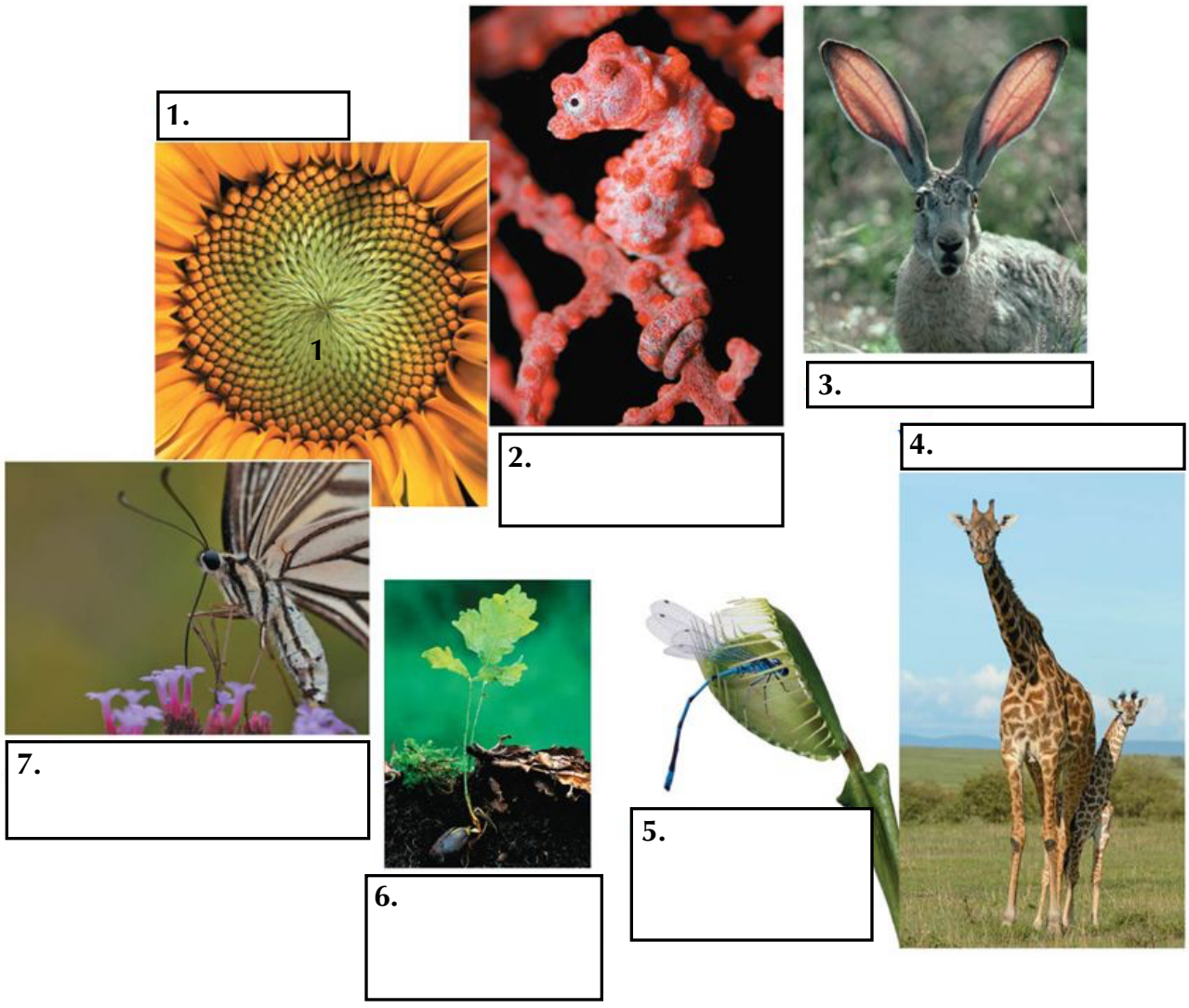
STUDY GUIDE - *Ch. 1.1 - The Study of Life Reveals Unifying Themes.* **NAME:** _____

