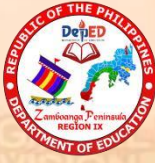


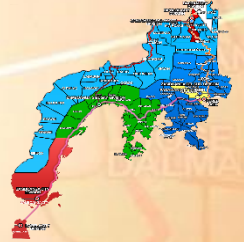


Republic of the Philippines
Department of Education
 Regional Office IX, Zamboanga Peninsula



- JANUARY**
Maugihon
- FEBRUARY**
Mahigugmaon
- MARCH**
Matinabungan
- APRIL**
Matinahuron
- MAY**
Mahapsay og Malimpyo
- JUNE**
*Maabtik og Masunod sa
Dhaklong Oras*
- JULY**
Maantigo og Maabilidad
- AUGUST**
*Maginhuhuhunon
para sa Uban*
- SEPTEMBER**
Madaginoton
- OCTOBER**
Matinud-anon
- NOVEMBER**
Masaligan
- DECEMBER**
Maalampon

8



Zest for **P**rogress
Zeal of **P**artnership

Science Grade 8

Quarter 4 - Module 2

CELL DIVISION



Name of Learner: _____

Grade & Section: _____

Name of School: _____



What I Need to Know

This module directs you to the understanding of how a cell works in both plants and animals. It will help you have an idea of the **comparison between mitosis and meiosis and their role in cell division (S8LT-IVd-16)**. This topic will answer your query on why and how plants and animals grow and develop. And this material will bring to comprehend your existence and others. The languages used in this module are within the range of your understanding. Moreover, the activities are simplified without deferring the competencies set in the Department of Education.

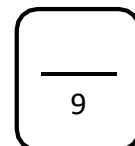
After going through this module, you are expected to:

1. describe the cell cycle; and
2. differentiate mitosis from meiosis.

Every living thing undergoes reproduction. The nutrients taken by an individual will provide energy for metabolic processes, growth, development, and reproduction. In cell division, the cellular level of reproduction offers the backdrop for the organismal level of reproduction.

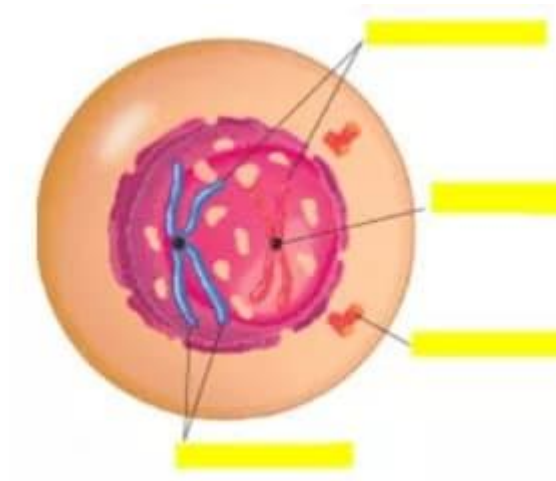


What's In



Activity 1: The Chromosome and the Cell Cycle

Part A. Label the parts of the chromosome. Write your answer next to the picture.



Part B. True or False: Draw a smiley emoticon 😊 if the statement is true and sad emoticon ☹️ if it is false.

- _____ 1. A Cell cycle is divided into two stages: the interphase and the Prophase.
- _____ 2. The two chromatids are held together at one point, called the centromere.
- _____ 3. Mitosis produces two unidentical cells.
- _____ 4. Meiosis reduces the chromosome number in half.
- _____ 5. Alignment of chromosomes in the equatorial region is in telophase.



What's New

Activity 2: A R G

Direction: Accomplish the Anticipation-Reaction Guide (ARG) below.

1. Before reading: Read the statements in the table below and check the column that corresponds to your response as to Agree or Disagree.
2. After reading: Review your answers and write in the last column whether you were **right** or **wrong**.

| Agree | Disagree | Statement | Were you right? |
|-------|----------|--|-----------------|
| | | 1. G ₁ , S ₁ , and G ₂ are the phases of cell cycle under interphase. | |
| | | 2. Interphase is the first part of mitosis. | |
| | | 3. Mitosis and Meiosis produce the same number of chromosomes in their daughter cells. | |
| | | 4. Prophase, metaphase, anaphase, and telophase are found both in mitosis and meiosis. | |
| | | 5. Chromosomes aligned at the center of equatorial plate during anaphase. | |
| | | 6. Cells come from preexisting cells. | |
| | | 7. Mitosis is also known as reduction-division. | |
| | | 8. Meiosis produces 4 daughter cells | |
| | | 9. Mitosis occurs in the body cells while meiosis occurs in the sex cells | |
| | | 10. Uncontrolled growth of cells can increase our height, weight, and mass | |



