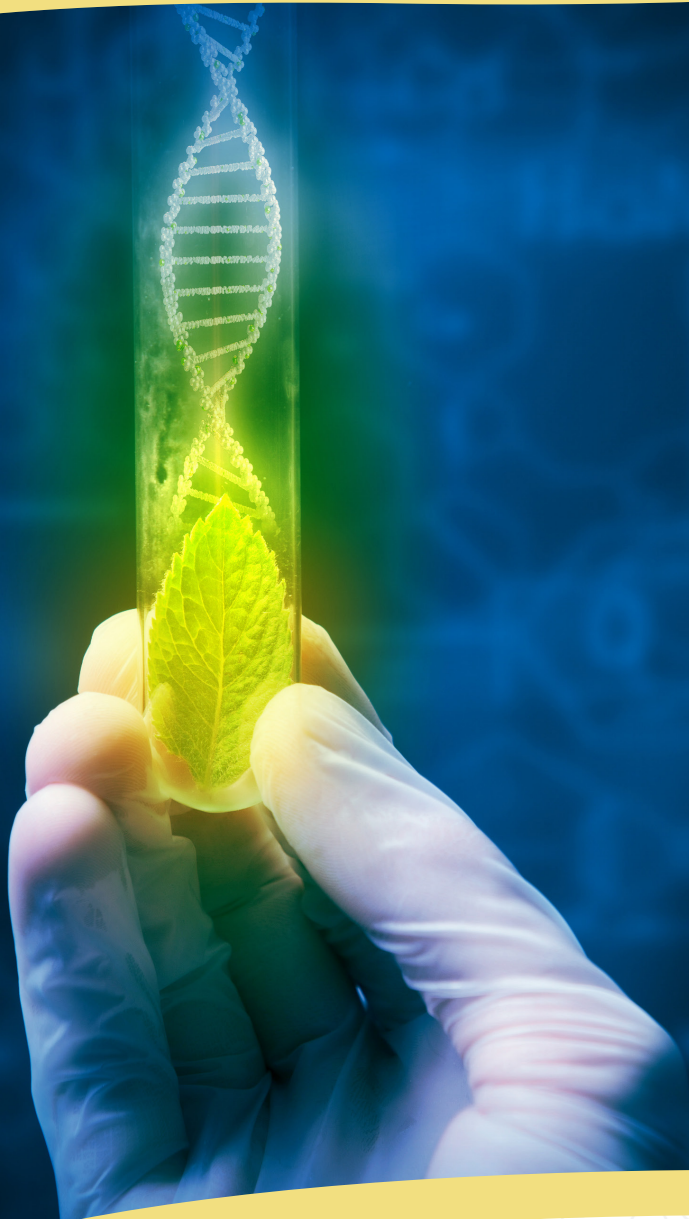


SCIENCE SCIENCE SCIENCE SCIENCE SCIENCE
Learn
BRIGHT

MITOSIS AND MEIOSIS



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GRADE 5-6

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Classroom Procedure:

1. Ask students to share everything they know about cell division.
2. Allow for responses and discussion. Display a list of responses. Ask students if all organisms reproduce using the same process. Why or why not?
3. Allow for responses and discussion. Ask students if they have ever heard the terms- *mitosis* or *meiosis*. Ask students if they can identify what is different or the same about each process.
4. Allow for responses and discussion. Introduce *Mitosis and Meiosis* to the class.
5. Distribute *Mitosis and Meiosis* content pages. Read and review the information with the students. Save the final question for the lesson closing. Use the additional resources to enhance understanding.
6. Distribute the Activity page. Read and review the instructions. Pair students. Distribute supplies. Circulate through the room as students manipulate the supplies to demonstrate mitosis and meiosis. Ensure students are correctly showing the two processes before creating the poster board. Allow time for completion of the poster boards.
7. Once completed, pairs of students meet and present their posters to each other.
8. Distribute the Practice page. Check and review the students' responses.
9. Distribute the Homework page. The next day, check and review the students' responses.
10. In closing, ask students: *If you could invent a third process for cell division, what would it look like? Describe it for the class.*
11. Allow for responses and discussion. Ask students to specifically and clearly describe the newly "invented" cell division process. Encourage students to use mitosis/meiosis terms like stages, phases, etc.