- **PHYSICALLY PRINT OUT this PDF and HANDWRITE (with a black or blue pen) your answers directly on this PDF.** *Typed or digitally-written work is **not** be accepted. Do **not** answer questions on separate paper.*
- **Importantly, study guides are NOT GROUP PROJECTS!!!** *You, and you alone, are to answer the questions as you **read** your assigned textbook. You are **not** to share answers with other students. You are **not** to copy any answers from any other source, including the internet.*
- **Get in the habit of writing LEGIBLY, neatly, and in a medium-sized font.** *AP essay readers and I will skip grading anything that cannot be easily read so start perfect your handwriting, and don't write so large you can't add all the relevant details and key elaborations in the space provided.*
- **SCAN physical documents in color and with good resolution. Then, upload your final work as PDFs to Archie.** *Avoid uploading dark, shaded, washed out, side ways, or upside down scans of homework. Keep completed physical study guides organized in your biology binder to use as future study and review tools.*
- **READ FOR UNDERSTANDING and not merely to complete an assignment.** ***First**, read a section quickly to get an overview of the topic covered. Then, read it a **second** time slowly, paraphrasing each paragraph **out loud** and analyzing every figure. Finally, read it a **third** time as you answer the study guide questions if assigned and to start building your memory. Try to write answers out in your own words when possible and to purposefully and accurately use all new terminology introduced.*

1. a. To study life, we must **identify the properties and processes associated with life**. Study figure 1.2 in your textbook. Label the figure below with the **seven properties** that all organisms must display **to be considered living**.



b. Now briefly explain how each of the organisms above illustrate one of the **seven Properties of Life** that separate the living from nonliving.

1.

2.

3.

4.

5.

6.

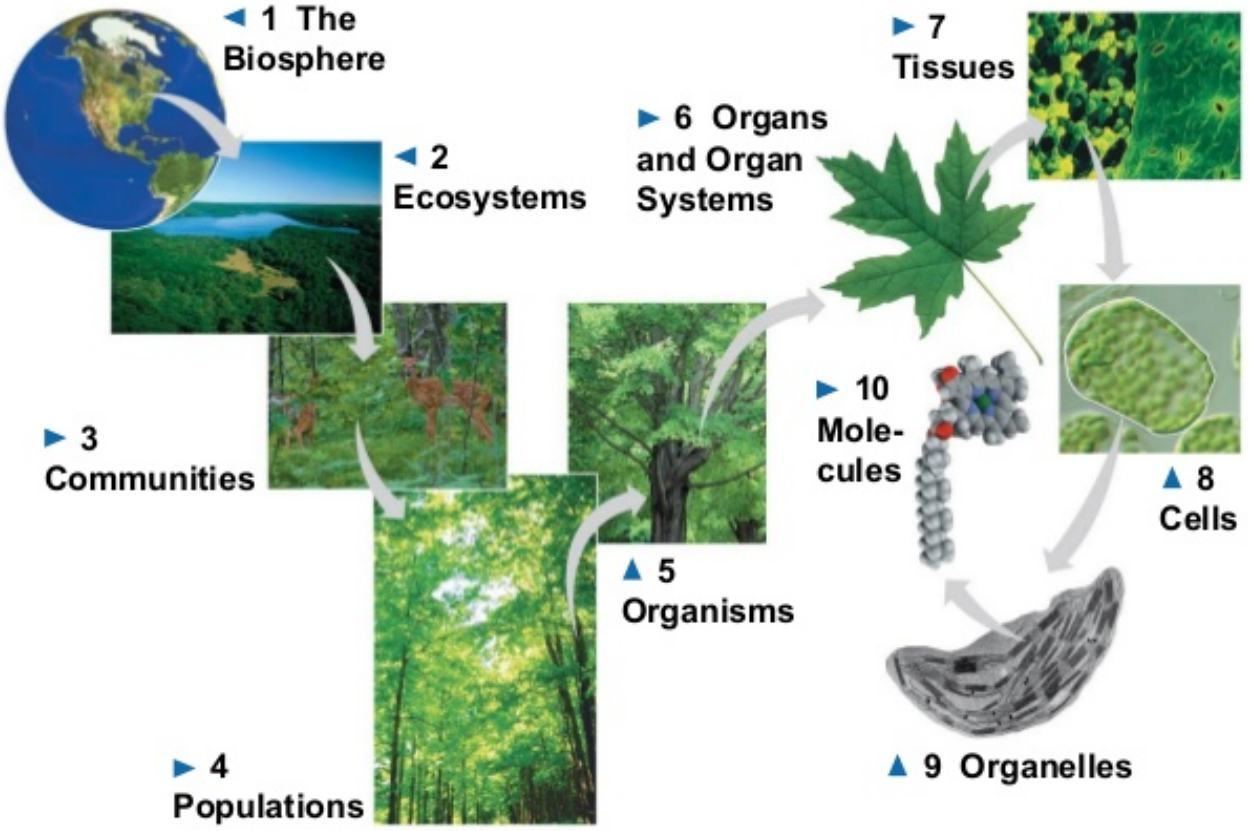
7.

