

Name: _____

AP Biology

Chapter 4 Active Reading Guide **A Tour of the Cell**

Section 1

1. The study of cells has been limited by their small size, and so they were not seen and described until 1665, when Robert Hooke first looked at dead cells from an oak tree. His contemporary, Anton van Leeuwenhoek, crafted lenses and with the improvements in optical aids, a new world was opened. *Magnification* and *resolving power* limit what can be seen. Explain the difference.
2. The development of electron microscopes has further opened our window on the cell and its organelles. What is considered a major disadvantage of electron microscopes?
3. Study the electron micrographs in your text. Describe the different types of images obtained from:
scanning electron microscopy (SEM):

transmission electron microscopy (TEM):
4. In *cell fractionation*, whole cells are broken up in a blender, and this slurry is centrifuged several times. Each time, smaller and smaller cell parts are isolated. This will isolate different organelles and allow study of their biochemical activities. Which organelles are the smallest ones isolated in this procedure?

Section 2

5. Which two domains consist of prokaryotic cells?
6. A major difference between prokaryotic and eukaryotic cells is the location of their DNA. Describe this difference.

7. Refer to Figure 4.4 and give the function or description of the following structures:

Structure	Function or Description
cell wall	
plasma membrane	
bacterial chromosome	
nucleoid	
cytoplasm	
flagella	

8. Why are cells so small? Explain the relationship of surface area to volume.

9. What are *microvilli*? How do these structures relate to the function of intestinal cells?

Section 3

10. Describe the nuclear envelope. How many layers is it? What connects the layers?

11. What is the *nuclear lamina*? *Nuclear matrix*?

12. Found within the nucleus are the *chromosomes*. They are made of *chromatin*. What are the two components of chromatin? When do the thin chromatin fibers condense to become distinct chromosomes?

13. When are the *nucleoli* visible? What are assembled here?
14. What is the function of *ribosomes*? What are their two components?
15. Ribosomes in any type of organism are all the same, but we distinguish between two types of ribosomes based on where they are found and the destination of the protein product made. Complete this chart to demonstrate this concept.

Type of Ribosome	Location	Product
Free ribosomes		
Bound ribosomes		

Section 4

16. List all the structures of the *endomembrane system*.
17. The *endoplasmic reticulum (ER)* makes up more than half the total membrane system in many eukaryotic cells. Explain the *lumen*, *transport vesicles*, and the difference between *smooth* and *rough ER*.
18. List and describe three major functions of the smooth ER.
19. Why does alcohol abuse increase tolerance to other drugs such as barbiturates?

20. The rough ER is studded with ribosomes. As proteins are synthesized, they are threaded into the lumen of the rough ER. Some of these proteins have carbohydrates attached to them in the ER to form *glycoproteins*. What does the ER then do with these secretory proteins?

21. Besides packaging secretory proteins into transport vesicles, what is another major function of the rough ER?

22. The transport vesicles formed from the rough ER fuse with the Golgi apparatus. Describe what happens to a transport vesicle and its contents when it arrives at the Golgi apparatus.

23. What is a *lysosome*? What do they contain? What is the pH range inside a lysosome?

24. One function of lysosomes is intracellular digestion of particles engulfed by *phagocytosis*. Describe this process of digestion. What human cells carry out phagocytosis?

25. A second function of lysosomes is to recycle cellular components in a process called *autophagy*. Describe this process.

26. What happens in Tay-Sachs disease? Explain the role of the lysosomes in Tay-Sachs.

27. There are many types of vacuoles. Briefly describe:
food vacuoles:

contractile vacuoles:

central vacuoles in plants (give at least three functions/materials stored here):

28. Explain how the elements of the endomembrane system function together to secrete a protein and to digest a cellular component.

Section 5

29. What is an endosymbiont?

30. What is the *endosymbiont theory*? Summarize three lines of evidence that support the model of endosymbiosis.

31. Mitochondria and chloroplasts are not considered part of the endomembrane system, although they are enclosed by membranes. Sketch a mitochondrion here and label its *outer membrane*, *inner membrane*, *inner membrane space*, *cristae*, *matrix*, and *ribosomes*.

32. Now sketch a chloroplast and label its *outer membrane*, *inner membrane*, *inner membrane space*, *thylakoids*, *granum*, and *stroma*. Notice that the mitochondrion has two membrane compartments, while the chloroplast has three compartments.

33. What is the function of the mitochondria?

34. What is the function of the chloroplasts?

35. Recall the relationship of structure to function. Why is the inner membrane of the mitochondria highly folded? What role do all the individual thylakoid membranes serve? (Notice that you will have the same answer for both questions.)

36. Explain the important role played by *peroxisomes*.

Section 6

37. What is the *cytoskeleton*?

38. What are the three roles of the cytoskeleton?

39. There are three main types of fibers that make up the cytoskeleton. Name them.
40. *Microtubules* are hollow rods made of a globular protein called tubulin. Each tubulin protein is a dimer made of two subunits. These are easily assembled and disassembled. What are four functions of microtubules?
41. Animal cells have a *centrosome* that contains a pair of *centrioles*. Plant cells do not have centrioles. What is another name for centrosomes? What is believed to be the role of centrioles?
42. Describe the organization of microtubules in a centriole. Make a sketch here that shows this arrangement in cross section.
43. *Cilia* and *flagella* are also composed of microtubules. The arrangement of microtubules is said to be “9 + 2.” Make a cross-sectional sketch of a cilium here.
44. *Compare* and *contrast* cilia and flagella.

45. How do motor proteins called *dyneins* cause movement of cilia? What is the role of ATP in this movement?
46. *Microfilaments* are solid, and they are built from a double chain of *actin*. Explain three examples of movements that involve microfilaments.
47. What are the motor proteins that move the microfilaments? _____
48. *Intermediate filaments* are bigger than microfilaments but smaller than microtubules. They are more permanent fixtures of cells. Give two functions of intermediate filaments.

Section 7

49. What are three functions of the *cell wall*?
50. What is the composition of the cell wall?
51. What is the relatively thin and flexible wall secreted first by a plant cell?
52. What is the *middle lamella*? Where is it found? What material is it made of?

53. Explain the deposition of a *secondary cell wall*.
54. Animal cells do not have cell walls, but they do have an extracellular matrix (ECM). Give the role of each.
55. What are the intercellular junctions between plant cells? What can pass through them?
56. Animals cells do not have *plasmodesmata*. Summarize the role of the three types of intercellular junctions seen in animal cells.