Approximate Grade Level: 5 – 6

Objectives: The students will be able to define mitosis and meiosis, compare/contrast the two process, and identify examples of organisms that use mitosis and/or meiosis for cell division.

State Educational Standards*

LB.ELA-LITERACY.RI.5.2
LB.ELA-LITERACY.RI.5.3
LB.ELA-LITERACY.RI.5.4
LB.ELA-LITERACY.RST.6.2
LB.ELA-LITERACY.RST.6.4
LB.ELA-LITERACY.RST.6.7

Class Sessions (45 minutes):

2 or 3 class sessions

Teaching Materials/Worksheets:

Mitosis and Meiosis content pages (2),
Activity page, Practice page, Homework page

Student Supplies:

Poster board, yarn, colored pencils, colored construction paper, glue or tape, handouts

Prepare Ahead of Time:

Supplies for the activity; pair students for the activity. Copy handouts.

Options for Lesson: Students may work alone or in groups for the activity. For the activity, use additional supplies for the models, string, lids for cells, etc. For the closing question's response, students may create a drawing for the newly "invented" cell division process. Students can vote on the best "invented" cell division process based on the closing question. Invite a biologist to the class to discuss the differences between mitosis and meiosis.

*Lessons are aligned to meet the education objectives and goals of most states. For more information on your state objectives, contact your local Board of Education or Department of Education in your state.



Teacher Notes

The lesson introduces students to the differences between mitosis and meiosis, comparing/contrasting the processes, and identifying a variety of organisms that use the processes for cell division. Students should understand basic cell division, but some may not be aware of the two types of cell division. The lesson may be used in conjunction with other lessons related to biology, cells, and cell division.