What is it

The Cell Cycle

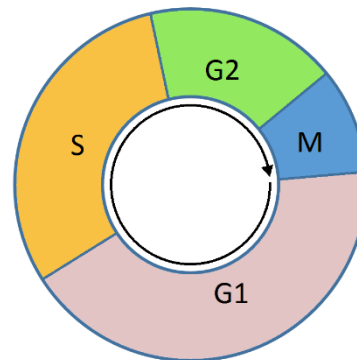
The chromosomes of a cell change form as the cell transition from one stage to another in a typical cell cycle. The cell cycle may be divided into two stages: the **interphase**, where the chromosomes are long and extended, referred to as **chromatin**, and the **cell division** phase, where the chromosomes become condensed or thickened.

The interphase refers to the period that follows one cell division and precedes another. During this stage, the cell does not divide; it merely grows. The chromosome produces an exact copy of itself.

The interphase is divided into three substages. The stage from the formation of a new cell until it begins to replicate its DNA is called the first gap or **G₁**, during which time the cell grows initially. This stage is characterized by protein and ribonucleic acid (RNA) synthesis. RNA, which is synthesized based on the DNA, is then used to synthesized proteins.

The middle of the interphase, called the synthesis stage or **S₁**, is the period of DNA synthesis or replication. The chromosomes are duplicated in preparation for the next cell division. The second gap period, or **G₂**, falls between the S period and the next cell division or **M** (mitosis or meiosis) phase. G₂ represents a period of rapid cell growth to prepare for cell division.

During interphase, the nucleus is clearly visible as a distinct membrane-bound organelle. In stained cells, this membrane can be clearly seen under the light microscope. One or more nucleoli are visible inside the nucleus. On the other hand, the chromosomes cannot be clearly seen. They appear as an irregular mass that is grainy in appearance because their DNA is stretched out thinly in the nucleus. This facilitates the replication of DNA during the S phase.



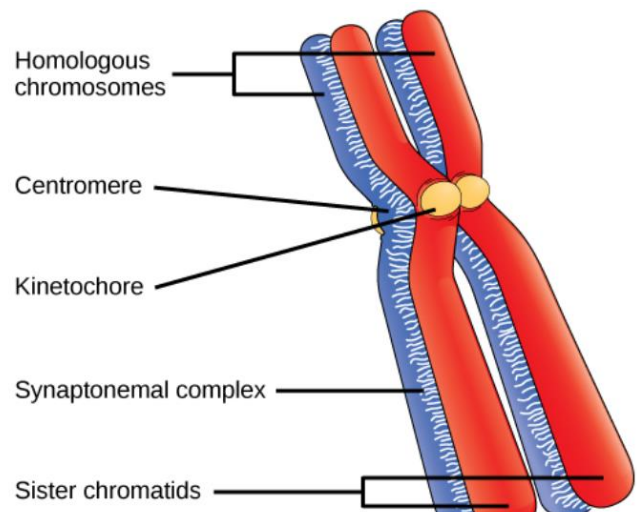
- G1 - Growth

- S - DNA synthesis

- G2 - Growth and preparation for mitosis

- M - Mitosis (cell division)