2. a. What is the definition of an **emergent property**?

b. Look around you. Provide your own example of an emergent property in your environment. Explain.

3. Contrast **reductionism** with **systems biology**. How do these approaches to studying aspects of biology differ?

4. Ready through and study Figure 1.3, which highlights the **Levels of Biological Organization**. Note how **each more-encompassing level displays new emergent properties that the level below it does not yet possess**. Once you have memorized all the terminology and definitions introduced, see if you can list and define the **ten Levels of Biological Organization** accurately and from memory below, checking your answers as needed.



1. **Level:** _____

   Definition:

2. **Level:** _____

   Definition:

3. **Level:** _____

   Definition:

4. **Level:** _____

   Definition:

5. **Level:** _____

   Definition:

6. **Level:** _____

   Definition:

7. **Level:** _____

   Definition:

8. **Level:** _____

   Definition:

9. **Level:** _____

   Definition:

10. **Level:** _____

    Definition:

5. Certain themes run through all the topics you will study in biology. Watch for the following themes throughout your studies this year:

    1. **Evolution accounts for the unity and diversity of life.**
    2. **New properties emerge at each level in the biological hierarchy.**
    3. **Structure and function are correlated at all levels of biological organization.**
    4. **Cells are an organism's basic units of structure and function.**
    5. **The continuity of life is based on heritable information in the form of DNA, life's processes involving the expression and transmission of genetic information.**
    6. **Organisms interact with their environments, exchanging matter and energy, life requiring the transfer and transformation of energy and matter.**
    7. **From molecules to ecosystems, interactions are important in biological systems.**
    8. **Feedback mechanisms regulate biological systems.**

    Let's delve into more details that relate to some of these themes...

    a. When it comes to structure and function, analyzing a biological structure gives us clues about what it does and how it works. Conversely, knowing the function of something provides insight into its structure and its organization. What **mechanism causes the evolution of a match between form and function in nature**?

    b. Describe one example *you* have noticed in nature (even in yourself) that illustrates the connection between structure **and** function *(do not copy the example of your textbook)*.

6. What is a **cell**?

7. What is the **main tenant** of the **Cell Theory**?

8. What is **one main characteristic that ALL cells have in common**, regardless of if they are prokaryotic or eukaryotic?

9. How does a **eukaryotic cell** differ from a **prokaryotic cell**?

    - **Eukaryotic Cell =**

    - **Prokaryotic Cell =**

10. On average, which type of cell, eukaryotic or prokaryotic, is **largest**?

11. What is **DNA**? *("Deoxyribonucleic acid" is not a sufficient answer)*

12. In addition to the main tenant you listed as an answer to question #7 above, the **Cell Theory also states that all new cells are derived from preexisting cells**. Read your text and review Figure 1.6. **How does each daughter cell**, that formed from the physical division of a parent cell, **get its own DNA?**

13. a. What is a **chromosome**?

    b. Memorize the following: **Genes contain the instructions cells use to make RNA molecules and proteins.** Where are **genes** located?