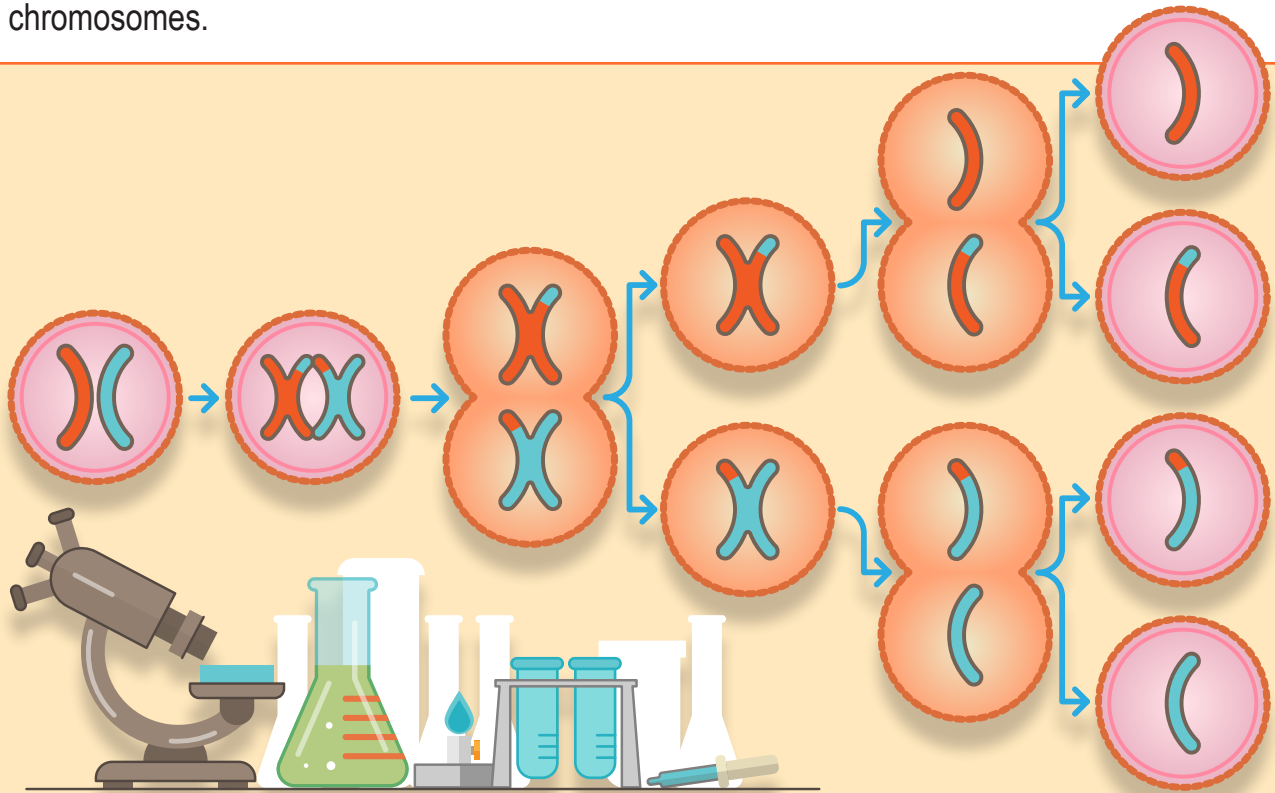
Cell Division

You are quite familiar with cell division. Cell division is necessary for living organisms to grow and reproduce some of their own kind. During both asexual (one-parent) reproduction and sexual (two-parent) reproduction, cell division must take place. Asexual reproduction occurs mostly in some plants and single-celled organisms, and sexual reproduction is the most common form of reproduction in plants and animals.

Without cell division, asexual or sexual reproduction would not be possible. In addition, cell growth would not be possible without cell division. For example, the cells of your skin die, but they are replaced through cell division. It is also the same for the blood, bone, brain, and other cells of your body. All plants and animals, as well as single-cell or multicellular organisms, rely on cell division for growth and/or survival of the species.

Cells divide in two different ways to make new cells. In asexual reproduction, a process called **mitosis** occurs when all the organism's chromosomes are copied to make two identical sets of chromosomes. This includes the cell nucleus dividing into two identical nuclei (plural for nucleus).

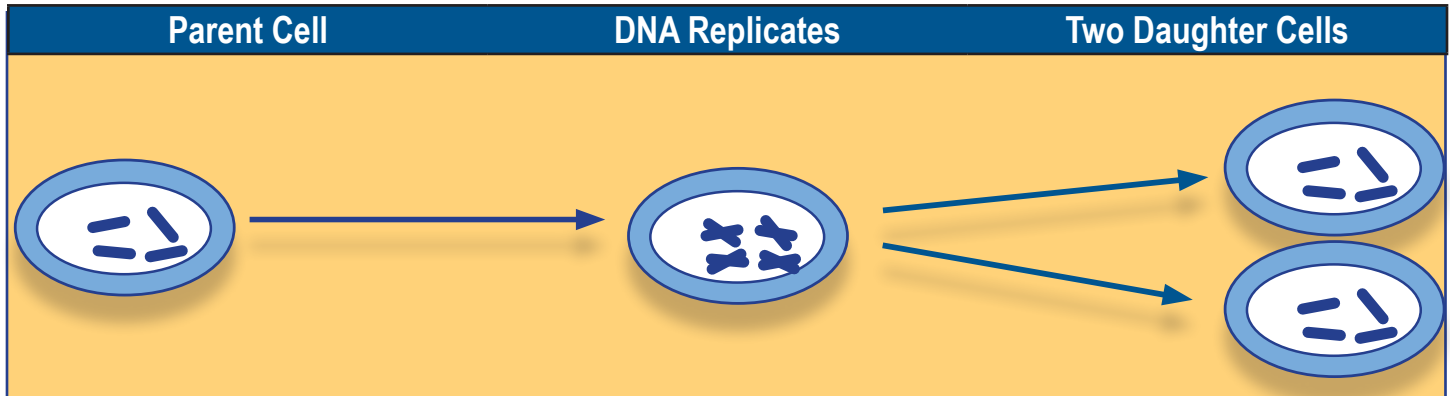
In sexual reproduction, a process called **meiosis** occurs, this is when just half the chromosomes from each parent are passed into an offspring. This is how you were born following sexual reproduction. You received half the chromosomes from your mother (23) and the other half (23) from your father. Every cell in your body has 46 chromosomes.



