

Name: \_\_\_\_\_

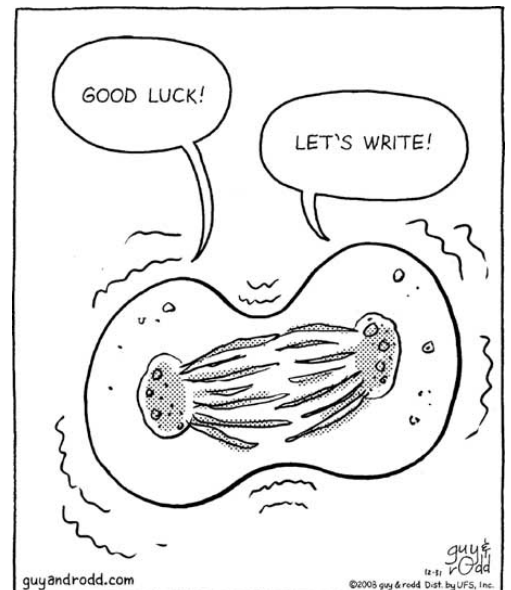
# Mitosis and Meiosis Calendar

## Unit 5; Chapter 9 and 10

Date	Classwork	Homework (Due the next Day)
11/21	Complete Diagnostic Test Wound healing Mitosis Sequencing Worksheet Begin Mitosis PowerPoint	Read/Questions 9.1
11/22	Candy and Surface Area to Volume ratio Mitosis PowerPoint	Read/Questions 9.2
11/25	Finish PowerPoint	Read/Questions 9.3 Read and Prelab Observing Mitosis Lab
11/26	Complete Observing Mitosis -Onion Root Tip Lab	Review Mitosis Questions
11/27 (Half day)	Finish Observing Mitosis Lab	Finish Lab Cell Cycle Concept Map
12/2	Cell Cycle Concept Map Worksheet: Normal vs. Cancer Cell Mitosis (with graph) Examining the Risk Of Cancer Activity	Finish Cancer Activities
12/3	Review Cancer Activities Begin Ch. 9 Review (pages 31-33)	Finish Ch. 9 Review (pages 31-33)
12/4	Go Over Ch. 9 Review Begin Meiosis PowerPoints	Reading/Questions 10.1
12/5	Finish Meiosis Notes Start Meiosis Concept Mapping (pages 34-35)	Review Notes Work on pages 34-35
12/6	Meiosis Internet Activity If time, Complete Meiosis Flow Chart	Complete Internet Activity and Meiosis Flow Chart Complete Study Guide for Monday for EC
12/9	Finish Flow Chart Study Guide due for extra credit Review For Test	Study for Test
12/10	Test Packets Due	

**Packet Grade:**

Grade	Out of	Earned
Chapter Reading and Questions	Graded when Due	
Diagnostic Test and Mitosis Sequencing	Graded when Due	
PowerPoint Notes	20	
Cell Cycle Concept Map	Graded when Due	
Observing Mitosis Lab	30	
Cancer Activity	20	
Normal vs Cancer Cell Wkst	20	
Meiosis Flow Chart and Study Guide	10	
Total		



## Chapter Questions

### Chapter 9.1 Cellular Growth

Before you read

1. Explain...:
2. Explain...:
3. State:
4. What stage is of interphase is DNA copied?
5. Name...:

### 9.2 Mitosis and Cytokinesis

Before you Read

1. Name...:
2. Draw the picture ...:
3. Identify...:
4. Describe...:
5. Identify...:
6. Name...:
7. Identify...:

### 9.3 Cell Cycle Regulation

Before you Read

1. Name...:
2. Define cancer.
3. Identify...:
4. Identify...:
5. Describe ...:

### 10.1 Meiosis

Before you Read

1. Calculate...:
2. Draw the pair of homologous chromosomes.
3. Identify...:
6. Label the chromosome number (n or 2n)
  - a. Prophase I
  - b. Metaphase I
  - c. Anaphase I
  - d. Telophase I
7. Label...:
8. Compare; Draw the table and fill in the blanks?
9. Draw the haploid daughter cell
10. Compare ...:
4. What part of the chromosome was swapped...:
5. Identify...:

## Diagnostic Test: Cellular Reproduction

Before reading Chapter 9, predict answers to questions about the chapter content based on what you already know. Circle the letter of the correct answer, and then explain your reasoning.

1. Carlos is studying human skin cells under a microscope during science class. He asks his teacher why cells are small. Which response does his teacher give him?
  - a. A large cell rapidly becomes dangerous
  - b. Cells divide too rapidly to grow much larger in size.
  - c. Larger cells could not efficiently transport nutrients.
  - d. Small cells place fewer energy demands on an organism.

**Explain:**

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2. Scott learns that his aunt has a form of cancer. Scott's science teacher explains to Scott what cancer is. Which is part of the teacher's explanation?
  - a. A cancer patient can pass the disease to other people.
  - b. A pathogen, such as a virus, infects a cell with cancer.
  - c. Cancer is caused when body cells divide out of control.
  - d. Some cancer cells perform normal function in the body.

**Explain:**

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3. Keshia is watching a news broadcast story that features the controversy over stem cell research. She does not know what stem cells are, and she looks up the term in the dictionary. What definition does she find?

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# Steps of Wound Healing

Everyone has fallen and skinned their knee at one time or other. What process does the human body go through when this happens?

▲ Step 1

▲ Step 2

▲ Step 3

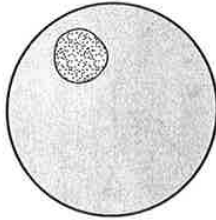
▲ Step 4

▲ Step 5

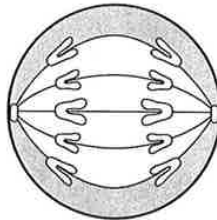
▲ Step 6

# Mitosis Sequencing

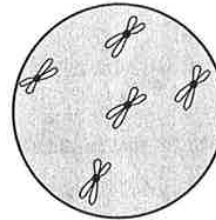
Label the following pictures in order. (1 to 15)



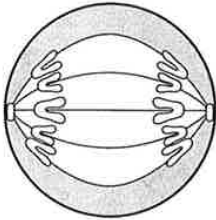
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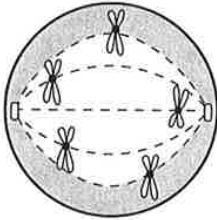
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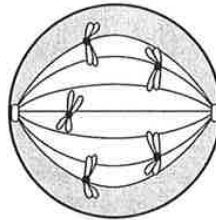
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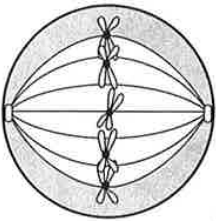
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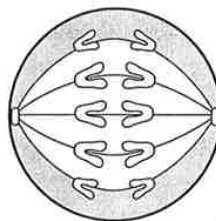
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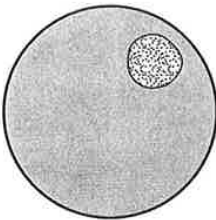
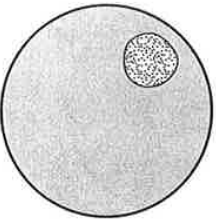
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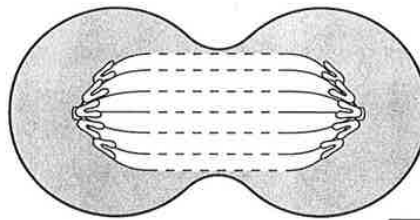
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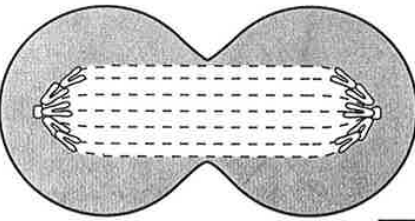
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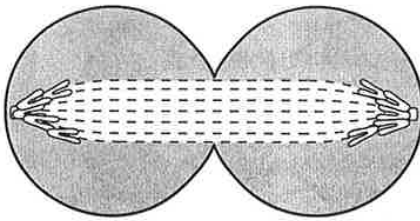
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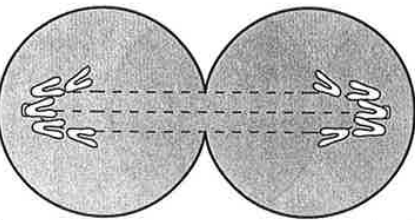
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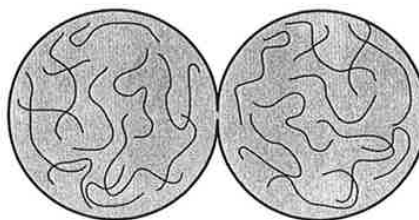
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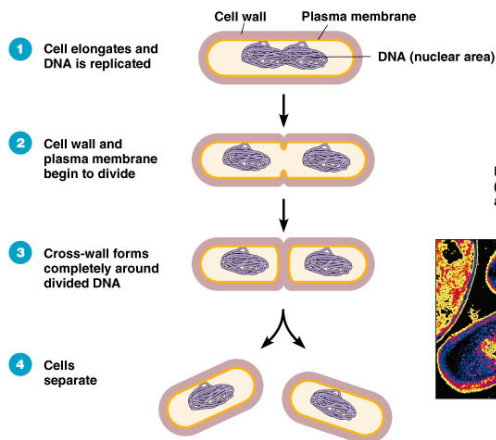
# PowerPoint Notes