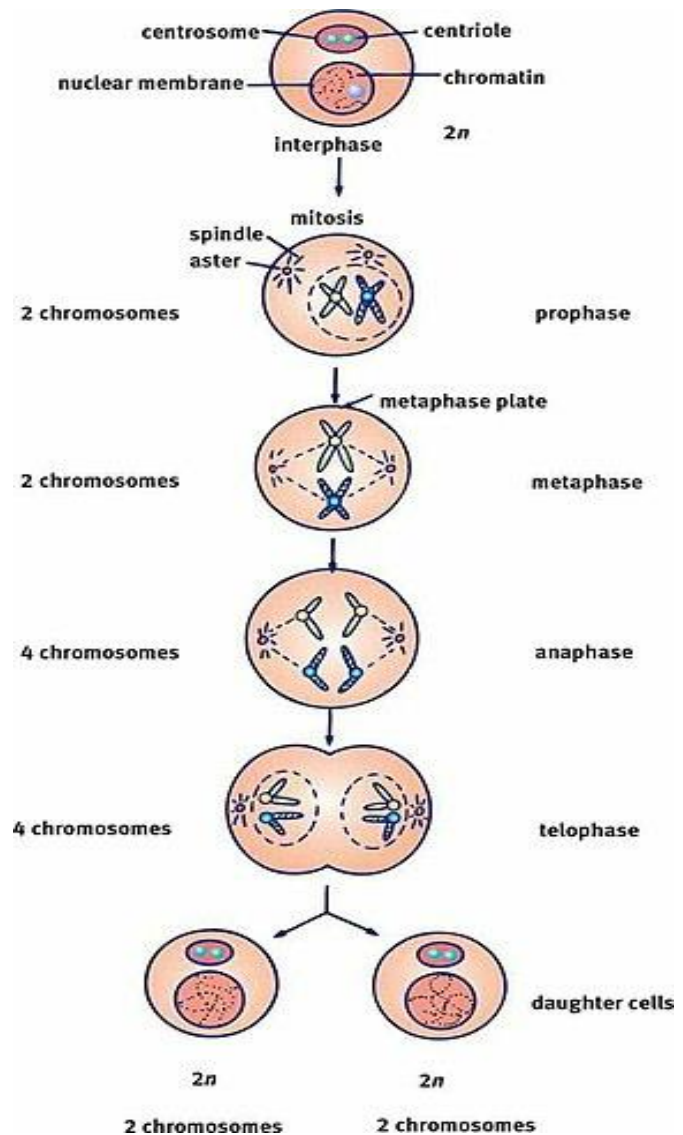
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<https://bit.ly/3rfDRia>

Mitosis

It is the process in which a eukaryotic cell separates the chromosomes in its cell nucleus into two identical sets in two daughter nuclei. It is generally followed immediately by cytokinesis, which divides the nuclei, cytoplasm, organelles, and cell membrane into two daughter cells containing roughly equal shares of these cellular components. Mitosis and cytokinesis together define the mitotic (M) phase of the cell cycle - the division of the mother cell into two daughter cells, genetically identical to each other and to their parent cell. The process of mitosis is complex and highly regulated. The sequence of events is divided into phases, corresponding to the completion of one set of activities and the start of the next. These stages are prophase, prometaphase, metaphase, anaphase, and telophase. During mitosis, the pairs of chromosomes condense and attach to fibers that pull the sister chromatids to opposite sides of the cell. The cell then divides in cytokinesis to produce two identical daughter cells.



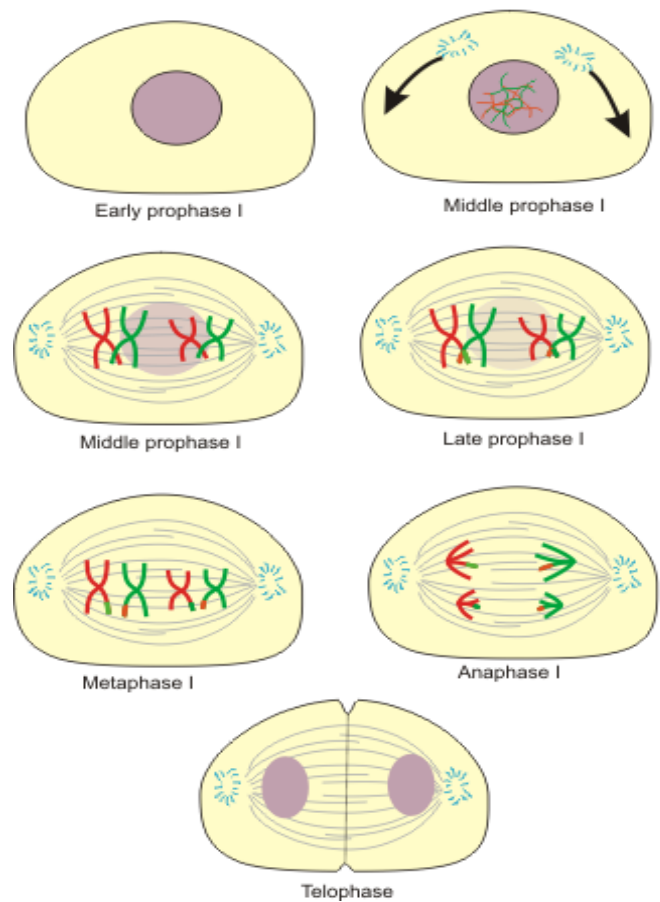
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Meiosis I