However, the process of mitosis also occurs in humans and most other animals as well. Mitosis is the process that occurs when the cells of your body are duplicated. For example, the cells that make up your skin divide using mitosis. A skin cell (the parent cell) divides to form two daughter cells that are exactly the same as the parent skin cell.

Mitosis

Your body contains trillions and trillions of cells. However, you began life as a single cell. You began as a fertilized egg cell. The fertilized egg cell had to divide repeatedly to make more cells through a process called mitosis. Review the diagram showing mitosis.

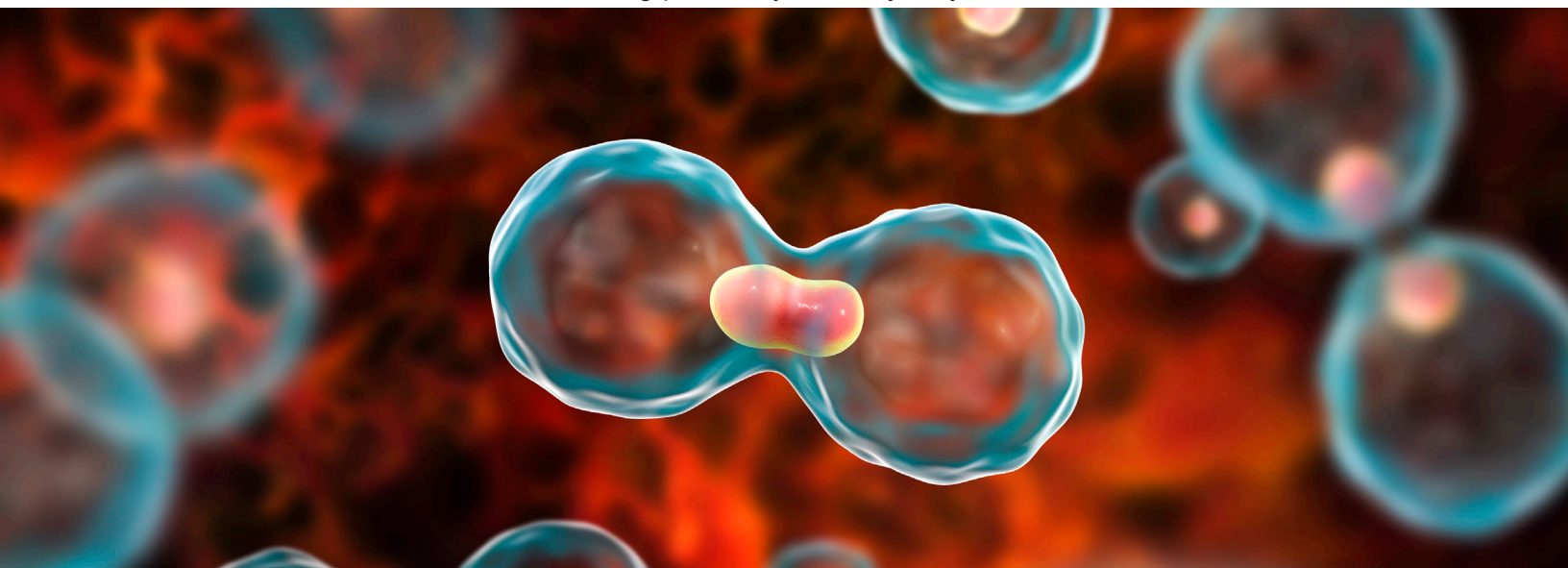


The daughter cells are genetically the same as the parent cell. Note, the DNA, the chromosomes, are replicated (copied) before the two daughter cells develop. The chromosomes coil up, and each chromosome looks like an X inside the nucleus of the cell.

