3 REVIEW SHEET

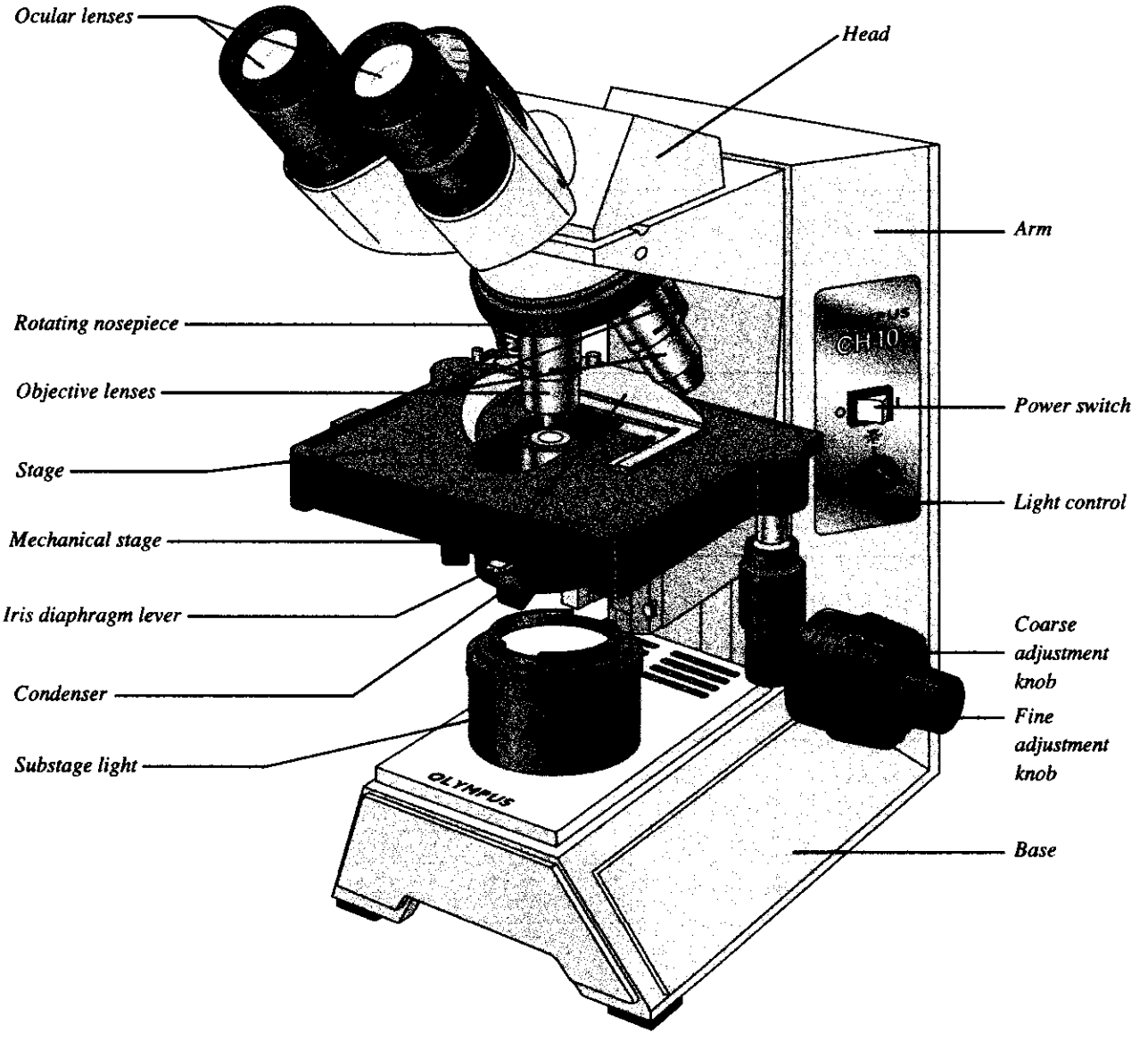
NAME Julie LYNCH

LAB TIME/DATE Tuesday 2:30-5:00 Pm Pm

The Microscope

Care and Structure of the Compound Microscope

1. Label all indicated parts of the microscope.



2. Explain the proper technique for transporting the microscope.

Carry with two hands—one supporting the base, the other holding the arm.