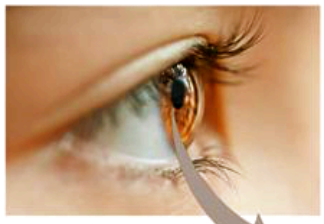
14. a. DNA is considered a polymer: a large biological molecule composed of many smaller, repeating subunits. The smaller molecules that are covalently bonded together to make a large polymer are called monomers. What term is used to refer to the **monomers of nucleic acids** (like DNA and as we will see later RNA)?

    b. Read and your text and review Figure 1.7. **How does the molecular structure of DNA allow it to store information** that later can be used for making necessary cellular molecules like proteins?

15. a. What does it mean when we say that **all forms of life on Earth use essentially the same genetic code** when carrying out gene expression?

    b. If all forms of life use the same genetic code, **how then do variations between different types of organisms come about**?

16. When a **gene for making a protein is expressed**, the cell accesses the **information stored or "encoded" in a gene** in the DNA, using this information to construct the necessary protein. In the image below, fill in the missing terms in the box on the right and, in the boxes on the left, describe what takes place during the three steps (**DNA Transcription, RNA Translation, and Protein Folding**) that must be completed in order to construct a protein, using the instructions encoded in a gene.



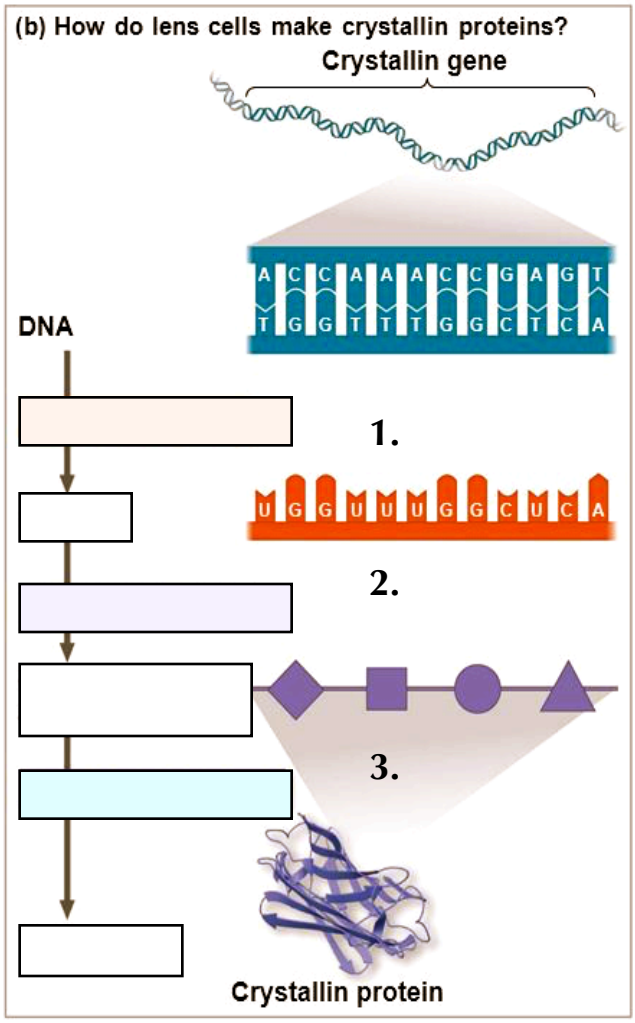
(a) Lens cells are tightly packed with transparent proteins called crystallin.

Lens cell

1.

2.

3.