The middle cell above is now ready for mitosis. The two daughter cells have a copy of each chromosome. In the case of a human, each new cell would have the same 46 chromosomes as the parent cell.

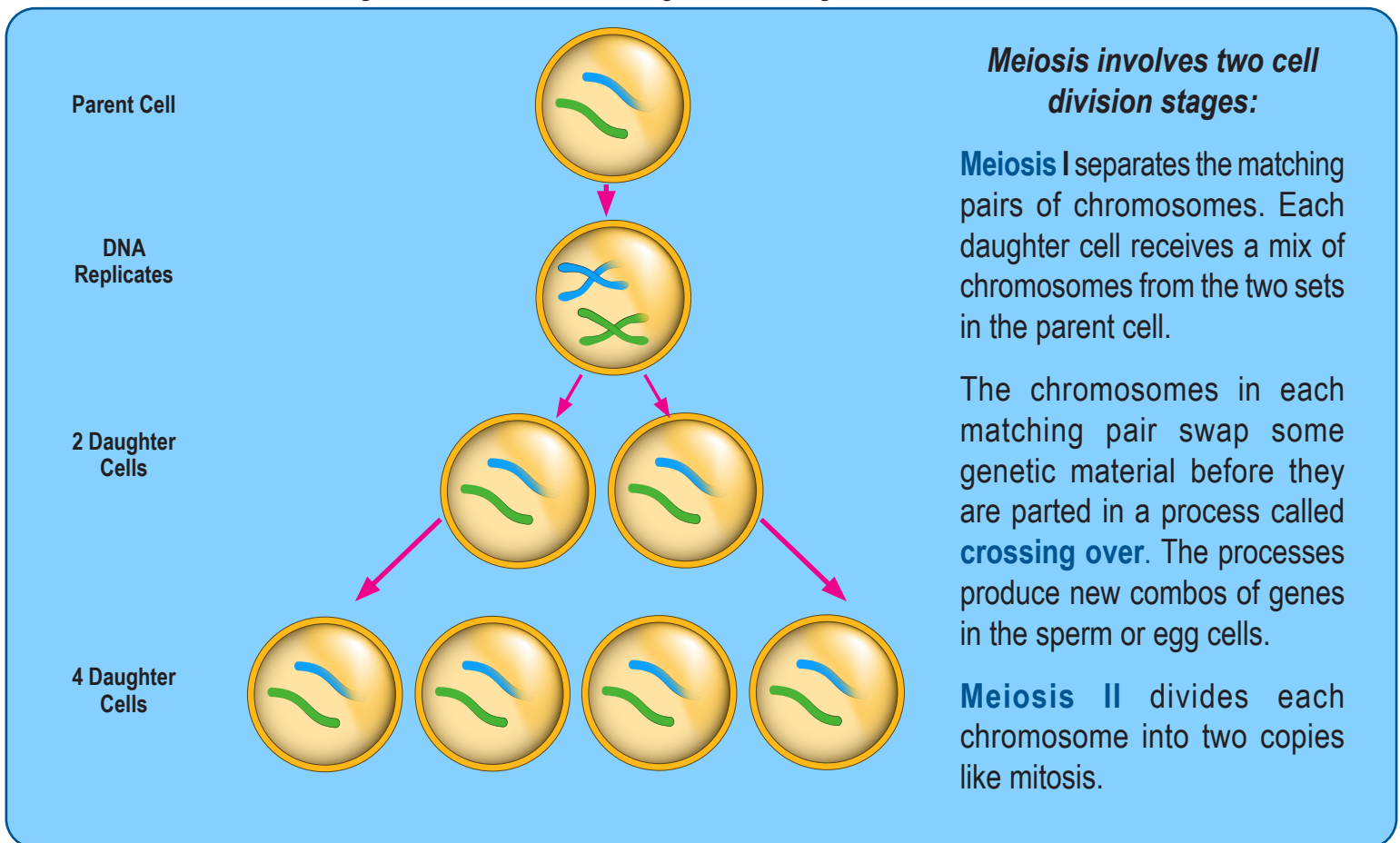
Mitosis plays an important part in the development of embryos and for the development of your body. Mitosis produces new cells and replaces old, lost, or damaged cells in the body. The full process of mitosis involves several different stages not shown above, called phases.

