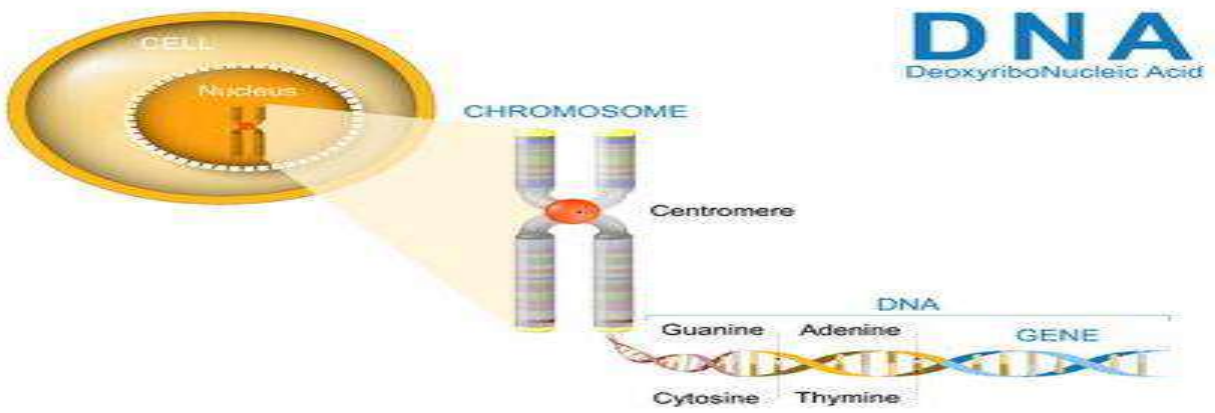
Name: Date: Period:

Cell Cycles and DNA Study Guide



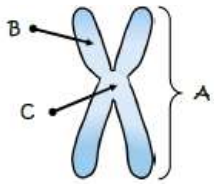
DNA (Deoxyribonucleic Acid) is the chemical inside the nucleus of cells that contains hereditary information. DNA is shaped like a double helix/twisted ladder. The sides of the ladder are made up of sugar-phosphate molecules. The steps of the ladder are made up of four nitrogen base pairs. **Adenine always bonds with Thymine. Guanine always bonds with Cytosine**.

Chromosomes are rod-shaped or threadlike structures made of tightly coiled DNA typically containing thousands of genes that hold hereditary information.

Genes are small sections of DNA on a chromosome.

Practice Questions:

1. Label the following:



A) CHROMOSOME B) CHROMATID C) CENTROMERE

2. List the sequence of DNA bases that would pair with the following strand:

1 2 3
GTA AGT GAC

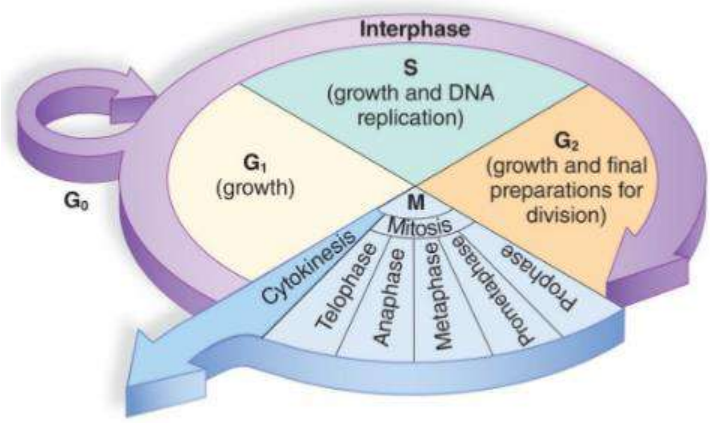
CAT TCA CTG

3. Identify the shape of DNA DOUBLE HELIX/TWISTED LADDER.

4.

A chromosome is best described as a

A. gene that has more than one form.
B. green cell found in many plants.
C. strand of DNA containing genetic information.
D. reproductive cell found in certain kinds of bacteria.



The **Cell Cycle** is the life cycle of the cell. **Interphase** is the longest phase of the cell cycle. Interphase includes three stages: G1 (cell growth), S (DNA replication), and G2 (rapid cell growth). Mitotic cell division follows. After mitosis, cytokinesis occurs.

Practice Questions:

5. Mitosis includes

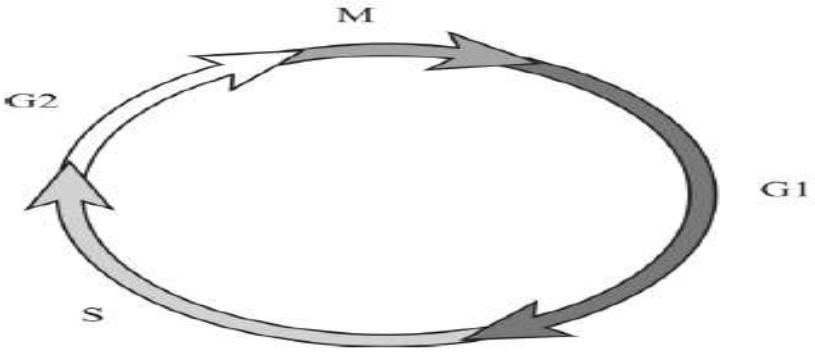
a. Cell growth

b. DNA replication

c. PMAT

d. Splitting of cytoplasm

6.



