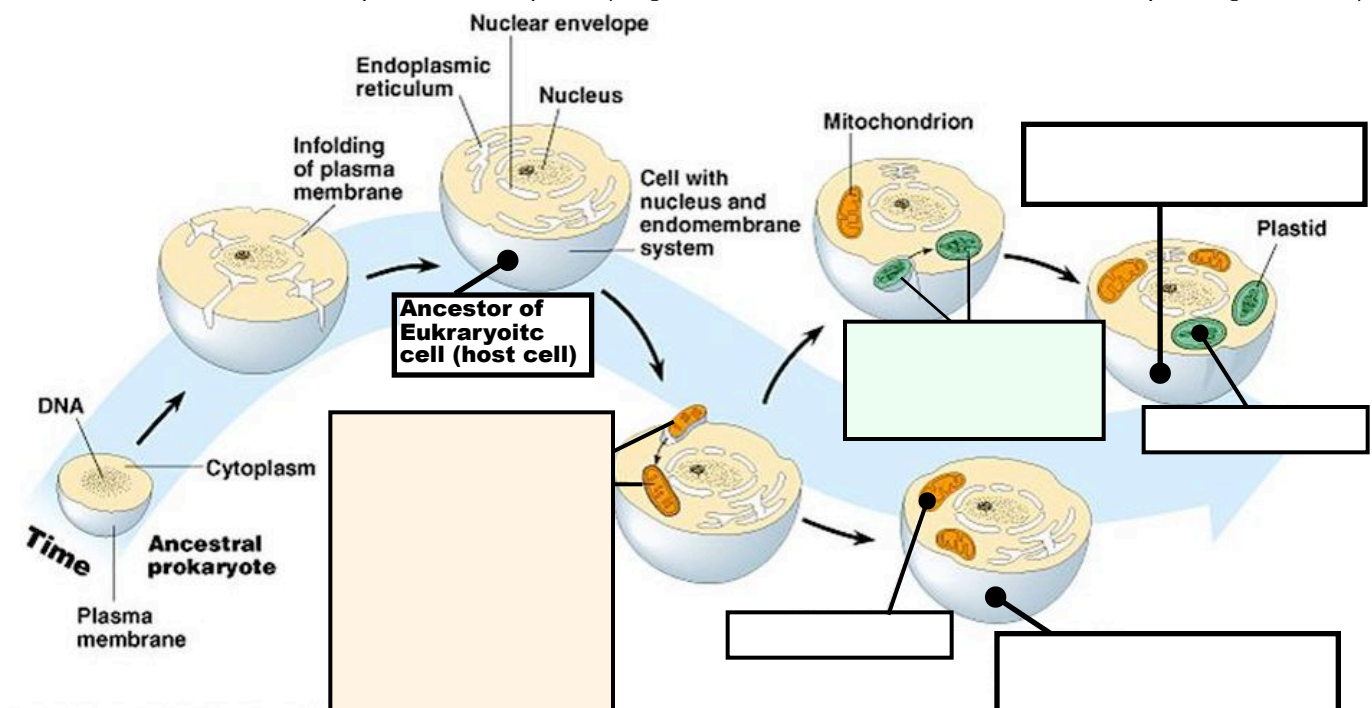


- **PHYSICALLY PRINT OUT** this PDF and **HANDWRITE** (with a black or blue pen) your answers directly on this PDF. Typed or digitally-written work is **not** accepted. Do **not** answer questions on separate paper.
- **Importantly, study guides are NOT GROUP PROJECTS!!!** You, and you alone, are to 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 perfecting 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, sideways, 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 start building your memory. Try to write answers out in your own words, when possible, and try to purposefully and accurately use all new terminology introduced.

- a. Almost all eukaryotic cells (*plants, fungi, animals, & protists*) contain mitochondria. Part of **Cellular Respiration takes place in the Mitochondria**. What is Cellular Respiration? **A must know!** (*Remember, besides being used as a monomer of RNA, the ribose-based nucleotide, **ATP**, is also used as an energy-carrying molecule in the cell*)
 - b. Almost all plant and some protist cells contain chloroplasts. **Photosynthesis takes place in the Chloroplasts in eukaryotes** (some prokaryotes being photosynthetic too, though lacking organelles specialized for the process). What is Photosynthesis? **A must know!**
- Eukaryotic cells evolved from early prokaryotic cells. **The endomembrane system is thought to have evolved by infolding of the plasma membrane** while the theory that explains **how mitochondria and chloroplasts evolved** in cells is called the **Endosymbiont Theory**. Study Figure 6.16. & fill in the illustration below, explaining this theory.