## Cell Growth and Reproduction Binary Fission, Mitosis and Meiosis

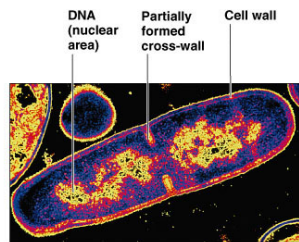
How does the cell grow and divide?

Prokaryotes: \_\_\_\_\_

- Remember, prokaryotes are \_\_\_\_\_ organisms
- 3 stages to binary fission:
  - • Cell grows to be 2x original size
  - Cell wall forms and cells begins to \_\_\_\_\_
  - Two identical haploid cells result
- Same genetic information = \_\_\_\_\_



(a) A diagram of the sequence of cell division.



(b) A thin section of a cell of *Bacillus licheniformis* starting to divide.

## Mitosis vs. Meiosis

- \_\_\_\_\_ – new cells having genetic information identical to that of the original cell
  - Occurs in:
    - **Reproduction of unicellular organisms**
    - **Addition of cells to tissue/organ in multicellular organisms**
- \_\_\_\_\_ – results in genetic variation
  - More details later!

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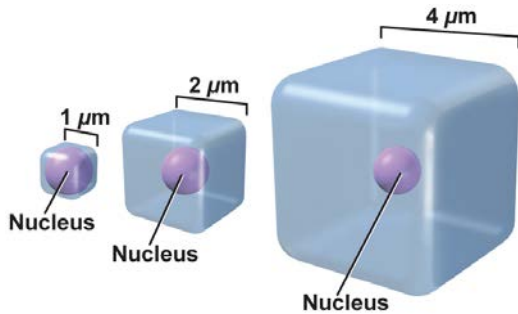
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Draw the candy cross sections here:

Mini

Original

Before we get to Mitosis...  
Surface area to Volume Ratio



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Question:

A cell is 2mm x 2mm x 2mm  
What is its surface area?  
What is its volume?

• **Surface area:**

• **Volume**

\_\_\_\_\_

\_\_\_\_\_

**Surface area :Volume Ratio**

\_\_\_\_\_

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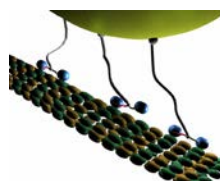
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What happens to the ratio of  
SA:V as the cell gets larger?

- **Having a large surface area to volume ratio allows materials to** \_\_\_\_\_
  - Cells don't get poisoned by their own waste
  - Motor proteins don't have to pull substances as far



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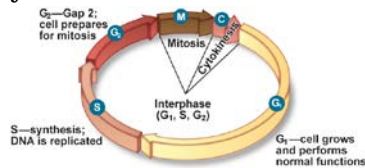
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## The Cell Cycle

- What happens to a cell when it reaches its size limit?
  - It can stop growing
  - It can divide
- 3 Main steps to the Cell Cycle




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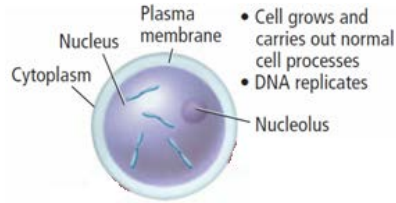
## The Cell Cycle Overview

Stage	Description	# of Cells
Interphase		
Mitosis		
Cytokinesis		

# Interphase

- Longest Phase
- 3 Stages

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# Interphase - Details

- G1
  - Performs normal functions
  -
- S
  - DNA can be packaged in two ways:
    - Chromatin- unwound, loosely packed
      - Think of Ponytail
    - Chromosome- wound, tightly packed
      - Think of Braid
- G2
  -

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# Mitosis

- Why do cell need to reproduce?
  - 
  -
- Two identical copies of DNA split to form two identical cells
  - Both daughter cells are completely \_\_\_\_\_
  - They have the same DNA
- Several Phases
  - Prophase
  - Metaphase
  - Anaphase
  - Telophase
- Remember: \_\_\_\_\_

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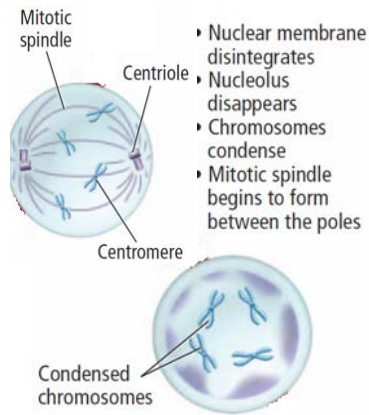
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## Mitosis Prophase

- 1st phase
- Nuclear membrane \_\_\_\_\_
- Nucleolus disappears
- \_\_\_\_\_ condenses to form chromosomes
- Mitotic spindle forms between poles




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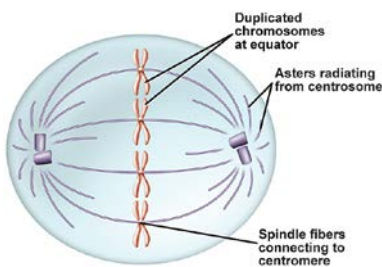
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## Mitosis: Metaphase

- 2nd phase
- Chromosomes easily seen under light microscope
  - \_\_\_\_\_ made
- Chromosomes attach to mitotic spindle and align along the \_\_\_\_\_ of the cell
  - Protein fibers from spindle come from cell cytoskeleton
    - Then return to cytoskeleton function




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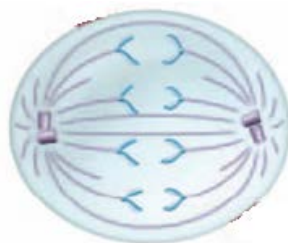
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## Mitosis: Anaphase

- 3rd phase
- \_\_\_\_\_ shorten separating chromatids of each chromosome
  - Move to opposite poles
  - When chromatids separate, they are considered to be individual chromosomes



Microtubules shorten, moving chromosomes to opposite poles

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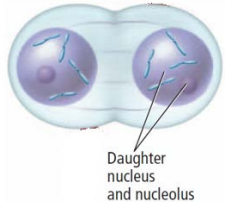
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## Mitosis: Telophase

- 4th phase
- Chromosomes reach the poles
- Nuclear envelope \_\_\_\_\_
- Nucleolus \_\_\_\_\_
- Chromosomes unwind to become chromatin



- Chromosomes reach poles of cell
- Nuclear envelope re-forms
- Nucleolus reappears
- Chromosomes decondense

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## Cytokinesis

Cytokinesis- division of the cytoplasm

### Animal Cells

- No \_\_\_\_\_
- Microtubules constrict and \_\_\_\_\_

### Plant Cells

- Has a cells wall
- A \_\_\_\_\_ forms between the two daughter nuclei
- Cell walls form on the sides of the plate

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## Result of Cell Cycle - Two New Cells

- In both plants and animals, offspring (daughter) cells:
  - Are the \_\_\_\_\_ size
  - Have \_\_\_\_\_ copy of original cell's chromosomes
    - Ie. in humans – have 46 to start; after mitosis each new cell has 46
  - Have ½ of the cell's cytoplasm and organelles

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## Cell Check Points

- \_\_\_\_\_ – quality control mechanisms
  - End of G1- DNA Damage check
  - Many others
- If there is a \_\_\_\_\_ the cell cycle stops and the cell goes through \_\_\_\_\_

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## But what is Apoptosis?

