. 237) and "**Investigating Life: Size Matters in Fishing Frenzy**" (p. 256). These also provide good practice with the types of scenarios that appear on our exams!

Readings about **Coevolution** can be found in **Chapter 38.**

- For an explanation of **coevolution**, see p. 771.
- For examples of coevolution, with the concepts defined specifically, read about **competition** (p. 768); symbiosis, including **mutualism**, commensalism, and **parasitism** (p. 769-770); and herbivory and **predation** (p. 770)
    - An elegant example of coevolution among **a plant, a fungus and a virus in Oklahoma** can be found in "Investigating Life: Two Kingdoms and a Virus Team Up to Beat the Heat" p. 784-785

Readings about **Cellular Respiration** can be found in **Chapter 6.**
Readings about **energy, biochemical reactions, and enzymes** can be found in **Chapter 4.**

- To formulate an answer to " **Why do we undergo cellular respiration?**", read "Cells Use Energy in Food to Make ATP" on p. 106
- For an **overview** of the three main processes aerobic cellular respiration, read p. 107 and the summary in Figure 6.2. This overview can be pretty valuable because it defines terms such as **NADH**, **$FADH_2$**, and **pyruvate**. Figures 6.16 and 6.17 on pp. 118 and 119 also summarize and review processes nicely.
    - You will commonly see the terms **oxidation**, **reduction**, and **redox**. These are explained on p. 75. We do not require you to remember these terms (although you may want to if you plan on taking more life or physical science courses) on exams, but knowing what they mean will help with reading the textbook.
    - If you have forgotten how **protons** and **electrons** are organized in **atoms** and **molecules**, read pp. 20-22.
    - If you are unfamiliar with (or need to review) chemical **bonds**, read pp. 22-24. The molecules involved in cellular respiration are assembled by **covalent** bonds (p. 24). That said, we will also refer to hydrogen **ions** quite often, so if you are not sure to what that refers, read p. 23.
- For an **introduction** to the roll of **mitochondria** in cellular respiration (and to learn about their **structure**), read p. 108 and be sure to examine **Figure 6.3** and find the **matrix**. When you look at figure 6.3, the structure of the inner and outer membranes may not be familiar to you. if not, consider comparing them to cell **membranes** on pp. 54-55.
    - More **details** about mitochondria and also be found on p. 60.
    - You should also find **mitochondria in the diagrams of cells** on pp. 52 (Figure 3.8) and 53 (Figure 3.9). Pay special attention to that second figure – students get many questions about cellular respiration in whole organisms because they forget what they should have learned from this figure! While you are there, you can read about **cytoplasm** if you are not sure what (p. 49) and where it is found.
- The details of **Glycolysis** can be found on p. 109. This can appear daunting to some, but that is because you are worried about all the steps – don't. Concentrate on what chemicals (molecules) start and are input into the reactions and which are produced (output) during the reactions.
    - Each of the steps in glycolysis and later steps are catalyzed by **enzymes**. What enzymes are and how they work is explained on pp. 78-79.
    - **HINT**: When you are examining **Figure** 6.4 (and later ones), each **grey ball** represents a carbon atom + either two hydrogen or one Oxygen and one Hydrogen atom. Counting them at each step will help you answer some questions we ask. **Don't** try to remember how many are there at each step.
    - If you are not sure what **ATP** is or how it is made, read p. 76 or what it is used for, read p. 77
    - If you are not sure what **glucose** or **carbohydrates** are, read p. 31. When you look at the green pentagons and hexagons in **figure 2.17**, you may be confused. This might help – each letter represents an atom (C=carbon, O = Oxygen, H = Hydrogen) and each "----"

represents a chemical bond between those atoms. When they leave out the letters, it means that at the junction of the two lines is a carbon atom. You will see the terms **monosaccharide**, **disaccharide**, and **polysaccharides** used from time to time. Again they are not something that will appear on tests, but knowing what they are (single, paired, and many sugar chains) can be useful in reading.

- If you are not sure what constitutes **Aerobic Respiration**, read p. 110
    - If you are not sure what happens in the **transition step** between glycolysis and the Krebs cycle, read about how **pyruvate is oxidized to Acetyl CoA**, on p. 110 (summarized in figure 6.5). By now, we hope you are using the words oxidized and reduced as specialized forms of "is made into."
    - For an explanation of the **Krebs Cycle**, read p. 110 and review Figure 6.6. As in glycolysis, don't be concerned about the name of all the intermediate compounds. Instead focus on the overall process and the inputs and outputs.
    - For an explanation of the **Electron Transport Chain**, or **chemiosmosis** read p. 110 and study figure 6.7.
- **Not sure which step contributes the most ATP**? Reading about "How Many ATPs Can One Glucose Molecule Yield?" on p. 112 can help you understand how all the steps are related, how important this process is to life, and how important oxygen is.
- To learn about **anaerobic respiration** or **fermentation**, read pp. 114-115

STUDY TIP: These processes can seem overwhelming, but you will learn them quite well and be able to answer our most challenging questions if you **rehearse** describing the process like this:

1. Put away your book, notes, videos, images, computer, cell phone or other aids
2. Draw a simple figure to represent ALL the steps of cellular respiration. Keep it simple so you can draw it on an exam quickly.
3. Start at the beginning the whole process or each of the major steps and describe clearly (using the terms)
    a. what molecules are used (input),
    b. what happens to each,
    c. what molecules are produced (output).
    d. be sure you are confident on how the steps are related – each produces materials for the other!
4. If you wrote them out – compare your description to the textbook, note your mistakes or omissions, throw away your drawing, and try again.
5. If you said them out loud – listen to a recording while comparing your description to the textbook OR have your study partner tell you what you missed by following along in the textbook.
6. When you feel confident, test your ability to apply your knowledge by using your diagram to
    a. predict/explain all the effects of the poisons on p. 112.
    b. answer test questions from old tests.

For a challenge to your ideas about **endotherms**, some insight into how **thermogenesis** works, and another interesting possible example of **coevolution**, read "**Investigating Life: Hot Plants offer heat reward**" on p. 117. Pretty good practice for exam questions too!