3. Several pieces of evidence support the theory that **mitochondria** were once independent, oxygen-using, non-photosynthetic **prokaryotes** before they were engulfed by an ancestral, non-oxygen-using, non-photosynthetic **prokaryotic** host cell, forming the **ancestors of modern, eukaryotic, oxygen-using, non-photosynthetic cells** (like those of fungi, animals, and non-photosynthetic protists such as an amoeba or paramecium).

Several pieces of evidence also support the theory that **chloroplasts** were once independent, photosynthetic **prokaryotes** before they were engulfed by early eukaryotic, oxygen-using, non-photosynthetic cells (like early non-photosynthetic eukaryotic protist cells), forming the **ancestors of modern eukaryotic, oxygen-using, photosynthetic cells** (such as plants and photosynthetic protist cells like algae).

Describe **three evidences to support this Theory of Endosymbiosis and Serial Endosymbiosis** as an explanation for how both non-photosynthesis and photosynthetic eukaryotes evolved?

I.

II.

III.

4. Based on what you have learned so far about how endosymbiotic events helped modern eukaryotic cells evolve, **do plants and photosynthetic protists have mitochondria**? Explain how you concluded your answer based on what you learned in question #2. *(Check your answer by going to the **Ch.6.5 Concept Check Question #2** answer in Appendix A)*
5. Which **types of cells are expected to have larger numbers of mitochondria**?
6. a. **Mitochondria and chloroplasts are NOT considered part of the endomembrane system**, although they are enclosed by membranes. Sketch a large mitochondrion here and label its **outer membrane, inner membrane, intermembrane space, cristae, matrix, mitochondrial circular DNA, and mitochondrial ribosomes**.

b. What takes place in the **mitochondrial matrix**?

c. What takes place using the **proteins embedded in the inner mitochondrial membrane**?

d. In what way is the **inner mitochondrial membrane being highly folded**, containing so many cristae, an example of **form fits function**? (*What can the mitochondria, and thus the entire cell, do better or more of with more inner membrane than with less?*)

7. Like mitochondria, chloroplasts are **NOT** considered part of the endomembrane system (*which consists of the nuclear envelope, endoplasmic reticulum, Golgi apparatus, transport vesicles, lysosomes, plasma membrane, and vacuoles*). Sketch a large chloroplast here and label its **outer membrane, inner membrane, intermembrane space, thylakoid, thylakoid space, stroma, ribosomes, chloroplast circular DNA, and grana**. Notice that the mitochondrion has two membrane compartments while the chloroplast has three compartments.

8. Given what you have learned about chloroplasts and mitochondria in this section, as well as what you should be regularly studying and committing to memory in the last section about the endomembrane system, why are **chloroplasts and mitochondria NOT classified as part of the endomembrane system of organelles** in the cell? (*Check your answer by going to the **Ch.6.5 Concept Check Question #3** answer in Appendix A*)

9. Chloroplasts are specialized for **photosynthesis**, containing the solar-energy-capturing pigment molecule, **chlorophyll**, along with other enzymes. They are the sites where **radiant energy is converted into chemical energy**. Chloroplasts are one type of **plastid**. What do these other types of plastid organelles do?

a. **Amyloplasts** =

b. **Chromoplasts** =

10. a. **Peroxisomes** are organelles bound by a single membrane. What chemistry happens inside the peroxisomes that has led them to be named what they are?

b. What happens to the toxic hydrogen peroxide (H_2O_2) that forms in peroxisomes? (P.S. the enzyme involved in this process is called **catalase**!)

c. What are three of the **functions of peroxisomes** (and specialized plant seed peroxisomes known as *glyoxysomes*)?

1.

2.

3.

11. Review what you have covered in Ch.6 Section 5 so far before continuing. Let's test what you know: describe two characteristics both mitochondria and chloroplasts have in common with regards to function and to membrane structure? (Check your answer by going to the **Ch.6.5 Concept Check Question #1** answer in Appendix A)

1.

2.

12. a. Both eukaryotic and prokaryotic cells have cytoskeletons. What is the **cytoskeleton**?

b. What are the **two main roles of the cytoskeleton** of cells?

1.

2.

c. What are three examples of **cell movement involving motor proteins that interact with cytoskeletal fibers**.

i.

ii.

iii.