- \_\_\_\_\_ cell death
  - Occurs in many embryonic cells
    - You don't have a tail, or webbed fingers and toes... you once did
  - Occurs in cells that are \_\_\_\_\_ beyond repair or can become cancerous



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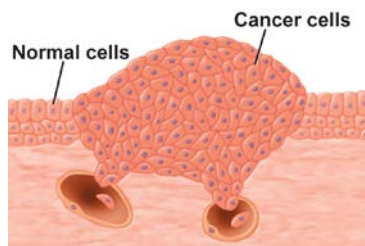
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## Cancer

- Cancer is \_\_\_\_\_ and division of cells
- Cancer cells can kill an organism by crowding out normal cells resulting in the loss of tissue function
- Cancer cells \_\_\_\_\_ other cells for nutrients



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## Causes of Cancer

- Cancer is caused by \_\_\_\_\_
  - Environmental Factors
  - Carcinogens- substances know to cause cancer
- - Older people's cells have divided for a longer period of time
  - more chances of mutation
- - Inheriting a mutated gene from a parent
    - p53 gene

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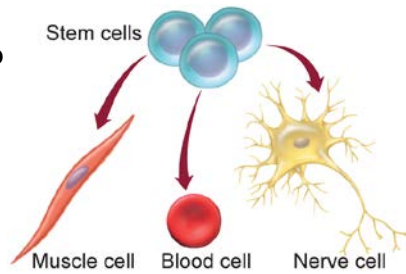
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## Stem Cells

- \_\_\_\_\_  
\_\_\_\_\_ that can develop into specialized cells under the right conditions



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## Types of Stem Cells

### Embryonic Stem Cells

- After fertilization – resulting mass of cells divides repeatedly until there are about 100-150 cells
- Cells have \_\_\_\_\_ become specialized
  - Can become \_\_\_\_\_ cell in body

### Adult Stem Cells

- Found in various tissues in body (bone marrow/other tissues)
- May be used to \_\_\_\_\_ the same kind of tissue
- \_\_\_\_\_ controversial because adult stem cells obtained with consent of donor

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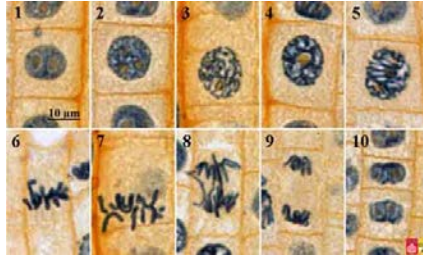
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# Allium Slides

- 1 – interphase
- 2 - interphase / beginning prophase
- 3 - early prophase
- 4 - mid prophase
- 5 - late prophase
- 6 – metaphase
- 7 - early anaphase
- 8 – anaphase
- 9 - early telophase
- 10 - telophase /cytokinesis



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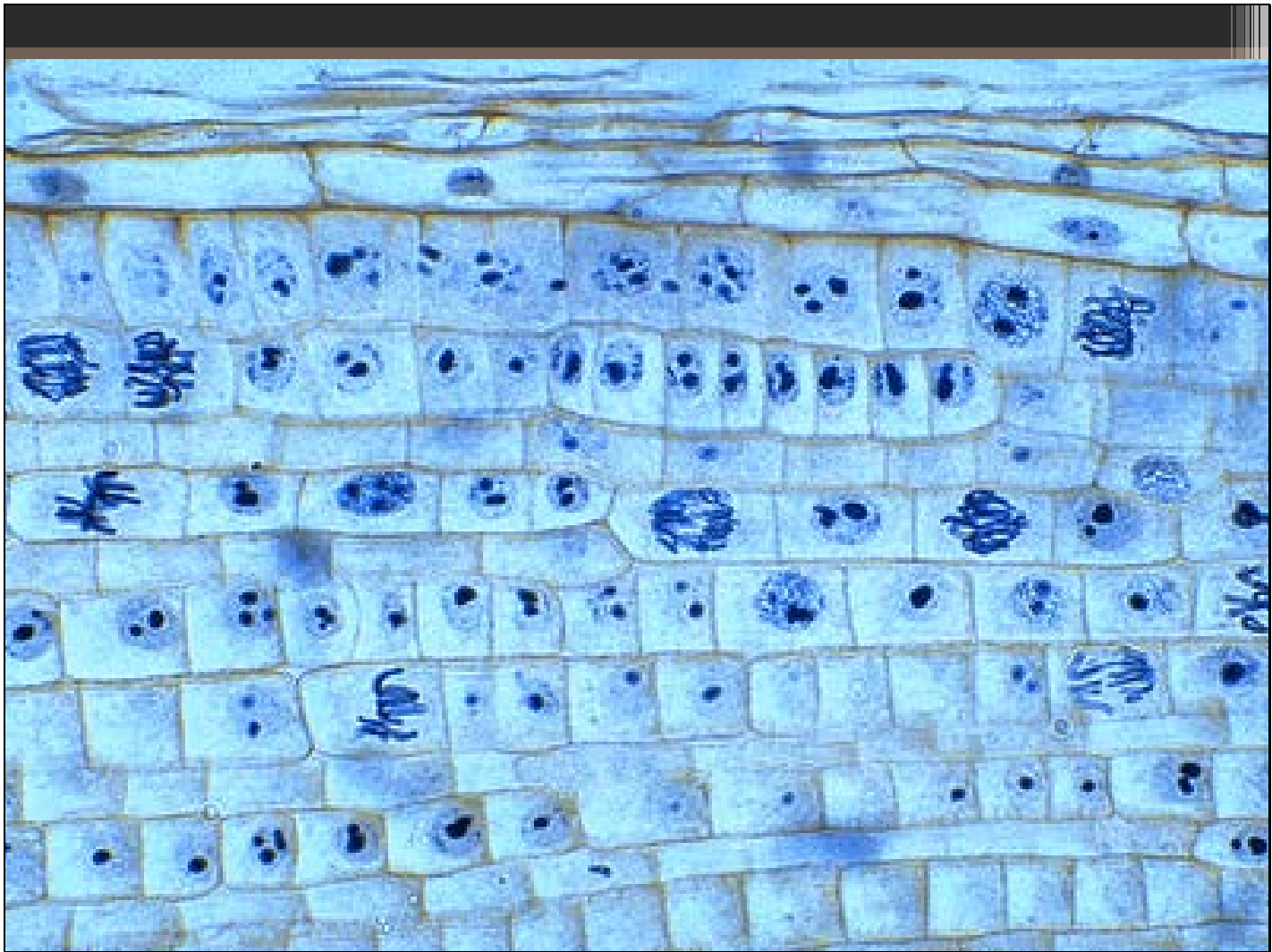
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# Meiosis

Why can't a sexual organism produce offspring through mitosis?

Hint- think chromosome number...