3. The following statements are true or false. If true, write *T* on the answer blank. If false, correct the statement by writing on the blank the proper word or phrase to replace the one that is underlined.

with grit-free lens paper 1. The microscope lens may be cleaned <u>with any soft tissue</u>.

low-power or scanning 2. The microscope should be stored with the <u>oil immersion</u> lens in position over the stage.

T 3. When beginning to focus, the <u>lowest power</u> lens should be used.

away from 4. When focusing, always focus <u>toward</u> the specimen.

T 5. A coverslip should always be used <u>with wet mounts and the high-power and oil lenses</u>.

4. Match the microscope structures given in column B with the statements in column A that identify or describe them.

Column A

i 1. platform on which the slide rests for viewing

d 2. used to increase the amount of light passing through the specimen

e 3. secure(s) the slide to the stage

b 4. delivers a concentrated beam of light to the specimen

c 5. used for precise focusing once initial focusing has been done

f 6. carries the objective lenses; rotates so that the different objective lenses can be brought into position over the specimen

Column B

a. coarse adjustment knob
b. condenser
c. fine adjustment knob
d. iris diaphragm
e. mechanical stage or spring clips
f. movable nosepiece
g. objective lenses
h. ocular
i. stage

5. Define the following terms.

virtual image: *An image that is erect and appears to be where it is not.*

resolution: *Ability to discriminate two closely situated objects as separate.*

Viewing Objects Through the Microscope

6. Complete, or respond to, the following statements:

working distance 1. The distance from the bottom of the objective lens in use to the specimen is called the _____.

to the left 2. Assume there is an object on the left side of the field that you want to bring to the center (that is, toward the apparent right). In what direction would you move your slide?

field 3. The area of the specimen seen when looking through the microscope is the _____.

95 4. If a microscope has a 10× ocular and the total magnification at a particular time is 950×, the objective lens in use at that time is _____×.

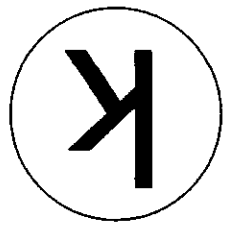
increases contrast 5. Why should the light be dimmed when looking at living (nearly transparent) cells?

parfocal 6. If, after focusing in low power, only the fine adjustment need be used to focus the specimen at the higher powers, the microscope is said to be _____.

0.75 7. If, when using a 10× ocular and a 15× objective, the field size is 1.5 mm, the approximate field size with a 30× objective is _____ mm.

0.4 8. If the size of the high-power field is 1.2 mm, an object that occupies approximately a third of that field has an estimated diameter of _____ mm.

7. You have been asked to prepare a slide with the letter *k* on it (as shown below). In the circle below, draw the *k* as seen in the low-power field.



8. Figure out the magnification of fields 1 and 3, and the field size of 2. (*Hint:* Use your ruler.) Note that the numbers for the field sizes below are too large to represent the typical compound microscope lens system, but the relationships depicted are accurate.

1. 5 mm

50 ×

2. *2.5* mm

100×

3. 0.5 mm

500 ×

9. Say you are observing an object in the low-power field. When you switch to high power, it is no longer in your field of view.

Why might this occur? *The field decreases proportionately as magnification increases. Therefore, unless the object is centered at low power, it might be outside the higher-power field.*

What should be done initially to prevent this from happening? *Center the object that you wish to view.*

10. Do the following factors increase or decrease as one moves to higher magnifications with the microscope?

resolution: *increases (to a point)*

amount of light needed: *increases*

working distance: *decreases*

depth of field: *decreases*

11. A student has the high-dry lens in position and appears to be intently observing the specimen. The instructor, noting a working distance of about 1 cm, knows the student isn't actually seeing the specimen.