13. Study Table 6.1. Then, describe the **three types of cytoskeletal filaments**.

Name of Fiber Type: _____

a. Three dimensional structure =

b. Diameter =

c. Protein composition =

d. Main functions in cell =

Name of Fiber Type: _____

- a. Three dimensional structure =
- b. Diameter =
- c. Protein composition =
- d. Main functions in cell =

Name of Fiber Type: _____

- a. Three dimensional structure =
- b. Diameter =
- c. Protein composition =
- d. Main functions in cell =

14. **Microtubules are made of tubulin** which is a dimer made up of two polypeptides. Let's review. Based on your understanding of protein structure (Ch.5), what **levels of protein folding does tubulin exhibit & why?** (*Review ch.5.4*)

15. Microtubules are said to have a **plus end**. Why is one end of a microtubule fiber referred to differently than the other?

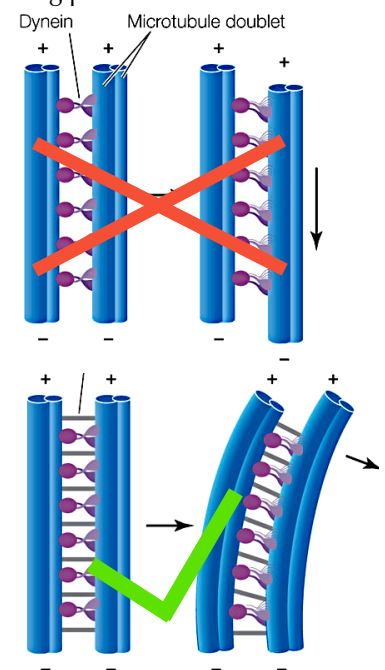
16. Eukaryotic cells have one or more centrosomes, often near the nucleus. What is the **role of a centrosome**?

17. **In AP Biology, you are expected to answer the EXACT question asked in a free response question.** If you are asked to **"Compare & Contrast"** two items, it means you are to tell **1. how they are alike - compare** and **2. tell how they are different - contrast**. Let's first contrast and then compare eukaryotic cilia and flagella.

★ **Comparing Cilia and Flagella**

- a. What **kind of structures** are flagella and cilia?

- b. What are motile cilia and flagella used for by cells that may have them when the **cells are not held in place**?
- c. What are motile cilia and flagella used for by cells that may have them when the **cells are held in one place in tissue**?
- d. **Some eukaryotic cilia are nonmotile** (they don't move). While some cells have numerous motile cilia and some cells have one or a few flagella, certain cells have only one nonmotile cilium (*singular*). What function does this nonmotile cilium have in eukaryotic cells? *(Note that by having this thin extension of the plasma membrane, the SA/V of the entire cell is increases slightly to form fits function here too).*
- e. Motile eukaryotic **cilia and flagella are both made of parallel-running microtubules covered by an extension of the plasma membrane**. How are they similar in the **arrangement of their microtubules**?
- f. **Dynein is a motor protein** involved in the movement of cilia and flagella. Explain **how the cilia and flagella move**? Be sure to explain the role of dynein, ATP, and flexible cross-linking proteins.



★ Contrasting Cilia and Flagella

- a. How do cilia and flagella **differ in the numbers of them found typically on cells** (that have them)?
- Cilia =
- Flagella =
- b. How do cilia and flagella **differ in their relative lengths**?
- Cilia =
- Flagella =

c. How do cilia and flagella **differ in their beating patterns?**

Cilia =

Flagella =

18. **Actin filaments (a.k.a. microfilaments) play a role in cell motility.** Let's look at some examples.

Myosin motor proteins **move actin microfilaments inside animal muscle cells** allowing muscle cells to contract. In plant cell, cytoplasm is moved in between parallel rows of actin filament causing **cytoplasmic streaming**, which helps move organelles within the cell or helps distribute nutrients, throughout the cell.

a. Actin fibers also help cells "crawl" in their environment. Explain how the single-celled **Amoeba** protist or vertebrate **macrophage** (a type of white blood cell of the immune system) **move** using actin filaments?

19. **Intermediate filaments are made of keratin proteins.** Unlike microtubules and microfilaments, which are found in all Eukaryotic cells, intermediate filaments are **found only in the Eukaryotic cells of vertebrates** (*animals that possess a backbone or spinal column, including mammals, birds, reptiles, amphibians, and fishes*). Intermediate filaments vary in diameter, but are bigger than microfilaments and smaller than microtubules. They are also **more permanent** fixtures of cells. What are **two main functions of intermediate filaments?**

1.

2.

20. Now that you understand the three types of fibers found in cells and their varied functions, imagine you are a physician with a patient who suffers from frequent lung infections and is sterile (unable to conceive a child). Upon further investigation, you note that his sperm is immobile. It turns out his condition is caused by a genetic problem (caused by a problem in DNA). Based only on what you learned from your reading, what would you say is the specific reason for his symptoms? (*Check your answer by going to the **Ch.6.6 Concept Check Question #2** answer in Appendix A*)