Meiosis is the first of the two separate divisions during which the diploid cell separates into two diploid cells. This is the step of meiosis where genetic variation is created by recombination. It is often called the **reduction division**. This is because it is here that the chromosome complement is reduced from diploid (two copies) to haploid (one copy). **Interphase** in meiosis is identical to interphase in mitosis. At this stage, there is no way to determine what type of division the cell will undergo when it divides. The meiotic division will only occur in cells associated with male or female sex organs. **Prophase I** is virtually identical to prophase in mitosis, involving the appearance of the chromosomes, the development of the spindle apparatus, and the nuclear membrane's breakdown. **Metaphase I** is where the critical difference occurs between meiosis and mitosis. In mitosis, all the chromosomes line up on the metaphase plate in no particular order. In Metaphase I, the chromosome pairs are

aligned on either side of the metaphase plate. During this alignment, the chromatid arms may overlap and temporarily fuse, resulting in what is called **crossovers**. During **Anaphase I**, the spindle fibers contract, pulling the homologous pairs away from each other and toward each pole of the cell.

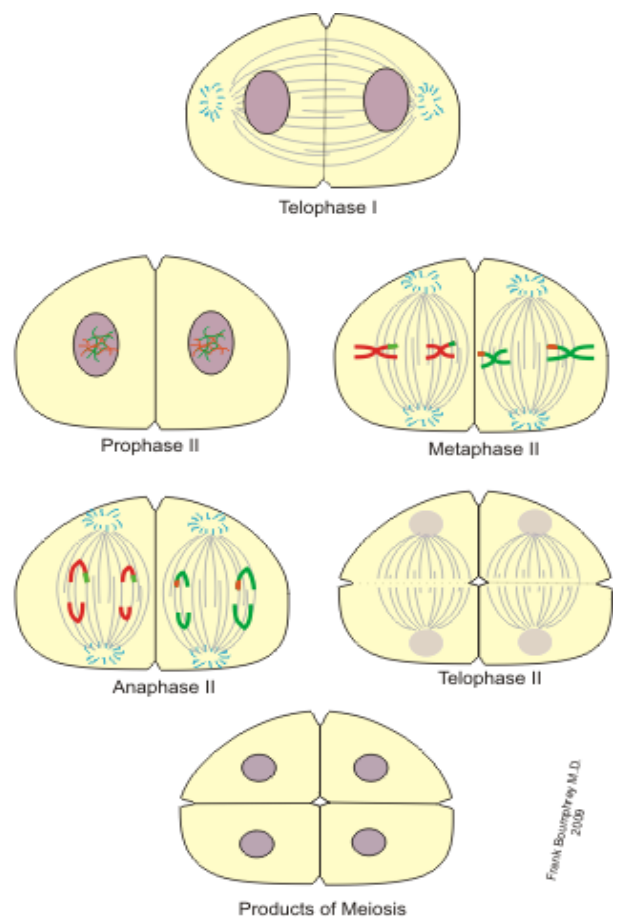
In **Telophase I**, a cleavage furrow typically forms, followed by cytokinesis - the changes that occur in the cytoplasm of a cell during nuclear division. Still, the nuclear membrane is usually not reformed, and the chromosomes do not disappear. At the end of Telophase I, each daughter cell has a single set of chromosomes, half the total number in the original cell, that is, while the original cell was diploid; the daughter cells are now haploid.



<http://bit.ly/3pXP2C>

Meiosis II

During Meiosis II, two diploid cells are then split into four haploid cells during the second set of stages of meiosis. It is quite simply a mitotic division of each of the haploid cells produced in Meiosis I. There is no Interphase between Meiosis I and Meiosis II, and the latter begins with **Prophase II**. At this stage, a new set of spindle fibers forms, and the chromosomes begin to move toward the equator of the cell. During **Metaphase II**, all the chromosomes in the two cells align with the metaphase plate. In **Anaphase II**, the centromeres split, and the spindle fibers shorten, drawing the chromosomes toward each pole of the cell. In **Telophase II**, a cleavage furrow develops, followed by cytokinesis and the formation of the nuclear membrane. The chromosomes begin to fade and are replaced by granular chromatin, a characteristic of interphase. When **Meiosis II is complete, there will be a total of four daughter cells, each**



<http://bit.ly/3pXP2C>

Frank Boumpoury M.D.
2008

with half the total number of chromosomes as the original cell. In the case of male structures, all four cells will eventually develop into sperm cells. In the case of the female life cycles in higher organisms, three of the cells will typically abort, leaving a single cell to develop into an egg cell, which is much larger than a sperm cell.