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# Meiosis

- **Chromosome and Chromosome Number**
  - Human body cells have 46 chromosomes
    - 
    -
  - Each Parent contributes \_\_\_\_\_ chromosomes
  - \_\_\_\_\_ chromosomes 1 of 2 paired chromosomes, one from each parent
  - You have 2 \_\_\_\_\_ for each trait

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# Meiosis

- **Chromosome and Chromosome Number**
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  - 
  - Carry genes that control the same inherited traits
  - NOTE: to count chromosomes, count centromeres



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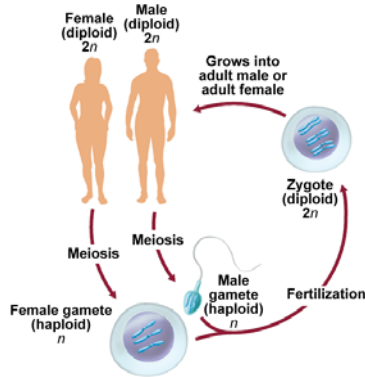
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# Meiosis

- The sexual life cycle in animals involves meiosis
- Produces \_\_\_\_\_
- When gametes combine in \_\_\_\_\_, the number of chromosomes is restored




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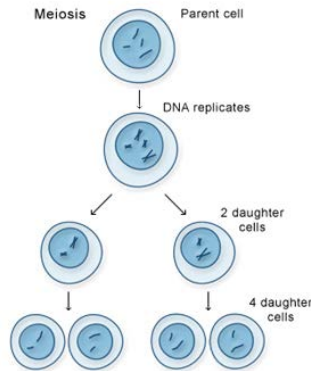
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# Meiosis - Stages

- Reduces chromosome number by \_\_\_\_\_ through separation of homologues
- Two cell divisions
  - 
  -




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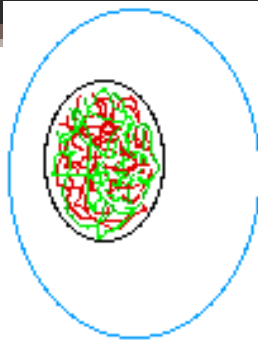
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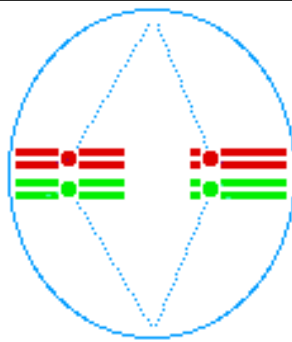
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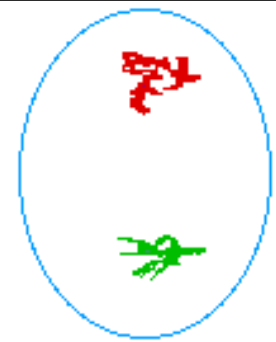
**Prophase I**



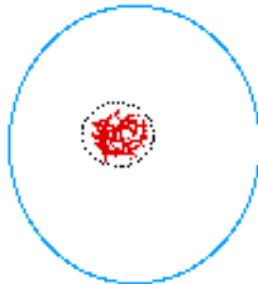
**Metaphase I**



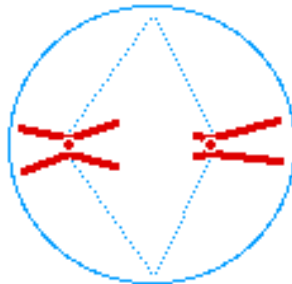
**Anaphase I**



**Telophase I**



**Prophase II**



**Metaphase II**



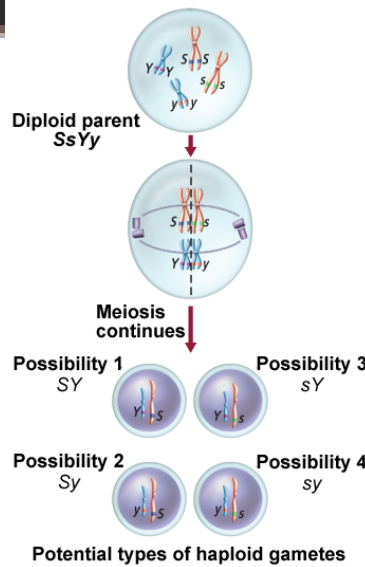
**Anaphase II**



**Telophase II**

# Meiosis

- Consist of 2 Divisions
- Produces \_\_\_\_\_ haploid cells that are \_\_\_\_\_ identical
- Results in \_\_\_\_\_ variation




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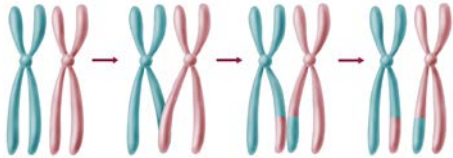
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## Crossing Over

- Takes Place in \_\_\_\_\_ of Meiosis I
- Crossing over produces \_\_\_\_\_ of genetic information
- Crossing over- chromosomal segments are exchanged between a pair of \_\_\_\_\_



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## Mitosis vs. Meiosis

<b>Mitosis</b>	<b>Meiosis</b>

# Types of Reproduction

## Sexual

- \_\_\_\_\_ genes multiply faster of time
- Genetically \_\_\_\_\_ from its parents

## Asexual

- The organism inherits \_\_\_\_\_ of its chromosomes from a single parent
- The new individual is genetically \_\_\_\_\_ to its parent

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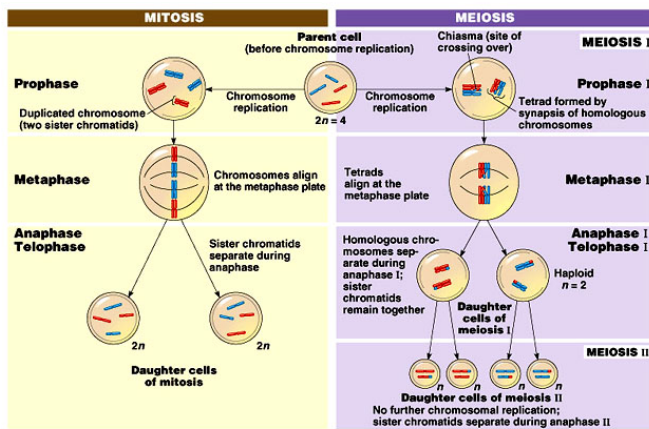