How so? *The working distance for the h.p. lens is closer to 1 mm.*

12. Describe the proper procedure for preparing a wet mount.

Place the specimen on the slide with a medicine dropper or place a drop of water or saline on the slide. Mix specimen into drop using a toothpick. If staining, add a drop of stain and mix with a toothpick. Hold a coverslip with forceps so that the coverslip touches one side of the specimen drop, and then ***slowly*** *and* ***carefully*** *lower the angled coverslip onto the specimen.*

13. Indicate the probable cause of the following situations arising during use of a microscope.

a. Only half of the field is illuminated: *The lens is not correctly rotated into place.*

b. Field does not change as mechanical stage is moved: *The slide is not correctly positioned in the clamp on the mechanical stage and does not move when the mechanical stage moves.*

4 REVIEW SHEET

NAME Julie LYNCH

LAB TIME/DATE Tuesday 2:30-5:00 Pm Pm

The Cell: Anatomy and Division

Anatomy of the Composite Cell

1. Define the following terms:

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.*

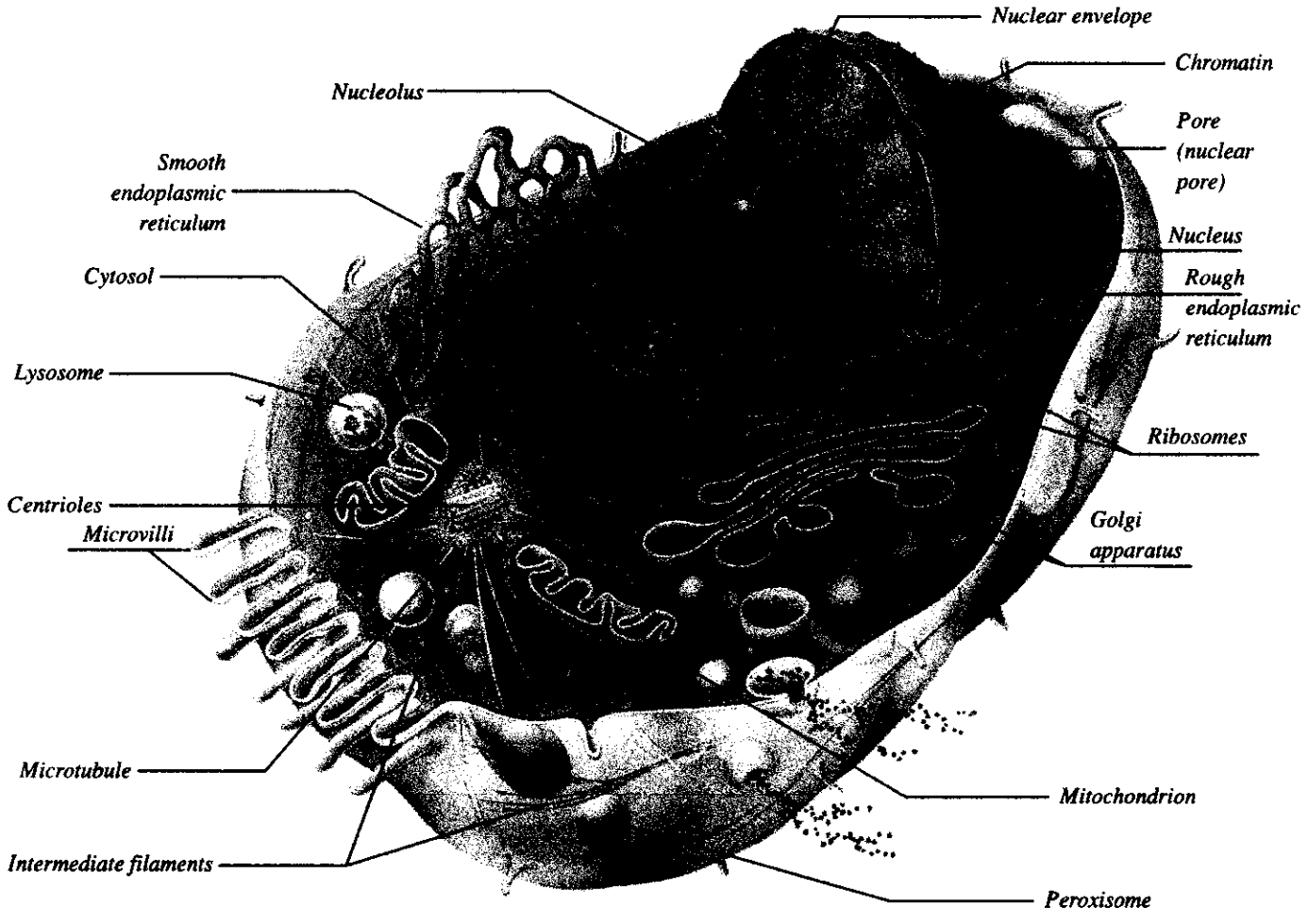
2. Although cells have differences that reflect their specific functions in the body, what functions do they have in common?