They include, in order, G2, prophase, prometaphase, metaphase, anaphase, telophase, and cytokinesis. There is no need to remember these terms for now, but recognizing the different phases reinforces the complexity of mitosis and the cell division that is taking place in your body as you read these words.



Meiosis

The cells in your body contain 23 pairs of chromosomes or 46 in total. The sperm and egg cells contain 23 single chromosomes, or half the number, and are made using the cell division process called meiosis. Meiosis is used to make the special cells that have half the normal number of chromosomes whether they are in humans or other organisms. Review the diagram showing meiosis.



The full process of meiosis involves phases as well, but there are several more than mitosis.

It may seem complicated, but the two processes of cell division, mitosis and meiosis, are necessary for the reproduction of nearly all living organisms. Some simple organisms such as bacteria can reproduce simply by dividing into two new individuals.



If you could invent a third process for cell division, what would it look like? Describe it for the class.





Instructions

Supplies: poster board, colored pencils, yarn, tape or glue, colored construction paper

1. Work with your partner. Use the supplies to create the different steps of mitosis and meiosis.
2. Cut apart the yarn for the chromosomes, make circles using the construction paper
3. Demonstrate the cell division for both processes using the supplies by manipulating the chromosomes and cells
4. After demonstrating the two processes, use the poster board and tape or glue the diagrams showing mitosis and meiosis
5. Add labels, arrows, and other helpful text to help the viewer understand the difference between mitosis and meiosis
6. Include additional information related to each process as well
7. Create a catchy title for the poster
8. Once completed, you will present your poster boards and information to another pair of students.

Your grade will be based on the following point system:

Item	Point Value	Your Points
All instructions followed for the assignment; includes a title	5	
The process of mitosis is displayed correctly	10	
The process of meiosis is displayed correctly	10	
Labels and applicable information are included	10	
Additional information related to each process is included	10	
Proper use of grammar, punctuation, and sentence structure	5	
Total Points	50	



Practice

Name _____ Date _____

Read each statement. Tell whether it is related to Mitosis or Meiosis or Both.

- | | | |
|----|----------------------|-----------------------------------------------------------------|
| 1 | mitosis meiosis both | For the growth and repair of a body's cells. |
| 2 | mitosis meiosis both | The stages of the process are separated into phases. |
| 3 | mitosis meiosis both | The outcome is two cells with identical genetic information. |
| 4 | mitosis meiosis both | Make the special cells that have 1/2 the number of chromosomes. |
| 5 | mitosis meiosis both | Involves two cell division stages. |
| 6 | mitosis meiosis both | Plays an important part in the development of embryos. |
| 7 | mitosis meiosis both | The outcome is four cells with different genetic information. |
| 8 | mitosis meiosis both | A fertilized egg cell divides repeatedly. |
| 9 | mitosis meiosis both | A process for the division of cells. |
| 10 | mitosis meiosis both | Used in preparation for sexual reproduction. |

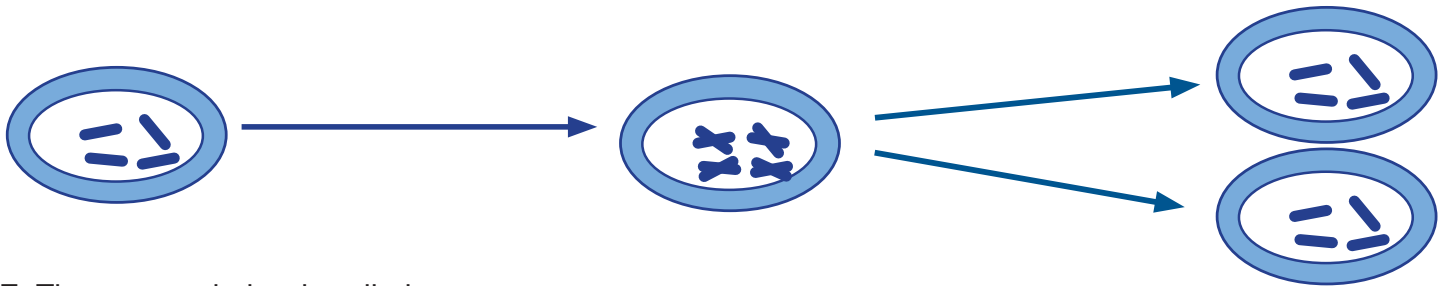
Label each diagram.