17. As you see, proteins are made of one or more chains of amino acids. These amino acid chains are called **polypeptides**. What are the monomers of polypeptides (and, thus, proteins) called?

18. a. What does the term **genome** refer to?

b. What does the term **proteome** refer to?

19. **All work that a cell performs requires** _____ .

20. a. Which organisms are referred to as **producers**?

b. What **type of energy conversion** is taking place in producers during photosynthesis?

c. Give an example of a producer you would find in your own house/yard?

21. a. What are **consumers**? **Note:** Consumers cannot perform photosynthesis, but still need energy do perform work.

b. Give an example of a consumer you would find in your house/yard?

22. When energy is transferred from one location to another within a cell, some of the energy is lost to the surroundings in the form of _____. Because of this, we say that **ENERGY** _____ an ecosystem in one direction, usually entering originally as _____, passing from one organisms to another, and exiting along the way as _____.

In contract, **CHEMICALS (matter)**, which are made up physically of atoms, _____ _____ an ecosystem, where they are used and then recycled.

23. Which two categories of organisms are referred to as **decomposers**?

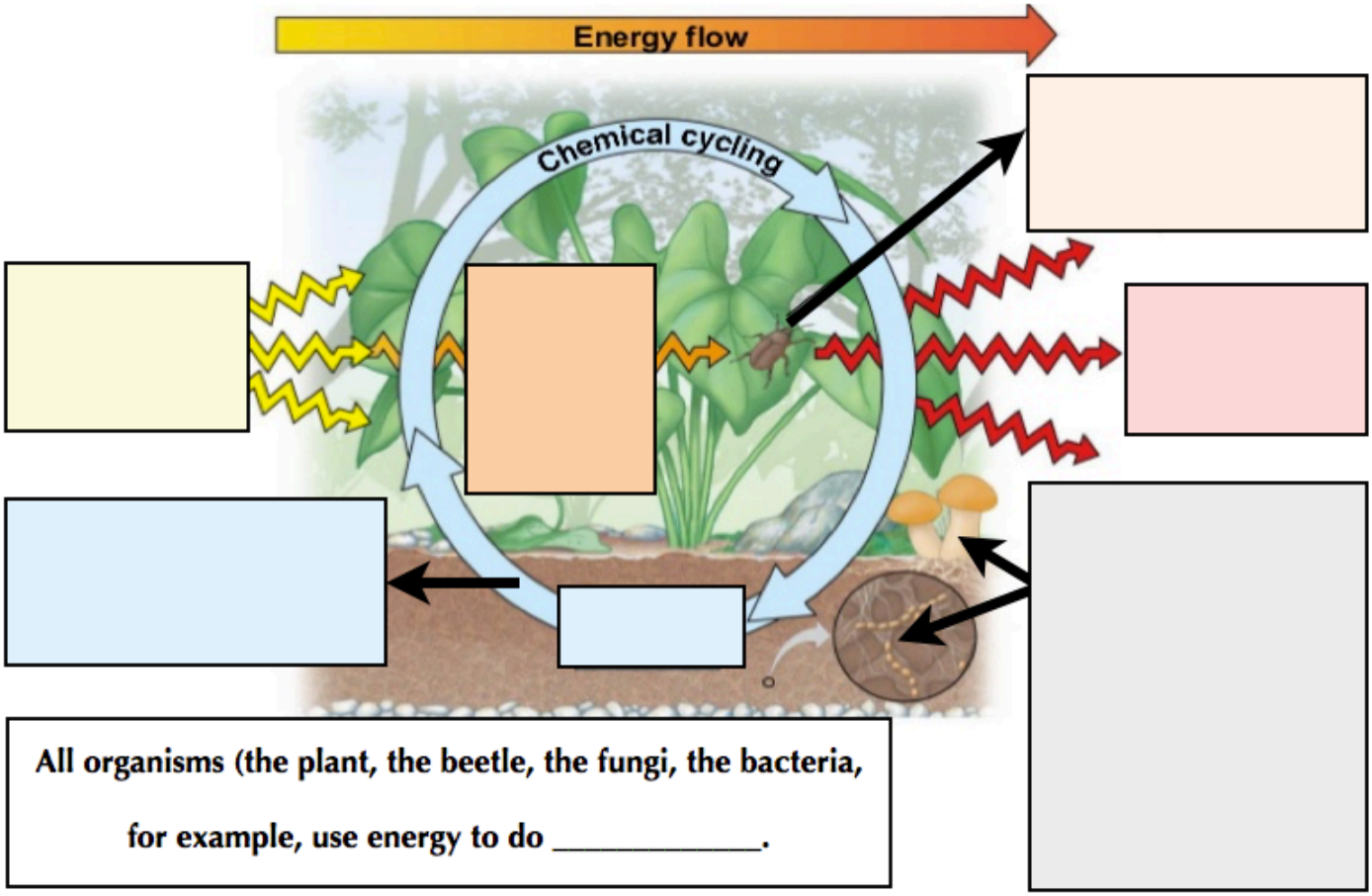
1. _____

2. _____

24. **Photosynthesis** is just one example in biology in which we can see the one-way flow of energy in an ecosystem and the recycling of matter within the ecosystem. It is an important example to understand well.

Plants convert the energy obtained from sunlight **(radiant energy)** into **chemical energy** (the energy stored in organic molecules like sugar). The chemical energy stored in sugars will be used by plants and other organisms that consume plants, as well as organisms that consume organisms that consume plants, to do **WORK**. As energy is processed while doing work, some of it eventually getting lost from the bodies of all organisms in the form of **HEAT**.
In the process of photosynthesis, plants also take in chemicals, and thus atoms, from their environment (like the air and the soil), using those atoms to build the molecules and cellular environments the plant needs to make its cells and make its cells perform all necessary cellular activities. These chemicals **CYCLE** between the plant and the physical environment, the atoms that make up the plant's chemicals, eventually being returned to the physical environment outside the plant when **decomposers** break down plant material, returning these atoms back to the air and soil!