Ability to metabolize, to reproduce, to grow (increase in mass), to respond to a stimulus, and to 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 or endoplasmic reticulum	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 or chromatin threads	13. threadlike structures in the nucleus; contain genetic material (DNA)
peroxisome	14. site of free radical detoxification

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*

red blood cells a. *anucleate (or no nucleus); disc shaped*

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

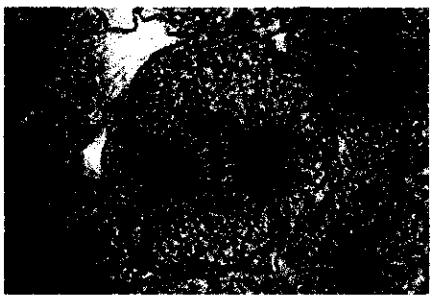
6. What is the significance of the red blood cell being anucleate (without a nucleus)? *Limited life span. Does not reproduce. The nucleus is gone; therefore, the cell cannot manufacture new proteins, etc.*

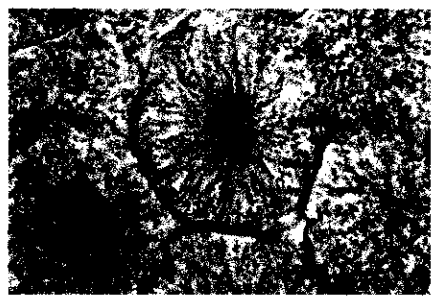
Did it ever have a nucleus? *Yes* If so, when? *Before its release into the bloodstream.*

7. Of the four cells observed microscopically (squamous epithelial cells, red blood cells, smooth muscle cells, and sperm) which has the smallest diameter? *sperm* Which is longest? *smooth muscle or sperm (variable)*

Cell Division: Mitosis and Cytokinesis

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





a. *metaphase* b. *anaphase* c. *prophase*

9. What is the importance of mitotic cell division? *Provides cells for body growth and for repair of damaged tissue or provides additional cells with the same genetic makeup.*

10. Draw the phases of mitosis for a cell that contains four chromosomes as its diploid or $2n$ number. (Refer to Figure 4.4.)

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 are _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 routinely undergo cell division are _8_ and _9_.

1. *nucleus*
2. *cytoplasm*
3. *coiled/condensed/shortened*
4. *centromeres*
5. *a binucleate cell or multinucleated cell*
6. *spindle*
7. *interphase*
8. *neurons*
9. *skeletal and cardiac muscle cells*

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 envelope 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 envelope 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 (or a, c, and d) 11. Chromosomal centromeres are attached to the kinetochore fibers.

_e_ 12. Cleavage furrow forms.

_a_ and _c (possibly d)_ 13. The nuclear envelope(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, thin chromatin threads.