A. The process below is called _____.

B. _____

C. _____

D. _____



E. The process below is called _____.

F. _____ G. _____ H. _____ I. _____



Homework

Name _____ Date _____



Fill in the blanks using the word bank.

chromosomes

meiosis

multicellular

mitosis

division

nucleus

growth

bacteria

egg

phases

1. Cell _____ is necessary for living organisms to grow and reproduce some of their own kind.
2. Cell _____ would not be possible without cell division
3. Single-cell or _____ organisms rely on cell division for growth species survival.
4. During mitosis, a cell's _____ divides into two identical nuclei.
5. The cells that make up your skin divide using _____.
6. In sexual reproduction, a process called _____ occurs.
7. During mitosis, _____ coil up, and each looks like an X inside the nucleus of the cell.
8. The final three _____ during mitosis include anaphase, telophase, and cytokinesis.
9. Sperm and _____ cells each contain 23 single chromosomes and are made during meiosis.
10. Simple organisms such as _____ can reproduce by dividing into two new individuals.

Show the division of chromosomes beginning with the parent cell for meiosis.



Read each statement. Tell whether it is related to Mitosis or Meiosis or Both.

- | | | |
|----|-----------------------------|---------------------------------------------------------------------------|
| 1 | mitosis meiosis both | For the growth and repair of a body's cells. |
| 2 | mitosis meiosis both | The stages of the process are separated into phases. |
| 3 | mitosis meiosis both | The outcome is two cells with identical genetic information. |
| 4 | mitosis meiosis both | Make the special cells that have $\frac{1}{2}$ the number of chromosomes. |
| 5 | mitosis meiosis both | Involves two cell division stages. |
| 6 | mitosis meiosis both | Plays an important part in the development of embryos. |
| 7 | mitosis meiosis both | The outcome is four cells with different genetic information. |
| 8 | mitosis meiosis both | A fertilized egg cell divides repeatedly. |
| 9 | mitosis meiosis both | A process for the division of cells. |
| 10 | mitosis meiosis both | Used in preparation for sexual reproduction. |

Label each diagram.

A. The process below is called **Mitosis**.

B. **Parent Cell**

C. **DNA Replicates**

D. **2 Daughter Cells**

E. The process below is called **Meiosis**.

F. **Parent Cell**

G. **DNA Replicates**

H. **2 Daughter Cells**

I. **4 Daughter Cells**



Fill in the blanks using the word bank.

chromosomes

meiosis

multicellular

mitosis

division

nucleus

growth

bacteria

egg

phases

1. Cell **division** is necessary for living organisms to grow and reproduce some of their own kind.
2. Cell **growth** would not be possible without cell division
3. Single-cell or **multicellular** organisms rely on cell division for growth species survival.
4. During mitosis, a cell's **nucleus** divides into two identical nuclei.
5. The cells that make up your skin divide using **mitosis**.
6. In sexual reproduction, a process called **meiosis** occurs.
7. During mitosis, **chromosomes** coil up, and each looks like an X inside the nucleus of the cell.
8. The final three **phases** during mitosis include anaphase, telophase, and cytokinesis.
9. Sperm and **egg** cells each contain 23 single chromosomes and are made during meiosis.
10. Simple organisms such as **bacteria** can reproduce by dividing into two new individuals.

Show the division of chromosomes beginning with the parent cell for meiosis.