Fill in the boxes in the figure below, which highlights the **energy flow and chemical cycling** in ecosystems.



25. What is **feedback regulation**?

26. a. What is **negative feedback**?

b. **In negative feedback, when an event happens, the event itself triggers certain activities that in turn stop more of that event from happening.** Describe how negative feedback works when a human body is trying to maintain a certain stable concentration of glucose, a major cellular fuel, in the blood.

c. To see if your description in 26.b. is accurately, review Figure 1.10 carefully. In the example you described above:

1. What was the response to insulin?

2. What was the **initial stimulus** that activates the bodily response, which will then reduce the stimulus?

*(Check your answers to 26.c. by going to the Ch.1 **Figure Questions** for **Figure 1.10** in Appendix A of your textbook)*

27. a. What is **positive feedback**?

b. **In positive feedback, when an event happens, the event itself triggers certain activities that in turn cause more of that event to happen.** Describe how blood clotting in response to injury is an example of positive feedback.

28. **Interactions** occur between ions and molecules inside a cell and an organism, but they also occur between organisms and the physical environment. Review Figure 1.11 to learn about some of the interactions happening in an ecosystem.

Human interactions with the environment affects our environment in several ways, one being that humans contribute to Global Warming, one aspect of Climate Change. How are **human interactions contributed to Global Warming**

29. a. What is **Climate Change**?

b. Besides Global Warming, what are two **other examples of ways in which Earth's climate is changing**?

1.

2.

c. What is a **consequence to organisms as their habitats change or deteriorate**?

d. Climate Change can even lead to extinction. What is **extinction**? _

30. Identify the theme or themes exemplified by:

a. The sharp quills of a porcupine.

b. The development of a multicellular organism from a single fertilized egg.

c. A hummingbird using sugar to power its flight.

(Check your answers to 30.a., b., and c. by going to the Ch.1 ***Concept Check Question #2*** *in Appendix A of your textbook)*