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# A Visual Comparison




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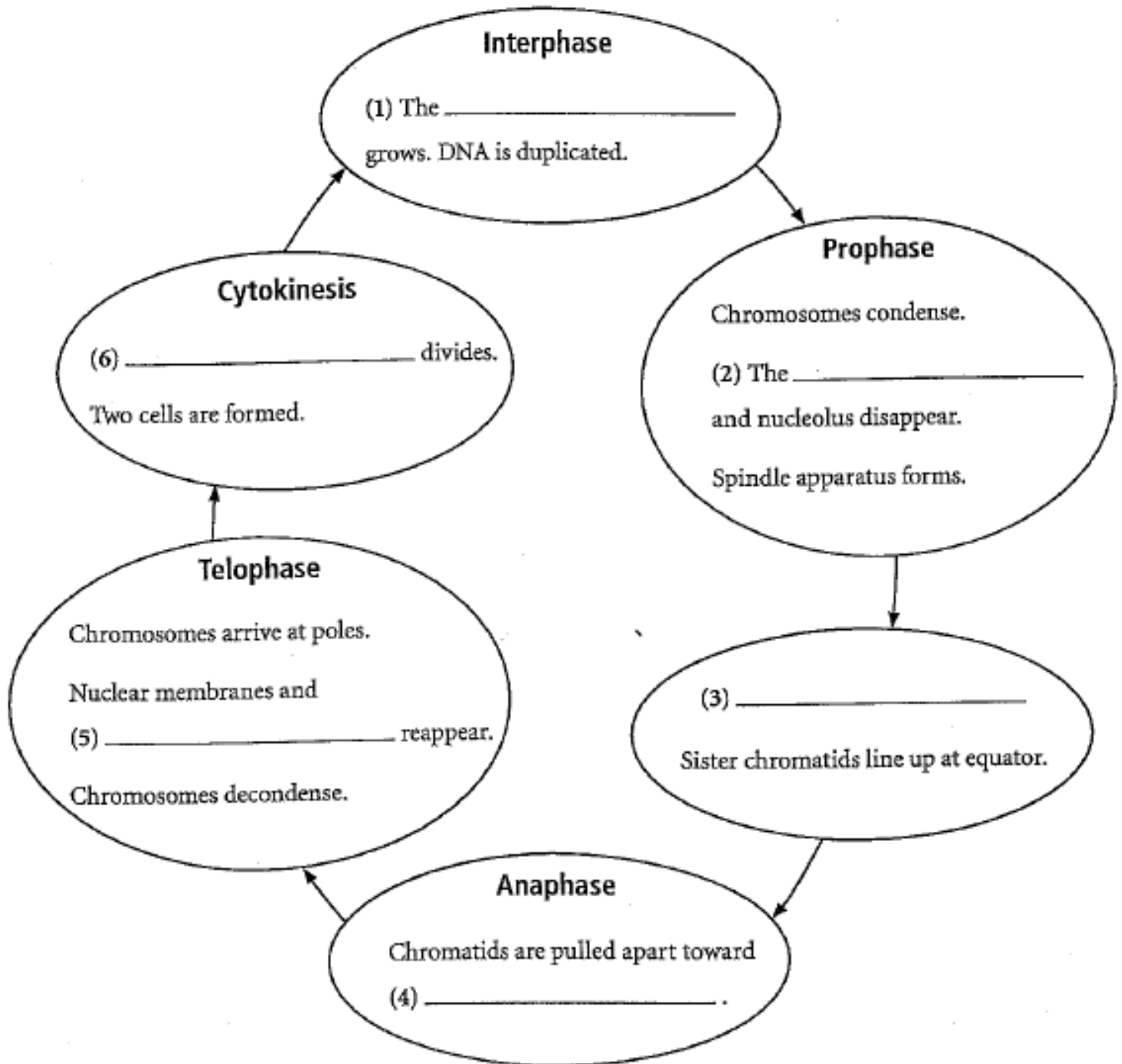


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## Concept Mapping

# The Cell Cycle

Complete the cycle map about the cell cycle. These terms may be used more than once: cell, cytoplasm, metaphase, nuclear membrane, nucleoli, poles.

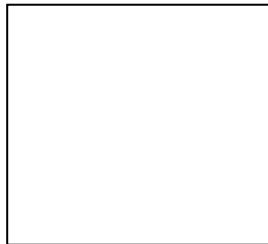


# Lab: Observing Mitosis

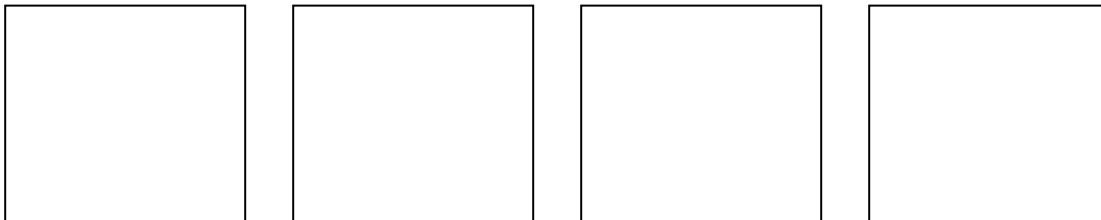
## INTRODUCTION:

All cells undergo a process of growth and division called the **cell cycle**. The cell cycle consists of three major stages: Draw each stage **in an animal cell**.

1. **Interphase**, in which the cell grows and, at the end, the cell's DNA replicates. The majority of the cell's life is spent in interphase.



2. **Mitosis**, during which the replicated genetic material separates into two separate nuclei. Mitosis is further divided into four stages: **prophase**, **metaphase**, **anaphase**, and **telophase**. Two identical nuclei result from mitosis.



3. **Cytokinesis**, the last stage of cell division, is the division of the cell cytoplasm between the two newly formed cells. The cell cycle results in the formation of two genetically identical daughter cells from the division of a parent cell.

In this lab you will be observing plant cells (onion) in the various stages of mitosis, and make time calculations based on the data you collect.



**MATERIALS:**

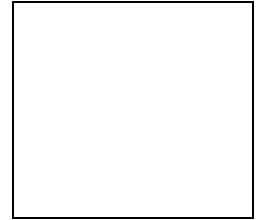
- Microscope
- Prepared slides of a longitudinal section of Allium (onion) root tip.

**PROCEDURE:**

1. Review the visible characteristics of each stage of mitosis. Draw what you see for the onion root tip (plant cell) next to the appropriate phases below. Be sure to color and label the parts. Make a list of these characteristics to aid you in your observations.

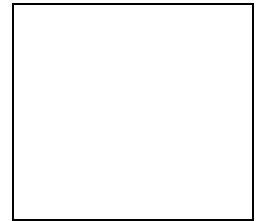
- **Interphase**

In this stage, the chromosomes are relaxed and we call them chromatin. If you cannot distinguish any chromosomes in the nucleus then the cell is in interphase. DNA is replicated.



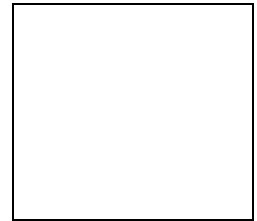
- **Prophase**

The chromatin appears as a mass of thick threads. These threads are the replicated chromosomes, which have coiled up and shortened. Each chromosome now consists of a pair of **chromatids**, which are duplicates of the original chromosome. The chromatids are held together by a centromere. In late prophase, the nuclear membrane cannot be seen, but the chromosomes are distinctly visible as pairs of chromatids in the central region of the cell.



- **Metaphase**

In metaphase, the chromosomes line up across the equator of the cell. A mass of fibers called a **spindle** has formed between the poles of the cell and the mass of chromosomes. A spindle fiber from each pole attaches to each chromosome (pair of chromatids).



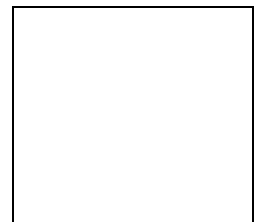
- **Anaphase**

The centromere of each chromatid pair divides during anaphase. The chromatids move along the spindle fibers toward the poles of the cell. Each chromatid in the pair of chromatids moves toward opposite poles of the cell.



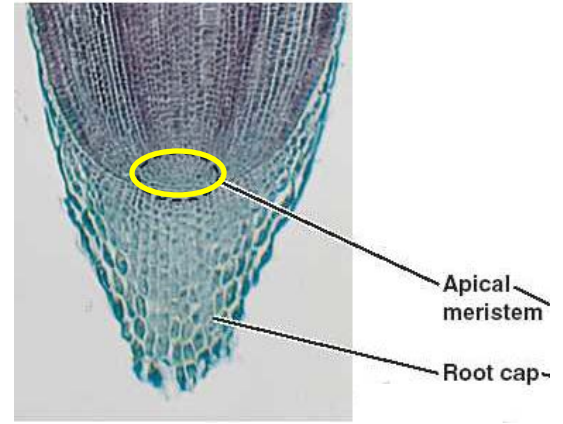
- **Telophase**

In this stage, the chromatids (now called chromosomes) have formed distinctive clumps at each pole. A new nuclear membrane forms around each clump of chromosomes, which uncoil and return to the chromatin network seen in interphase. The new cell walls grow to form the two new, identical daughter cells.



2. Using middle power on your microscope, focus on the apical meristem of the onion root tip. This is the area just behind the root cap.

3. Switch to high power. Examine the apical meristem carefully and choose a sample of at least 250 cells to classify. Make sure each lab partner gets a chance to count cells. Look for a group of cells that seems to have been actively dividing. The cells will appear to be in rows, so it should be easy to keep track of them.



4. For each of the cells in your sample, identify the stage of mitosis, and place a mark in the **Tally Marks** column of your **DATA TABLE**, next to the appropriate stage. Count the tallies for each stage, and fill in the **Count** column of the **DATA TABLE**.