Which of the following activities occurs in the G1 phase?

A. growth of the cell

B. replication of the DNA

C. formation of the mitotic spindle

D. breakdown of the nuclear membrane

Note: These are test-like practice questions. Please study the practice questions for understanding not memorization. Please keep this as a study guide for your nine weeks and state tests.

7. During which phase of the cell cycle is the cell growing and preparing for cellular division?

A. cytokinesis B. anaphase

C. prophase D. interphase

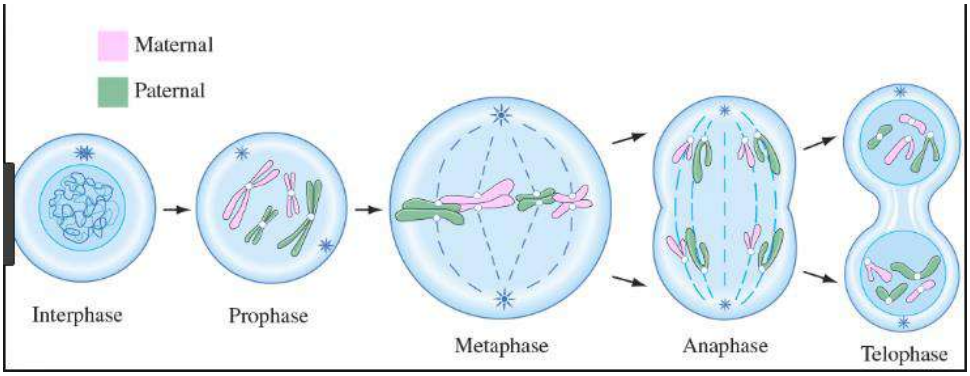
8. Before mitosis begins, which happens before the nucleus starts dividing?

A. The cytoplasm separates.

B. The DNA replicates.

C. The sister chromatids separate.

D. The homologous chromosomes cross over.



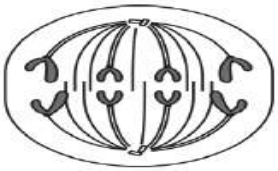
Mitosis is the process in which the nucleus divides to form two new nuclei that have the same genetic information. It is necessary for asexual reproduction to occur. Prior to mitosis, interphase occurs. Mitosis includes four phases

- Prophase – Chromosomes condense and become visible, spindle fibers appear, nuclear membrane dissolves
- Metaphase - Chromosomes line up in the middle of the cell along spindle fibers
- Anaphase – Chromosomes are pulled away towards opposite ends of the cell.
- Telophase – Chromosomes reach the poles of the cell, nuclear membrane forms abound two new nuclei.

After mitosis, cytokinesis occurs (cytoplasm splits creating two new daughter cells identical (diploid) to the parent).

Practice Questions:

9. Identify the phase of mitosis shown in the diagram. ANAPHASE



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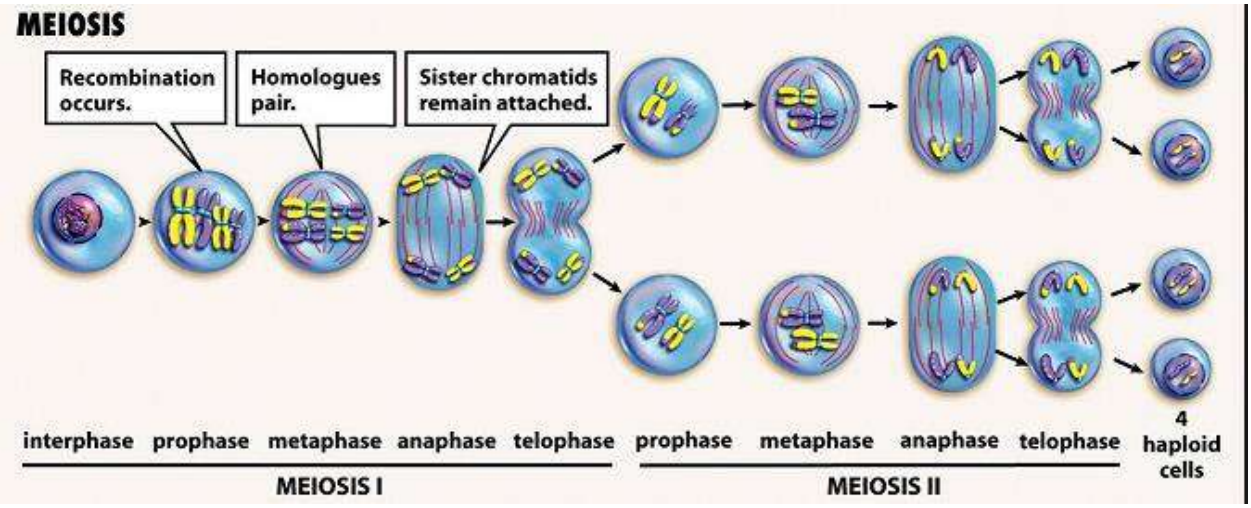
10. During which phase do chromosomes line up at the center? METAPHASE

11. How many daughter cells are produced in mitosis? 2

12. Circle one: Mitosis results in (haploid/diploid) cells.

13. Circle one: Mitosis results in (identical/unique) daughter cells.



Meiosis is when a cell goes through a double cell division process of the nucleus to produce 4 new haploid cells called gametes with half the number of chromosomes as the original cell. Meiosis occurs in the reproductive organs of organisms and produces male sperm and female eggs. It is necessary for sexual reproduction to occur. It occurs in two stages, Meiosis I and II.