What's More

12

Activity 3: I am doing what?

Directions: Choose the activity that best describes the phases of the cell cycle. Look for the answers inside the box below.



G1 - _____

S - _____

G2 - _____

M - _____

<https://bit.ly/3ttQSqc>

Cell division

Growth

DNA synthesis

Growth and preparation for cell division

Activity 4: Comparing mitosis and meiosis

Directions: Differentiate mitosis from meiosis. Write in the table the needed information to complete the task.

| Basis of Comparison | Mitosis | Meiosis |
|--|---------|---------|
| Number of daughter cells produced | | |
| Number of chromosomes is halved. (Yes/No) | | |
| Pairing of homologous chromosomes takes place. (Yes/ No) | | |
| The daughter cells produced are always identical in terms of genetic material. (Yes/ No) | | |

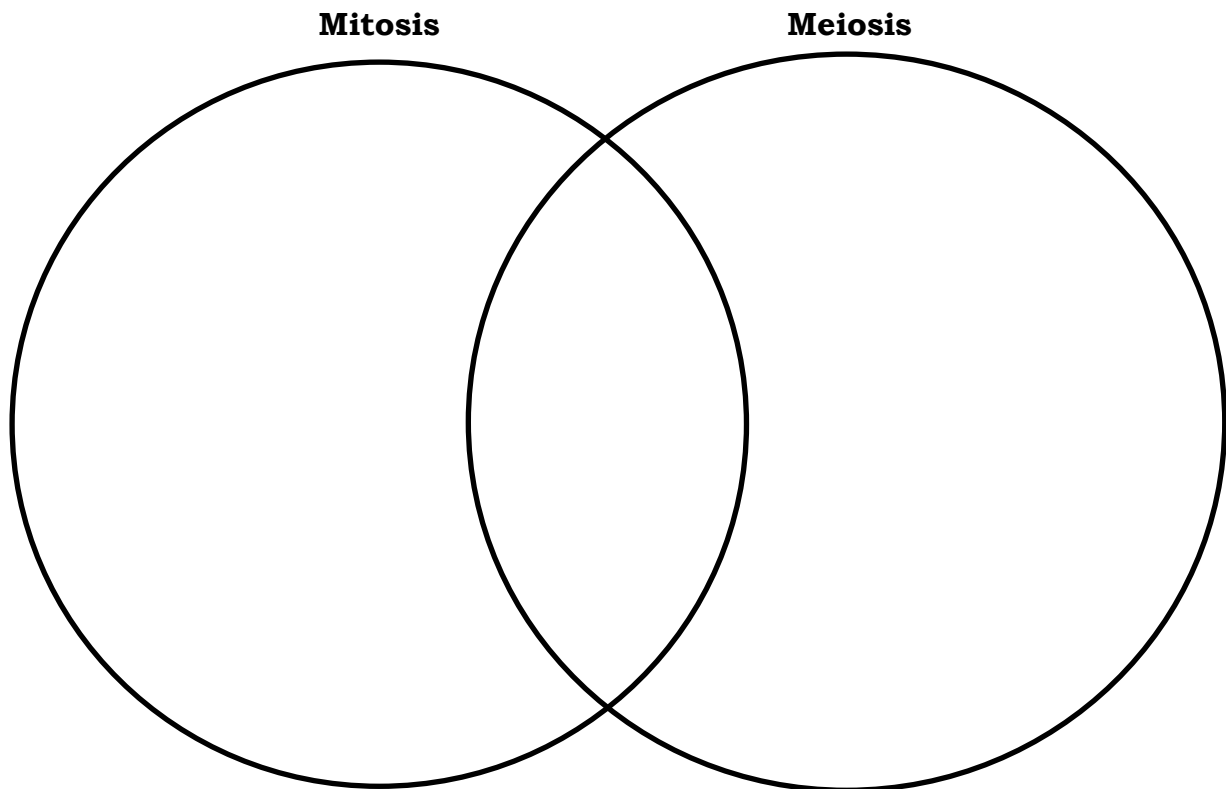


What I Have Learned

| |
|-------|
| _____ |
| 10 |

Activity 5: Similar but different!