5. Calculate the percentage of cells found in each stage, and enter the figures under **Percent** in the **DATA TABLE**.

$$\frac{\text{NUMBER IN A STAGE}}{\text{TOTAL SAMPLE NUMBER}} \times 100$$

6. Mitosis in *Allium* normally takes about 80 minutes at room temperature. You can calculate the amount of time each stage takes. This is because the percentage of the cells in a particular stage of mitosis is equal to the percentage of 80 minutes that the stage takes. From this information, calculate the amount of time each stage of mitosis takes. Record your answers in the **DATA TABLE**.

**For example:** If there were 8 percent of the cells in metaphase, then 8 percent of 80 minutes would be 6.4 minutes. This would be the amount of time that metaphase takes.

$$80 \text{ minutes} \times .08 = 6.4 \text{ minutes}$$

7. Look up the correct time values of the four stages of mitosis for *Allium* (onion), and compare to your experimental results.

<b>DATA TABLE: Observations of <i>Allium</i> (onion) root tip.</b>				
<b>Stage</b>	<b>Tally Marks</b>	<b>Count</b>	<b>Percent %</b>	<b>Time (minutes)</b>
<i>Interphase</i>				
<i>Prophase</i>				
<i>Metaphase</i>				
<i>Anaphase</i>				
<i>Telophase</i>				

**Total number of cells in sample:** \_\_\_\_\_





## Additional Slides to Check Out:

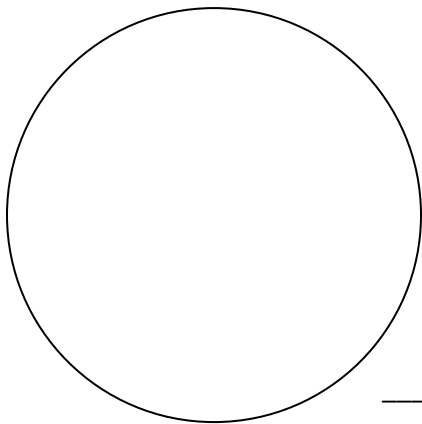
Look at and draw the hydra and the fish blastocyst slides.

### Background:

*Hydra* are a class of simple, predatory, fresh-water animals possessing radial symmetry. They can be found in most unpolluted fresh-water ponds, lakes, and streams in the temperate and tropical regions and can be found by gently sweeping a collecting net through weedy areas. They are small (usually only a few millimeters long), multicellular organisms. *Hydra* reproduce asexually through a process called budding. During budding, buds are produced in the body wall, which grow to be miniature adults and simply break away when they are mature.

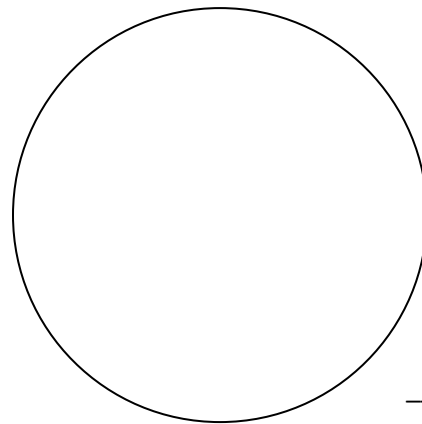
The fish blastodisc (sect) slide shows animal mitosis taking place. These cells are early embryonic cells, where cells are moving through the cell cycle quickly.

**Please draw the hydra and the fish blastodisc slides.** For the hydra, be sure to draw budding taking place and for the fish blastodisc slide, label as many stages of mitosis as possible. Be sure to color your drawings.



\_\_\_\_\_ x

**Hydra**



\_\_\_\_\_ x

**Fish Cells**

# Normal vs. Cancer Cell Mitosis

**Objective:** Use graphing techniques to determine if there is a difference in the phases of mitosis between normal and cancer cells.

**Introduction:** Scientists are trying to understand cancer, a common killer among humans. They know cancer occurs more often in older generations but can occur in babies and children. Specifically, scientists wish to understand how cancer, which is abnormal cell growth, is linked to the cell cycle. The results of their experiment are presented in Figure 1 under the **Data and Results** section.

**Data and Results:** Time spent for normal and cancerous chicken stomach lining cells to undergo interphase and various stages of mitosis.

Phase	Normal Cells – Time Spent (min)	Cancerous Cells - Time Spent (min)
Interphase	540	75
Prophase	60	75
Metaphase	10	15
Anaphase	3	2
Telophase	12	1

**Figure 1.**

**Task:** From the data provided, make a graph which compares the two types of cells on a sheet of graph paper. Use the most appropriate graph type for this activity: bar graph, pie chart or line graph. Use all appropriate labels. You must include why you chose the type of graph you decided on in the space below:

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**When you are finished graphing, use the graph to answer the following questions. You may use reliable sources on the internet for additional help.**

1. In normal cells, which phase of mitosis (PMAT) requires the longest time for complete and what changes occur in the cell during this phase?

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2. In normal cells, which phase requires the shortest time for completion and what changes occur in the cell during this phase?

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3. Add up the total amount of time normal and cancer cells spend in each category below:

Type of Cell	Amount Spent in Interphase	Amount Spent in Mitosis	Total Amount of Time in Cell Cycle
Normal cells			
Cancer cells			

4. Using the data provided and the graph you made, compare and contrast cancerous cells and normal cells in interphase and each phase of mitosis, as well as in the total amount of time spend in the cell cycle.

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5. How is a cancer cell an example of abnormal mitosis?

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6. What are some of the medical techniques used to treat cancer (abnormal mitosis)?

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## Examining and Reducing the Risks of Cancer

Most of your body cells undergo mitosis and make more cells to replace cells that are damaged, diseased, or worn out. Some cells divide rapidly to replace dead cells. Millions of cells in your body die every day. For example, blood cells and skin cells constantly need to be replaced. A red blood cell might live for only a few months. New blood cells are made by stem cells in your bone marrow. Dead cells in the outer layer of your skin are replaced every few days by new cells made in a lower layer of the skin. Sometimes, cells continue to make more cells even when they are not needed, or cells might not die when they should. This uncontrolled, unregulated growth and division of cells is cancer. Cancer cells can crowd out and kill healthy cells. Cancer can affect different parts of the body, such as the stomach, lungs, and brain. Cancer is the second leading cause of death in the United States. In this activity, you will examine some cancer risks and lifestyle choices that can help reduce those risks.

### Part A: Examining the Risks

Cancer is caused by changes in parts of a cell that control the growth and death of the cell. Certain substances, called carcinogens, can cause these changes. Scientists do research and collect evidence to determine what substances are carcinogens. Some research takes place in laboratories. Other research involves studying the lifestyles of people with different types of cancer. Scientists have identified some substances as known carcinogens; other substances have been identified as possible carcinogens. The table lists the cancer risks of three known carcinogens.

Carcinogen	Risks of Cancer
Tobacco	<ul style="list-style-type: none"> <li>Tobacco use accounts for at least 30 percent of all cancer deaths.</li> <li>Smoking causes nearly 87 percent of all lung cancers. Smokeless tobacco, pipe tobacco, cigars, and secondhand smoke also cause cancer.</li> <li>Tobacco use causes lung, stomach, mouth, nasal cavity, esophagus, pancreas, kidney, and bladder cancer, as well as other cancers.</li> </ul>
Alcohol	<ul style="list-style-type: none"> <li>Alcohol is the primary cause of liver cancer, but it can also cause mouth cancer, esophagus cancer, and other cancers.</li> <li>The cancer risk increases as the amount of alcohol consumed increases.</li> </ul>
Ultraviolet radiation	<ul style="list-style-type: none"> <li>UV radiation is the primary cause of skin cancer.</li> <li>People are at greater risk if they live in an area with year-round bright sunlight. For example, the risk of skin cancer is twice as high in Arizona as it is in Minnesota.</li> <li>People are at greater risk if they use tanning booths or sunlamps.</li> </ul>

### Analyze and Conclude

Respond to each question.

