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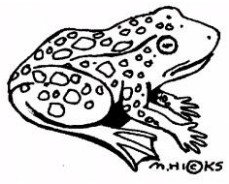


AP Biology 2019-2020 Summer Assignment
Mrs. Cris Robson cris.robson@asd20.org

Welcome to AP Biology! This course is designed to be the equivalent of a two semester introductory biology course usually taken in the first year of college. In other words, it's a little like drinking from a fire hose. It will be a rewarding experience, but as with most things that are, it will also be very challenging. One thing you may notice is that this summer assignment has been greatly reduced from previous years! YAY!! Throughout the course, you will become familiar with major recurring ideas that persist throughout all topics and material as deemed necessary by the college board.

The Four Big Ideas of AP Biology

Big Idea 1: The process of evolution drives the diversity and unity of life.
Big Idea 2: Biological systems utilize free energy and molecular building blocks to grow, to reproduce, and to maintain dynamic homeostasis.
Big Idea 3: Living systems store, retrieve, transmit, and respond to information essential to life processes.
Big Idea 4: Biological systems interact, and these systems and their interactions possess complex properties.

Additionally the college board has further broken down these ideas into the units below:

The Eight Units of AP Biology

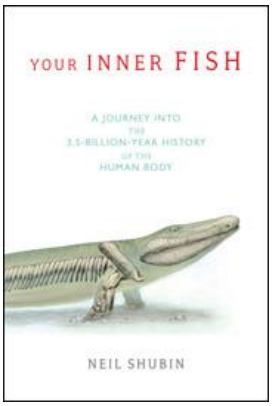
1. Chemistry of Life – Carbon & Biochemistry
2. Cell Structure and Function – Cell Anatomy, Physiology & Communication
3. Cellular Energetics – Photosynthesis & Respiration
4. Cell Cycle – Mitosis/Meiosis & Cancer
5. Heredity – Mendelian & Molecular Genetics
6. Gene Expression and Gene Regulation
7. Evolution / Natural Selection
8. Ecology

To successfully complete the course and meet all of the required objectives, you will need to do independent work on your own at home. It will not replace classroom instruction or labs. During the school year, you will be reading chapters in the book and taking some of your own notes to supplement notes taken in class. You will also check out other resources and links I may give to you in class or on Schoology or Mastering Biology-they will help your understanding of the topic. It is necessary that you do this throughout the year. The summer assignment is designed to prepare you for topics in AP Biology-evolution; scientific methodology; the chemistry and energy of life; and nucleic acids, proteins, and enzymes. As you work on the assignment over the summer and find that you have questions, you may contact me through email. My school email goes directly to my phone so I will answer promptly, unless I am on top of a mountain with no signal.

Please complete the assignment attached to this sheet. All work will be collected the first day when you return to school. You will have the ability to discuss and review the material, ask questions, clarify confusion or express concerns. Your understanding of the material will be assessed. I read every word you write. Do not attempted to copy work from someone else. I will notice and it will be apparent on the assessment. If you have any questions, feel free to email me at cris.robson@asd20.org.

PART I Reading

This is not a textbook reading! Many times throughout the year, we can learn about science in various books and journal articles that offer different perspectives and reveal new information that is not provided for in your textbook.



Your task: Read the book *Your Inner Fish* by Neil Shubin. This is an excellent book by a paleontologist and professor of anatomy who discusses the connection of body structures of past organisms to humans. We will refer to the book throughout the course of AP Biology to see how all living things connect/connected structurally and chemically throughout earth's history.

You can find the book at most local bookstores. Amazon sells used and new copies as well. I have seen it for as little as .51 on Amazon. You must turn in a copy of the text with this assignment.

Evolution is one of the major themes in any general biology course. In *Your Inner Fish*, Neil Shubin writes about the evolutionary relationship between fish and tetrapods (you are a tetrapod) by discussing development of major body systems. This is not a dry biology textbook. Everything is presented through exciting new scientific research and discoveries. In addition to seeing many connections to biology, you will find great applications to anatomy and physiology.

As you read the book, please keep a reading journal. (Turn in with the rest of the assignment)
For each chapter:

1. Take notes as you read the text that might be helpful to "jog" your memory when we discuss the different chapters at different points during the school year. You should also think about what topics we might cover in class and information mentioned in the text.

2. Answer the discussion questions below:

DISCUSSION QUESTIONS: Answers must be written in complete sentences and must be in times new roman 12 point font.

Overview questions (Keep these in mind as you are reading the book)

1. In what way do scientific explanations differ from other ways of knowing? What makes evolutionary biology a science?
2. What insights do we gain when we integrate molecular and fossil data?
3. Can we look to examples in the natural world to inform our conceptions of what is "normal" or ethical human behavior?

Chapter 1: Finding Your Inner Fish

1. Explain why the author and his colleagues chose to focus on 375 million year old rocks in their search for fossils. Be sure to include the types of rocks and their location during their paleontology work in 2004.
2. Describe the fossil Tiktaalik. Why does this fossil confirm a major prediction of paleontology?
3. Explain why Neil Shubin thinks Tiktaalik says something about our own bodies? (in other words –why the Inner Fish title for the book?)

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Chapter 2: Getting a Grip

1. Describe the "pattern" to the skeleton of the human arm that was discovered by Sir Richard Owen in the mid-1800s. Relate this pattern to his idea of exceptional similarities.
2. How did Charles Darwin's theory explain these similarities that were observed by Owen?
3. What did further examination of Tiktaalik's fins reveal about the creature and its' lifestyle?

Chapter 3: Handy Genes

1. Many experiments were conducted during the 1950s and 1960s with chick embryos, and they showed that two patches of tissue essentially controlled the development of the pattern of bones inside limbs. Describe one of these experiments and explain the significance of the findings.
2. Describe the hedgehog gene. Be sure to explain its' function and its' region of activity in the body.