Directions: Fill in the space where the circles overlap with characteristics that are common to both types of reproduction. Fill in the space to the left with characteristics specific to mitosis and the space to the right with characteristics specific to meiosis.



Did you get the idea? Well then, if you do, you are now ready to proceed to the next activity.



What I Can Do

20

Activity 6: The more I draw, the more I know!

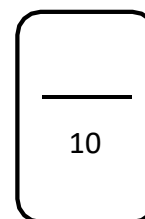
Part A: Draw the different stages of mitosis and write the name of the stage on the blank space provided.

Part B: Draw meiosis I and write the name of the stage on the blank space provided.

Part C: Draw meiosis II and write the name of the stage on the blank space provided.



Assessment



Set A: Encircle the letter of the best answer.

- Which of the following statements best describes the cell cycle?
 - The alignment of chromosomes at the equatorial region/plate
 - The production of DNA
 - The production of two identical cells
 - Transition of the cell from one stage to another
- Which of the following is likely to happen in the cell during G₁ or first gap?
 - Protein and ribonucleic acid (RNA) are synthesized
 - The cell grows
 - The cell produces daughter cells
 - The DNA is synthesized or replicated
- What do you call the period between synthesis and mitosis?
 - G₁
 - G₂
 - Meiosis
 - Prophase
- If mitosis occurs in the body cells, where can meiosis do?
 - Organ cells
 - Plant cells
 - Sex cells
 - Tissues
- A dog (*Canis lupus familiaris*) has body chromosomes of 52. How many chromosomes are there in its gametes?
 - 26
 - 30
 - 52
 - 104
- Which of the following statements is **NOT** true about mitosis and meiosis?
 - Meiosis produced half the number of chromosomes of the parent cell
 - Mitosis produced the same number of chromosomes as the parent cells
 - Both mitosis and meiosis are important in the continuity of life
 - Both mitosis and meiosis produced the same number of chromosomes
- What will likely happen if the cell will **NOT** divide?
 - Genetic information can be passed on
 - It will not affect any living organisms
 - There will be no cell growth and reproduction
 - All the cells will not be affected
- How do we know that cells are reproducing in a wound?
 - The appearance of scars in few days
 - The calming of nervousness
 - The ceasing of blood drop
 - The stopping of pain
- Scientists believe that cancer begins when _____
 - A cell divides too slowly
 - A mutation occurs in the DNA

- C. Cells stop growing
 - D. DNA replication stops
10. What happens during cytokinesis in animal cells?
- A. A cell plate forms in the middle of the cell
 - B. A new round of mitosis begins
 - C. Each organelle divides into two parts
 - D. Two new daughter cells are formed

Set B: Encircle the letter of your answer.

1. Mitosis is the stage during which
 - A. The cell cytoplasm divides
 - B. The cell divides into two new cells
 - C. The cell's DNA is replicated
 - D. The cell's nucleus divides into two new nuclei
2. Cancer is a disease in which cells
 - A. Cease producing DNA
 - B. Die before they can mature
 - C. Die during mitosis
 - D. Grow and divide uncontrollably
3. What do you call the transition of a cell from one to another?
 - A. Cancer cell
 - B. Cell cycle
 - C. Cell division
 - D. Cell reproduction
4. Which is the genetic material that serves as the set of instruction that directs the activities and function of the cells?
 - A. Chromosomes
 - B. DNA
 - C. Heredity
 - D. RNA
5. The passing on of traits from parents to offspring is known as_____
 - A. Cell Division
 - B. Genetics
 - C. Heredity
 - D. Variation
6. The chromosome number of every human being is
 - A. 10
 - B. 12
 - C. 32
 - D. 46
7. Which does **NOT** belong to the interphase substages?
 - A. First gap period
 - B. Mitosis/ meiosis
 - C. Second gap period
 - D. Synthesis stage
8. This cell division produces two identical cells with the same number of chromosomes.
 - A. Interphase
 - B. Meiosis
 - C. Mitosis
 - D. Synthesis
9. Two new daughter cells are formed during _____
 - A. Anaphase
 - B. Cytokinesis
 - C. Interphase
 - D. Metaphase
10. A human has 23 chromosomes in his gametes. How many does he have in his somatic cells?
 - A. 23
 - B. 46
 - C. 69
 - D. 92



Additional Activities

10

Activity 7: Let's see how it does!

