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NAME _____ LAB TIME/DATE _____

REVIEW SHEET
exercise
4

# The Cell: Anatomy and Division

## Anatomy of the Composite Cell

**1.** Define the following:

*organelle:* *Highly organized intracellular structure that performs a specific (metabolic) function(s) for the cell.*

*cell:* *The basic structural and functional unit of living organisms.*

**2.** Although cells have differences that reflect their specific functions in the body, what functions do they have in common?

*Ability to metabolize, to reproduce, to grow (increase in mass), to respond to a stimulus, and move.*

**3.** Identify the following cell parts:

| | | |
|---|---|---|
| *plasma membrane* | 1. | external boundary of cell; regulates flow of materials into and out of the cell; site of cell signaling |
| *lysosome* | 2. | contains digestive enzymes of many varieties; “suicide sac” of the cell |
| *mitochondria* | 3. | scattered throughout the cell; major site of ATP synthesis |
| *microvilli* | 4. | slender extensions of the plasma membrane that increase its surface area |
| *inclusions* | 5. | stored glycogen granules, crystals, pigments, and so on |
| *Golgi apparatus* | 6. | membranous system consisting of flattened sacs and vesicles; packages proteins for export |
| *nucleus* | 7. | control center of the cell; necessary for cell division and cell life |
| *centrioles* | 8. | two rod-shaped bodies near the nucleus; direct formation of the mitotic spindle |
| *nucleolus* | 9. | dense, darkly staining nuclear body; packaging site for ribosomes |
| *microfilaments* | 10. | contractile elements of the cytoskeleton |
| *rough ER* | 11. | membranous system; involved in intracellular transport of proteins and synthesis of membrane lipids |
| *ribosomes* | 12. | attached to membrane systems or scattered in the cytoplasm; synthesize proteins |
| *chromatin threads* | 13. | threadlike structures in the nucleus; contain genetic material (DNA) |
| *peroxisome* | 14. | site of free radical detoxification |

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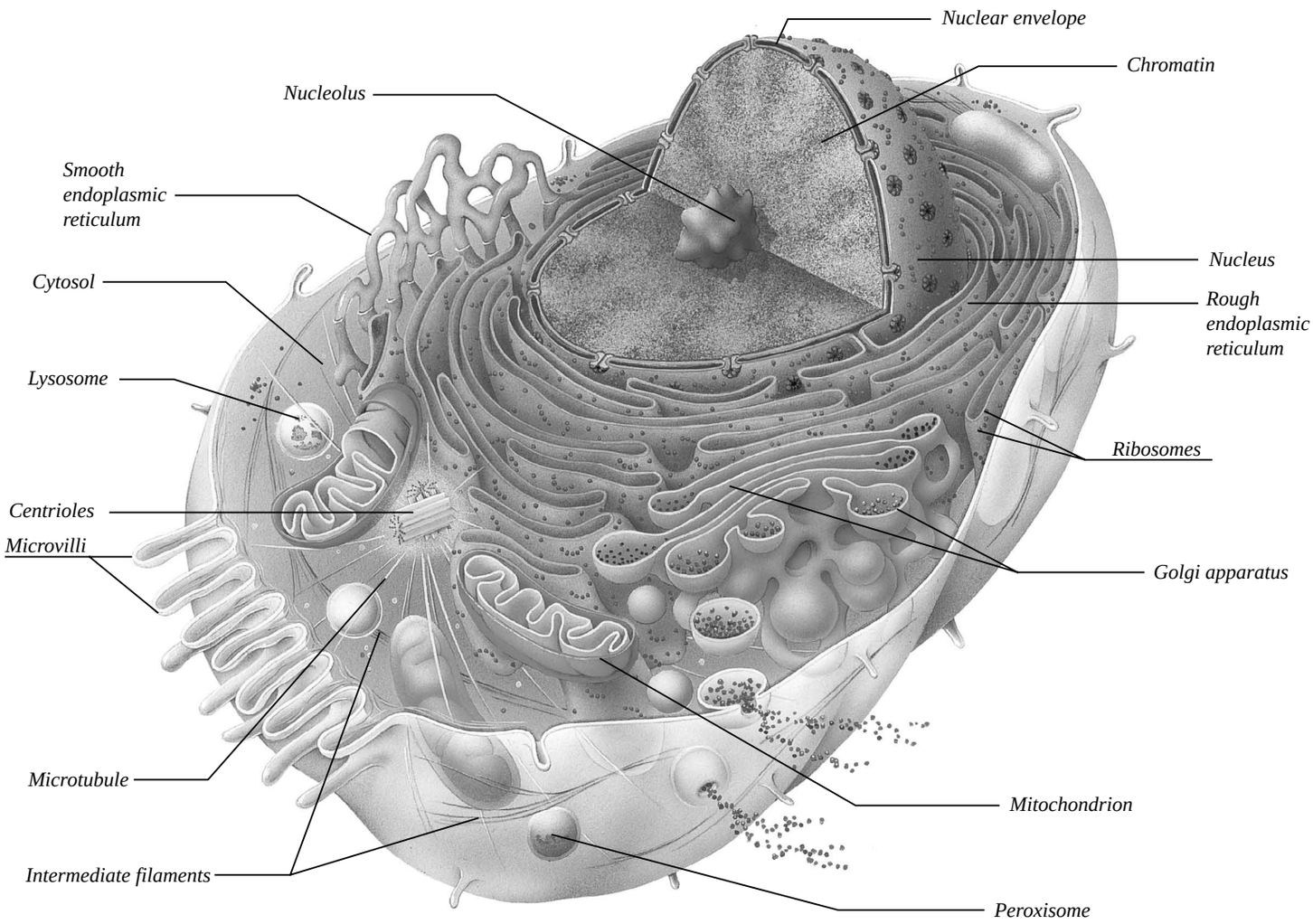
**4.** In the following diagram, label all parts provided with a leader line.