Chapter 4: Teeth Everywhere

1. Teeth make great fossils -why are they "as hard as rocks?"
2. What are conodonts?
3. Shubin writes that "we would never have scales, feathers, and breasts if we didn't have teeth in the first place." (p. 79) Explain what he means by this statement.

Chapter 5: Getting Ahead

1. Why are the trigeminal and facial cranial nerves both complicated and strange in the human body?
2. List the structures that are formed from the four embryonic arches (gill arches) during human development.
3. What are Hox genes and why are they so important?
4. Amphioxus is a small invertebrate yet is an important specimen for study–why?

Chapter 6: The Best Laid (Body) Plans

1. Early embryonic experiments in the 1800s led to the discovery of three germ layers. List their names and the organs that form from each.
2. Describe the blastocyst stage in embryonic development.
3. What is meant by "ontogeny recapitulates phylogeny?"
4. What type of gene is Noggin and what is its function in bodies?
5. Sea anemones have radial symmetry while humans have bilateral symmetry but they still have "similar" body plans –explain.

Chapter 7 -Adventures in Bodybuilding

1. Refer to the timeline on p.121 –what is most interesting to you about the timescale? Explain your reason.
2. What is the most common protein found in the human body? Name it and describe it.
3. Explain how cells "stick" to one another; give one example.
4. How do cells communicate with one another?
5. What are choanoflagellates and why have they been studied by biologists?
6. What are some of the reasons that "bodies" might have developed in the first place?

Chapter 8 -Making Scents

1. Briefly explain how we perceive a smell.
2. Jawless fish have a very few number of odor genes while mammals have a much larger number. Why does this make sense and how is it possible?

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Chapter 9 –Vision

1. Humans and Old World monkeys have similar vision –explain the similarity and reasons for it.
2. What do eyeless and Pax 6 genes do and where can they be found?

Chapter 10 –Ears

1. List the three parts of the ear; what part of the ear is unique to mammals?
2. An early anatomist proposed the hypothesis that parts of the ears of mammals are the same thing as parts of the jaws of reptiles. Explain any fossil evidence that supports this idea.
3. What is the function of the Pax 2 gene?

Chapter 11 -The Meaning of It All

1. What is Shubin's biological "law of everything" and why is it so important?
2. What is the author trying to show with his "Bozo" example?
3. This chapter includes many examples of disease that show how humans are products of a lengthy and convoluted evolutionary history. Choose one of the problems listed below and briefly explain how ancient ancestors' traits still "haunt" us:
    - Obesity
    - Heart disease
    - Hemorrhoids
    - Sleep apnea
    - Hiccups
    - Hernias
    - Mitochondrial diseases

Afterword (new findings re: Tiktaalik)

1. Tiktaalik was a fish that lacked an operculum –what does this tell us about the animal?
2. Tiktaalik had a true neck –what did this allow the animal to do (advantages?)
3. How was Tiktaalik able to survive in the cold Arctic environment?

Completion Date: Read the book throughout the summer. Complete the discussion questions after you finish each chapter. You should have the book read and discussion questions completed by the first day of school August 16th.

PART II AP Biology Supplies

Please use the summer as your opportunity to get your supplies for AP Biology early. Come in prepared on Day 1 as we will hit the ground running.

Materials

1. 3-ring class notebook (2.5-3 inch) for handouts, class notes, reading guides etc.

2. A *small* amount of lined loose leaf paper

3. Dark Blue or black pens and #2 pencils to be brought to class EVERY day. Colored pencils would be VERY helpful too!

4. A scientific or graphing calculator. https://apstudent.collegeboard.org/apcourse/ap-biology/calculator-policy

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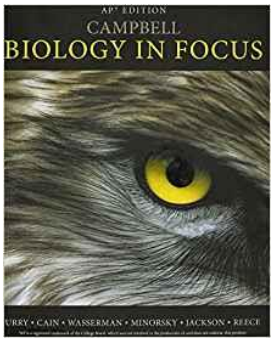
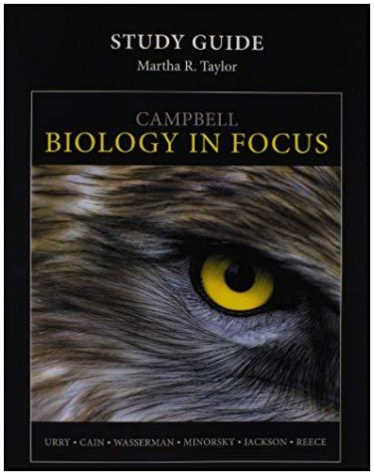
5. A **quadrille** (graph paper) **composition notebook** (not lined!). It MUST be a composition book and not a spiral or other bound book. This will be for your labs. **It MUST contain graph paper and be sewn bound.**

6. Some students elect to purchase their own textbook. We will be using the 1st edition of Campbell Biology In Focus. You can find this on Amazon: http://www.amazon.com/Campbell-Biology-Focus-Lisa-Urry/dp/0321813804 This book is expensive, but having your own copy will allow you to annotate it etc. It will not hurt you to have your own copy of the text when you go on to take more bio in college!



7. I strongly recommend purchasing the associated study guide: http://www.amazon.com/gp/product/0321864999/ref=pd_lpo_sbs_dp_ss_3?pf_rd_p=1944687602&pf_rd_s=lpo-top-stripe-1&pf_rd_t=201&pf_rd_i=0321813804&pf_rd_m=ATVPDKIKX0DER&pf_rd_r=19HM8A2HJPV97ZFV389W This is not required but it will help you a great deal throughout the year.



Any questions?

Email Mrs. Robson!! cris.robson@asd20.org