AP Biology **Name:** **P:**

Chapter 4 Reading Guide: A Tour of the Cell

How to use this reading guide: Look over the entire reading guide—read each question to prepare yourself for reading the chapter. Read the chapter carefully and thoroughly. Make sure to look at all of the figures and pictures and read their captions. Then…answer the questions posed below.

The Importance of Cells

1. Explain why the cell is considered the "fundamental unit of biology".

To study cells, biologists use microscopes and the tools of biochemistry

2. How does a light microscope work?

3. Two important parameters of microscopy are *magnification* and *resolution*. Define each term and explain what they have to do with being able to see cells.
    a. What is the resolving power of light microscopes? What limits this?

4. There are different techniques that can be used with the light microscope. For each technique listed below describe what it would allow you to see (what it would be used for).
    a. Brightfield (unstained)

    b. Brightfield (stained)

    c. Phase-contrast

5. There are two basic types of electron microscopes: scanning electron microscopes and transmission electron microscopes. Describe the difference between the two and explain for what each would be used.

6. Which type of microscope would you use to study …
    a. The changes in shape of a living white blood cell
    b. The details of surface texture of a hair
    c. The detailed structure of an organelle

7. Why would scientist want to fractionate cells? Briefly explain how this process works.

Eukaryotic cells have internal membrane that compartmentalize their functions

8. Compare prokaryotic cells with eukaryotic cells. List at least three similarities and at least 3 differences.
    a. What organisms have prokaryotic cells? Which ones have eukaryotic cells?

9. Eukaryotic cells are larger than prokaryotic cells, but they are still quite small. Why are cells generally so small? How is this related to surface area and volume? What sets the upper limit? What sets the lower limit?

10. The outer boundary of every cell is the plasma membrane. These membranes serve as the "outer limits"-a selective barrier. Draw a picture of a plasma membrane which shows how the phospholipids would be arranged. Use arrows to indicate where the membrane would be attracted to water and where it would repel water. What does water have to do with a cell?

11. Read over pages 72 and 73 – figure 4.7 – VERY WELL!!! Realize that cells are 5% of the AP Exam. Might I suggest flashcards?

12. After carefully reviewing Figure 4.7, briefly describe the structure and function of each of the following organelles: nucleus, mitochondrion, chloroplasts, central vacuole, endoplasmic reticulum, and Golgi apparatus.

The eukaryotic cell's genetic instructions are housed in the nucleus and carried out by the ribosomes

13. Describe the structure of the nuclear envelope, be sure to include lipid bilayers (how many?), pore complexes and the nuclear lamina (on which side is that?)

14. There are a number of things located inside the nucleus. List each one and explain what they do. (Did you remember to mention the nucleolus?)

15. Ribosomes are the structures which are the site for protein synthesis. In the cell there are two types of ribosomes: bound and free. Contrast the location and function of bound ribosomes with those of free ribosomes.

    a. Describe what the ribosomes composition of the following cells might look like:
        i. A cell in the pancreas which produces digestive enzymes.
        ii. A muscle cell that is breaking down sugars for use in cellular respiration.

The endomembrane system regulates protein traffic and performs metabolic functions in the cell

16. What tasks does the endomembrane system carry out in eukaryotic cells?

17. Which cellular structures make up the endomembrane system? How are the membranes of these structures in contact with each other?

18. Study figure 4.10. Of what is the Endoplasmic Reticulum made? What is the ER directly connected to in the endomembrane system?

19. There are two types of ER-rough and smooth. Contrast their structures and their functions. How can you tell them apart in an electron micrograph?

a. What types of cells would have extensive smooth ER? What types of cells would have extensive rough ER? How is this related to their function? (Remember the structure is ALWAYS related to function.)

b. Drug tolerance refers to a person's increased tolerance for larger and larger quantities of a drug (either elicit – such as alcohol, barbiturates, etc… or prescribed – such as antibiotics) before the "effect" is experienced. How is drug tolerance related to the smooth ER? (DOESN'T THE BODY JUST AMAZE YOU!?)

20. The rough ER is the "membrane maker". Explain how the rough ER contributes to the membranes of other organelles.

21. Study figure 4.11. Describe the structure of the Golgi apparatus.
    a. The Golgi apparatus is said to be "polar". What does this mean in relation to the membranes of the Golgi apparatus? How does this relate to both the receiving and shipping functions of the Golgi apparatus?

22. A vesicle budded off of the ER. Explain what happens to the vesicle and its contents as it reaches, moves through and then exits the Golgi apparatus. BE SPECIFIC!!!

23. In addition to receiving, shipping and modifying molecules, it also manufactures some molecules. What types of molecules are these?

24. What is the last step in the “shipping”? Why is this important?

25. What is contained in a lysosome? What is its function? Where is it made?

26. How does the phrase optimal pH relate to the lysosome? Why is this important?

27. What is phagocytosis? How are lysosomes involved? Give an example from your body!

28. What is autophagy?

29. What is a “storage disease”? What actually causes them?

30. There is a diversity of vacuoles inside cells. For each of the following describe what it does and in what types of organisms you would find it.
    a. Food vacuole

    b. contractile vacuole

    c. central vacuole

31. How is the central vacuole made? What role does the tonoplast play in the central vacuole?

32. How do vacuoles protect plants and help them grow?

Mitochondria and chloroplasts change energy from one form to another

33. Describe at least two common characteristics between mitochondria and chloroplasts.
    a. Why aren’t they considered part of the endomembrane system?

34. Describe the structure of a mitochondria. How many membranes? How many spaces? Why is the folding of the cristae important?

35. Chloroplasts belong to a category of organelles known as plastids. What other plastids are there and what are their functions?

36. What kinds of pigments do chloroplast contain? What type of cells contain chloroplasts? Name two types of cells that would not contain any chloroplasts.

37. There are three compartments in chloroplasts. Name them and describe how these compartments are formed and by what.

38. Why would peroxisomes often be found close to mitochondria?
    a. What is one enzyme that a peroxisome would contain?
    b. Why would liver cells contain a lot of peroxisomes?

The cytoskeleton is a network of fibers that organizes structures and activities in the cell

39. Define the cytoskeleton.
    a. Study table 4.1. Compare the structure, size, and shape of the 3 types of fibers that make up the cytoskeleton. BE DETAILED.

40. What is a motor protein? How does it aid whole cells in moving? How does it help organelles move?

41. Compare the structure of cilia and flagella. How does each function?
    a. How is a basal body involved in the structure?

    b. What is a dynein?

42. How do amoeba move?

43. What is cytoplasmic streaming?

Extracellular components and connections between cells help coordinate cellular activities

44. What are 4 functions of the cell wall?

45. Distinguish between the primary cell wall and the secondary cell wall.
    a. What is the middle lamella? Describe its structure and its function.

    b. What types of cells have secondary cell walls?

46. Animal cells don't have cell walls, instead they have a thick matrix. What are the main ingredients of the ECM?
    a. What is the function of the ECM?

47. Cells are organized into tissues where they are all packed in and in contact with lots of other cells. These cells interact and communicate by exchanging information through intracellular junctions. Complete the chart below about the intracellular junctions.

Type of Junction	What type of cells have them?	What is their function?
plasmodesmata		
tight junctions		
desmosomes		
gap junctions		