## Differences and Similarities in Cell Structure

**5.** For each of the following cell types, list (a) *one* important structural characteristic observed in the laboratory, and (b) the function that the structure complements or ensures.

squamous epithelium
a. *cells fit closely together like floor tiles*
b. *often a lining or covering tissue*

sperm
a. *has a tail or flagellum*
b. *allows sperm to propel itself to an egg*

smooth muscle
a. *cells have an elongated shape*
b. *a long axis allows a greater degree of shortening*

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red blood cells

a. *anucleate, disc-shaped*

b. *large surface area; more "room" to carry hemoglobin*

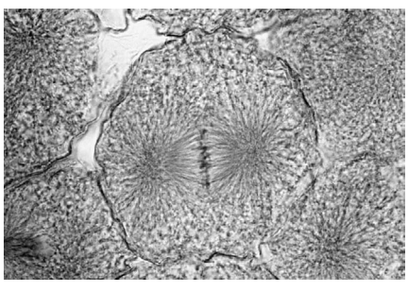
**6.** What is the significance of the red blood cell being anucleate (without a nucleus)? *Limited existence. The nucleus is gone; therefore, the cell cannot manufacture new proteins, etc.*

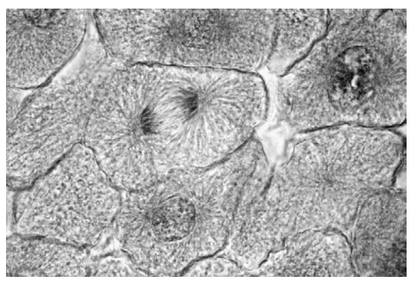
Did it ever have a nucleus? *Yes* If so, when? *Before its release into the bloodstream.*

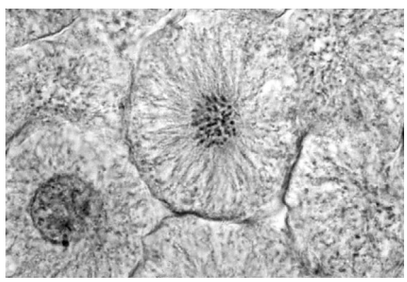
**7.** List the four cells observed from largest to smallest. *(student data)* _____ _____ _____

## Cell Division: Mitosis and Cytokinesis

**8.** Identify the three phases of mitosis in the following photomicrographs.







1. *metaphase* 2. *anaphase* 3. *prophase*

**9.** What is the importance of mitotic cell division? *Provides cells for body growth and for repair of damaged tissue.*

**10.** Draw the phases of mitosis for a cell with a diploid (2N) number of 4.

**11.** Complete or respond to the following statements:

Division of the __1__ is referred to as mitosis. Cytokinesis is division of the __2__. The major structural difference between chromatin and chromosomes is that the latter is __3__. Chromosomes attach to the spindle fibers by undivided structures called __4__. If a cell undergoes mitosis but not cytokinesis, the product is __5__. The structure that acts as a scaffolding for chromosomal attachment and movement is called the __6__. __7__ is the period of cell life when the cell is not involved in division. Two cell populations in the body that do not undergo cell division are __8__ and __9__. The implication of an inability of a cell population to divide is that when some of its members die, they are replaced by __10__.

1. *nucleus*
2. *cytoplasm*
3. *coiled/condensed*
4. *centromeres*
5. *a binucleate cell*
6. *spindle*
7. *interphase*
8. *neurons*
9. *skeletal and cardiac muscle cells*
10. *scar (connective) tissue*

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**12.** Using the key, categorize each of the events described below according to the phase in which it occurs.

Key: a. anaphase b. interphase c. metaphase d. prophase e. telophase

*d* 1. Chromatin coils and condenses, forming chromosomes.

*a* 2. The chromosomes are V-shaped.

*e* 3. The nuclear membrane re-forms.

*e* 4. Chromosomes stop moving toward the poles.

*c* 5. Chromosomes line up in the center of the cell.

*d* 6. The nuclear membrane fragments.

*d* 7. The mitotic spindle forms.

*b* 8. DNA synthesis occurs.

*b* 9. Centrioles replicate.

*d* 10. Chromosomes first appear to be duplex structures.

*d* 11. Chromosomal centromeres are attached to the kinetochore fibers.

*e* 12. Cleavage furrow forms.

*a*, *d* 13. The nuclear membrane(s) is absent.

**13.** What is the physical advantage of the chromatin coiling and condensing to form short chromosomes at the onset of mitosis?

*Short, compact bodies are mechanically much easier to manipulate during mitosis than are long chromatin threads.*