- Explain** Why are tobacco, alcohol, and ultraviolet radiation listed as carcinogens in the table?

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- Identify** What carcinogens in the table are known to cause cancer of the esophagus, the tube leading from the mouth to the stomach?

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- Apply** Why are people who work outdoors at greater risk of getting skin cancer?

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## Part B: Reducing the Risks

Carcinogens can cause changes in cells that result in cancer, but that does not mean everyone exposed to carcinogens will get cancer. Some people inherit a tendency to develop cancer. For people who have a family history of cancer, regular checkups are important. Many kinds of cancer can be treated successfully if they are detected early enough. Avoiding or reducing exposure to known carcinogens reduces a person's risk of getting cancer. In addition, numerous studies indicate that a healthy diet and exercise might protect people from cancer. Steps that people can take to reduce their risks of developing cancer are listed below.

### Lifestyle Choices for Reducing Cancer Risks

- Avoid smoking and secondhand smoke.
- Avoid alcohol.
- Avoid exposure to UV radiation, use sunscreen, and wear protective clothing.
- Choose foods with less fat and eat more vegetables, fruits, and whole grains.
- Exercise regularly and maintain a healthy weight.

## Analyze and Conclude

*Respond to each question.*

1. **Explain** How do the lifestyle choices listed above help reduce a person's risk of cancer?

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2. **Identify** In addition to following the lifestyle choices above, what should a person who has a family history of cancer do to reduce his or her risk of dying from cancer? How does this help?

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3. **Compare** Which diet would give a person a higher risk of cancer—one with lots of fat and few vegetables, fruits, and whole grains, or one with little fat and lots of vegetables, fruits, and whole grains?

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# Chapter Review

## Cellular Reproduction

### Part A. Multiple Choice

Circle the letter of the term or phrase that best completes each statement or answers each question.

1. During the cell cycle, a cell grows \_\_\_\_\_.
- a. and dies.
  - b. and divides.
  - c. without completing cytokinesis.
  - d. without completing mitosis.

What is the purpose of mitosis?

- a. Create genetic diversity.
- b. Increase cell volume.
- c. Produce new offspring.
- d. Replace damaged cells.

2. Which is the reproductive method of prokaryotes?

- a. Binary fission
- b. Cell apoptosis
- c. Cytokinesis
- d. Mitosis

3. How can cancer cells be described?

- a. Completing abnormal mitosis
- b. Dividing out of control
- c. Lacking essential nutrients
- d. Shrinking to a small size

4. The combination of mitotic cyclin with CDK signals the \_\_\_\_\_.

- a. beginning of cell mitosis.
- b. completion of cytokinesis
- c. growth of a cancer cell
- d. start of the cell cycle

### Part B: Matching and Completion

**Matching.** Write the letter of the correct stage of mitosis on the line next to its description. Answers may be used only once or not at all.

- |       |   |               |
|-------|---|---------------|
| _____ | 1. Chromatin condense into chromosomes.   | A. Anaphase   |
| _____ | 2. The nucleolus reappears.   | B. Interphase |
| _____ | 3. This stage ensures that the new cells have accurate copies of the chromosomes. | C. Metaphase  |
| _____ | 4. The cell grows during this stage.  | D. Prophase   |
|       |   | E. Telophase  |

**Completion.** Write the correct term in the blank to complete each sentence below.

5. The stage during which the cell's cytoplasm divides is called \_\_\_\_\_.
6. The stage during which the cell carries out cell functions is called \_\_\_\_\_.
7. Tobacco smoke is an example of a(n) \_\_\_\_\_.
8. Unspecialized human cells are called \_\_\_\_\_.

**Part C: Interpreting Drawings and Graphs**



Use the illustration above to respond to the following statement.

1. Identify the prophase, metaphase, anaphase and telophase stages of mitosis in the drawings labeled A-D in the order that they occurring during mitosis.

a. \_\_\_\_\_  
 b. \_\_\_\_\_

c. \_\_\_\_\_  
 d. \_\_\_\_\_

Use the graph to the right to respond to each question and statement.

2. Contrast the rate of pancreatic cancer for males and females at the age of 69.

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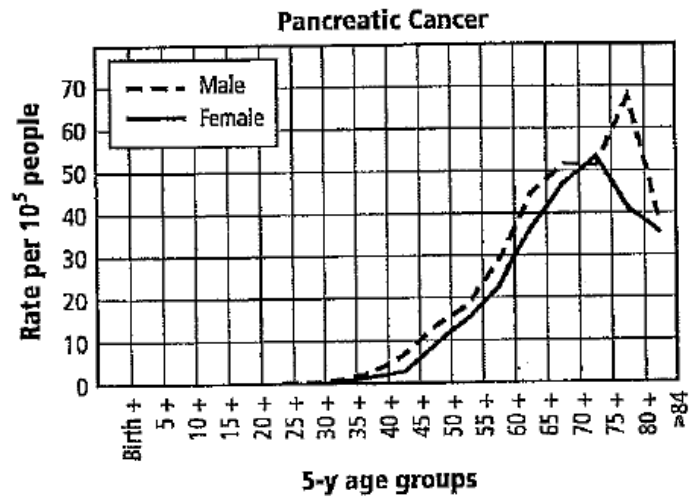
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3. **Interpret:** What age group is usually not afflicted by pancreatic cancer?

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**Part D: Short Answer**

Write your response to each statement in the space provided.

1. Identify two limiting factors that control eukaryotic cell division. Describe each limiting factor.

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2. Infer why embryonic stem cell research raises ethical concerns in the United States.

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**Part E: Concept Application**

Write your response to each question and statement in the space provided.

1. **Evaluate:** Why is it impractical for human liver cells to triple their average size?

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2. Formulate a strategy for a restaurant waiter who is searching for a job to minimize his risk of contracting cancer from work-related environmental conditions. Use the term *carcinogen* in your answer.

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Name: \_\_\_\_\_ Mods: \_\_\_\_\_ Date: \_\_\_\_\_

## Meiosis - Internet Activity

In this investigation, you will view sites that illustrate the process of meiosis. Answer the questions associated with each site. Remember to type in the url correctly!

**First site:** Go to Lew-Port's Biology Place (<http://www.lpscience.fatcow.com/jwanamaker/animations.htm>) and click on Meiosis (also try googling "lewport biology animations" for shortcut)

1. Draw a chromosome.
  
2. The cell in this animation starts with \_\_\_\_\_ (number) chromosomes.
3. In this animation, the homologous pairs (labeled as "chromosome pairs") are represented by similar \_\_\_\_\_.
4. Copies of chromosomes are held together by the \_\_\_\_\_.
5. From where did the information (DNA) in the chromosomes originally come? \_\_\_\_\_  
\_\_\_\_\_
6. Draw "crossing over" - using your pencil to shade in the areas that exchange parts.
  
7. How many chromosomes are at each pole of the cell? \_\_\_\_\_
8. During meiosis 2, chromosomes line up again along the cell's \_\_\_\_\_.
9. Only \_\_\_\_\_ copy of each chromosome moves toward the poles. Which means only \_\_\_\_\_ chromosomes of the original six.
10. New membranes form around each \_\_\_\_\_.
11. Each cell divides, forming a total of \_\_\_\_\_ cells.