Directions: Write **True** if the statement is correct and if the statement is false, change the **underlined** word to make the statement correct.

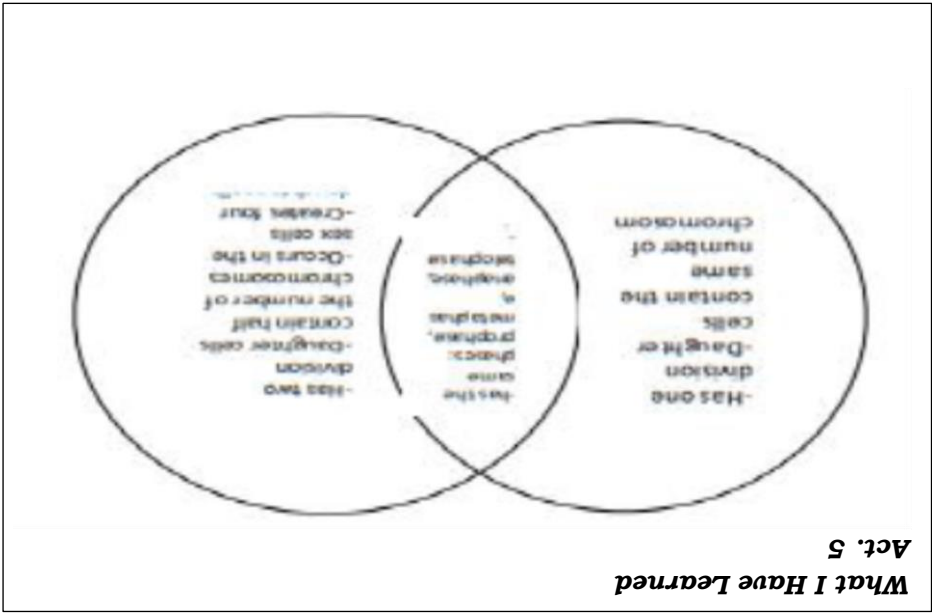
- _____ 1. The final stage of the cell cycle, during which the cytoplasm divides is called cytokinesis.
- _____ 2. Meiosis is the division of nuclear cells to form two identical nuclei during the stage of cell cycle.
- _____ 3. A diploid cell has the same chromosomal number as the parent cell.
- _____ 4. Interphase is not part of the cell division.
- _____ 5. During the G₁ stage, the DNA synthesized and replicated.

Answer Key Grade 8 Q4 W2 Science

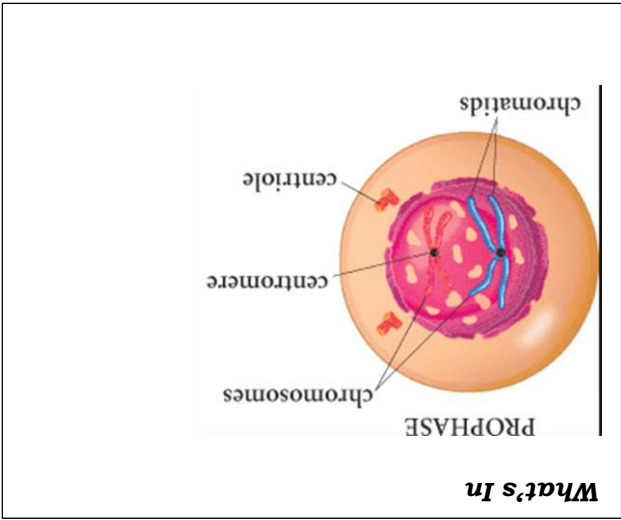
- Assessment (Set A)**
1. D
 2. A
 3. B
 4. C
 5. A
 6. C
 7. C
 8. A
 9. B
 10. D

- Assessment (Set B)**
1. D
 2. D
 3. B
 4. A
 5. C
 6. D
 7. B
 8. A
 9. B
 10. B

- Additional Activities**
1. True
 2. Mitosis
 3. True
 4. True
 5. S Stage



- What's More**
- Act. 3**
- G1 - Growth
S - DNA Synthesis
G2 - Growth and preparation for cell division
M - Cell division
- Act. 4**
- | | |
|---------|--------|
| Mitosis | 1. 2 |
| Meiosis | 4 |
| | 2. No |
| | 3. No |
| | 4. Yes |



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