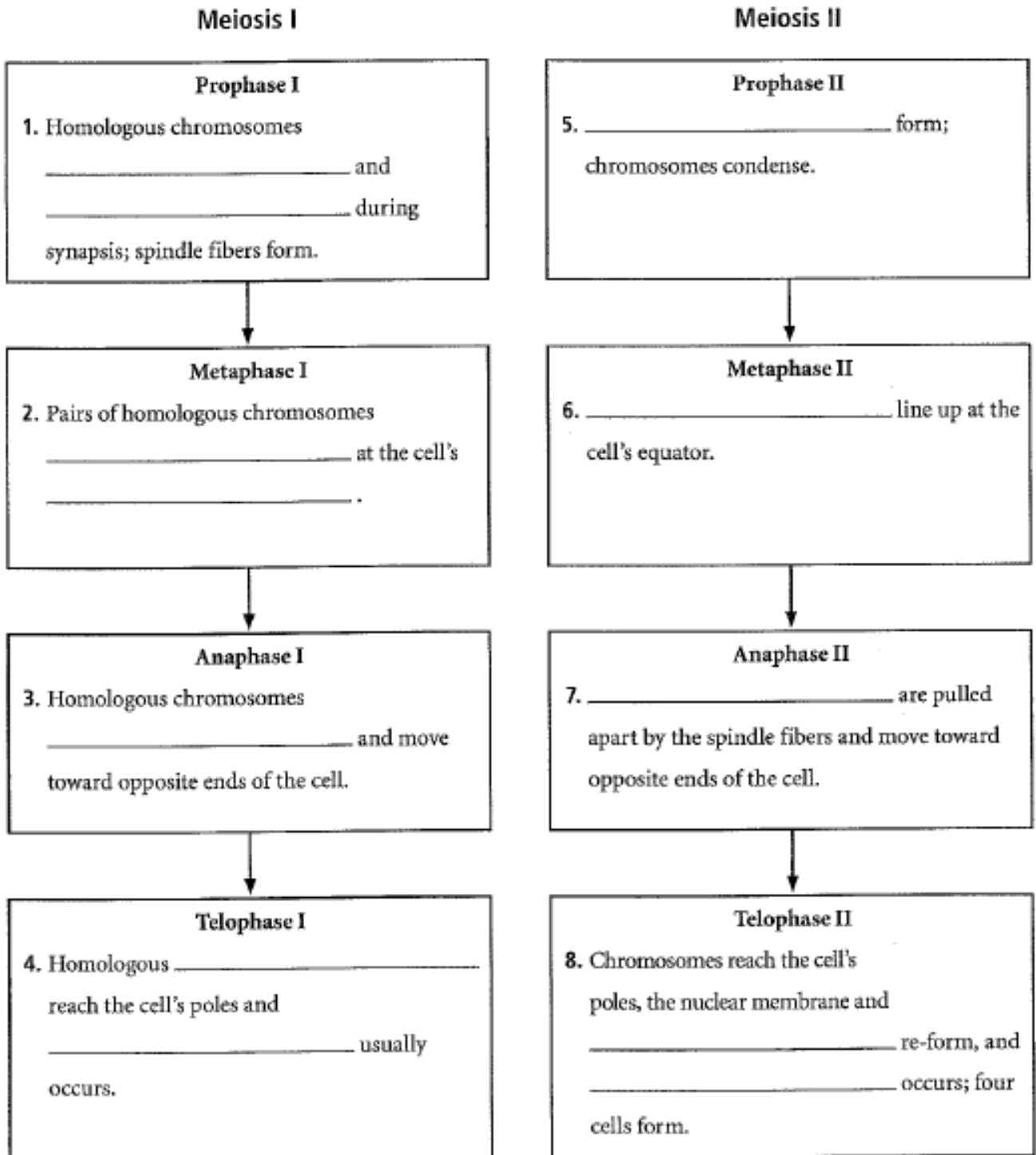
**Second Site:** Go to [[http://highered.mcgraw-hill.com/sites/0072495855/student\\_view0/chapter28/animation\\_how\\_meiosis\\_works.html](http://highered.mcgraw-hill.com/sites/0072495855/student_view0/chapter28/animation_how_meiosis_works.html)]. You can also google "mcgraw hill meiosis animation". Watch the simulation of Meiosis and use it to answer the questions below. You can pause and re-play the simulation from any point.

1. What kind of body cells does Meiosis produce? \_\_\_\_\_
2. When does DNA replication take place in haploid cells? \_\_\_\_\_  
\_\_\_\_\_
3. Meiosis starts with one \_\_\_\_\_ (haploid or diploid) cell and produces 4 \_\_\_\_\_ (haploid or diploid) daughter cells.
4. Meiosis has 2 phases \_\_\_\_\_ and \_\_\_\_\_.
5. Crossing over happens in Meiosis I. It is when ...
6. How does crossing over contribute to genetic diversity (hint: how does it make your genes different from your brother or sister's genes)?
7. In Meiosis I, is it possible for all of the sister chromosomes from mom to line up on one side and all of the sister chromosomes from dad to line up on the other? How?
8. Is it possible for the sister chromosomes to be arranged so that some of the ones from mom and some of the ones from dad are on the same side of the equator? How?

# Concept Mapping

## Meiosis I and Meiosis II

Complete the events chains about meiosis I and meiosis II. These terms may be used more than once: chromosomes, condense, cytokinesis, equator, line up, nuclei, pair up, separate, sister chromatids, spindle apparatus.

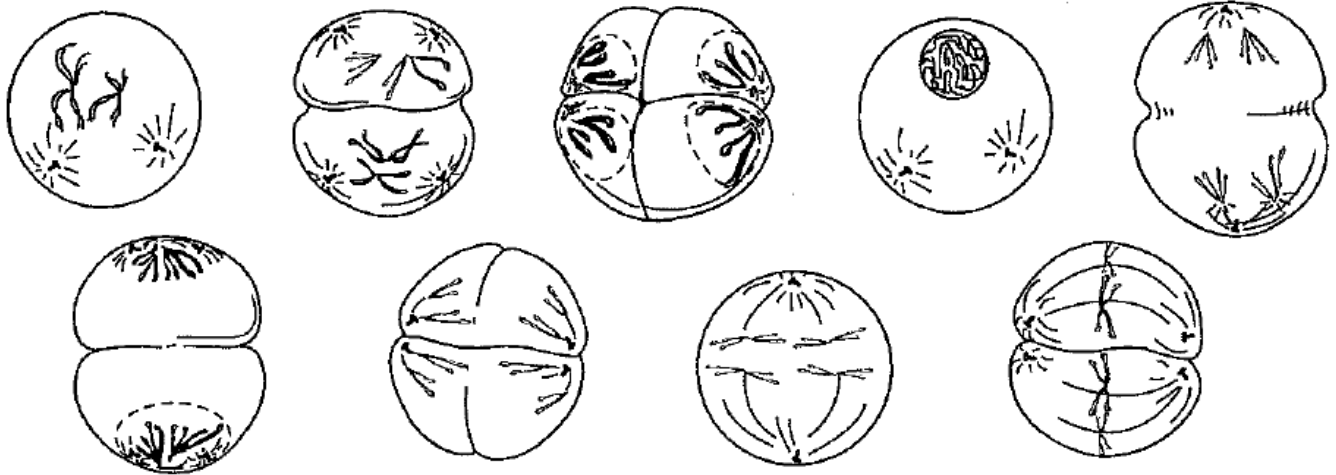


**In your textbook, read about meiosis I and meiosis II.**

Label the diagrams below. Use these choices:

- anaphase I      anaphase II      interphase      metaphase I      metaphase II  
 prophase I      prophase II      telophase I      telophase II

1. \_\_\_\_\_ 2. \_\_\_\_\_ 3. \_\_\_\_\_ 4. \_\_\_\_\_ 5. \_\_\_\_\_



6. \_\_\_\_\_ 7. \_\_\_\_\_ 8. \_\_\_\_\_ 9. \_\_\_\_\_

Complete the table by checking the correct column (s) for each description.

Description	Mitosis	Meiosis
10. Involved in the production of gametes		
11. Involved in growth and repair		
12. Promotes genetic variation in organisms		
13. Consists of one nuclear division		
14. Produces daughter cells that are genetically identical		
15. Involves two sets of nuclear divisions		
16. Produces daughter cells that are not identical		
17. Involves the synapsis of homologous chromosomes		
18. Occurs during asexual reproduction		
19. Results in four haploid gametes		
20. Also called <i>reduction division</i>		