- Meiosis I (see phases of mitosis)
  - Prophase 1, Metaphase 1, Anaphase, Telophase 1
- Meiosis II
  - Prophase 2, Metaphase 2, Anaphase 2, Telophase 2, Cytokinesis

During Prophase I chromosomes condense and crossing over occurs. Crossing over is the process by which the two chromosomes of a homologous pair exchange equal segments with each other.
In Metaphase I, homologous tetrads line up at the center of the cell. In Anaphase I, homologous pairs are separated leaving chromosomes intact. Telophase I creates two identical daughter cells.
Interphase DOES NOT occur again between Meiosis I and Meiosis II so that chromosomes become haploid.
In prophase II, chromosomes condense, but crossing over does not occur (no pairs). In Metaphase II, single chromosomes line up at the center of the cell. In Anaphase II, sister chromatids are pulled apart. In Telophase II, the nuclear membrane forms around the four unique chromatids formed in meiosis.
Cytokinesis occurs.

Practice Questions:

14. A cell containing 20 chromosomes at the beginning of meiosis would, at its completion, produce cells containing how many chromosomes? 10 CHROMOSOMES

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15. A sperm cell contains 40 chromosomes at the end of meiosis how many chromosomes would be present in its somatic (body) cells?? 80 CHROMOSOMES

16.

The genome of a goldfish contains 96 chromosomes. How many chromosomes will each daughter cell have after mitosis of a goldfish cell is complete?

A. 24 B. 48 C. 96 D. 192

17.

Which of the following statements correctly describes meiosis?

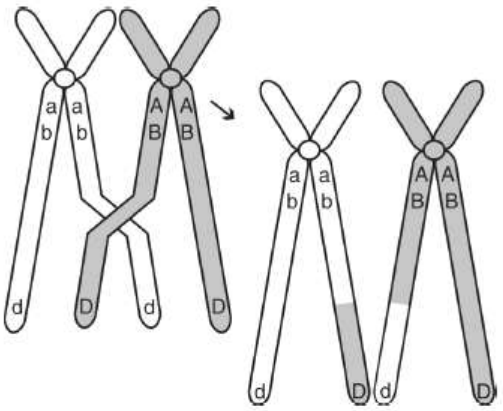
A. Cells divide only once during meiosis.

B. Meiosis does not occur in reproductive cells.

C. The cells produced at the end of meiosis are genetically identical to the parent cell.

D. The cells produced at the end of meiosis contain half the number of chromosomes as the parent cell.

18.



The diagram above shows homologous chromosomes during prophase I of meiosis. Which of the following correctly describes the process being illustrated?

A. mutation in which the DNA content of the gene is altered

B. segregation of sister chromatids

C. condensation and segregation of alleles

D. crossing-over in which alleles are exchanged

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Differences between Mitosis & Meiosis

Characteristic	Mitosis	Meiosis
# of daughter cells produces	2	4
Number of divisions	once	twice
Type of Chromosome number in daughter cell	Diploid (full set) Body cells	Haploid (half set) Gametes (sex cells)
Purpose/function	Growth, repair, some asexual reproduction	Produce sex cells for Sexual reproduction
Genetic information	Identical	variations

The process of **asexual reproduction** involves only one parent and produces genetically identical offspring, whereas **sexual reproduction** involves two parents and contributes to genetic variation.

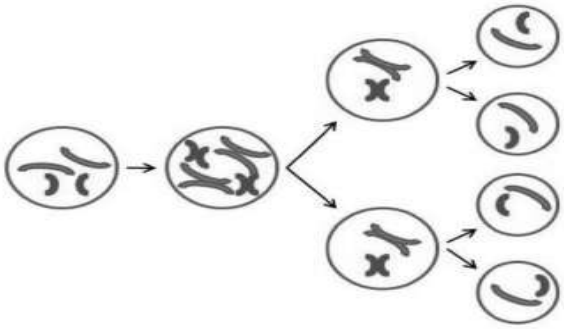
When gametes (sperm and egg cells) fuse, **fertilization** occurs producing a **zygote** with a diploid set of chromosomes (half from mother, half from father).

Practice Questions:

19. How many daughter cells are produced in meiosis? 4

20. Circle one: Meiosis results in (haploid/diploid) cells.

21. Circle one: Meiosis results in (identical/unique) daughter cells.



Which process and type of resulting cells are represented in the diagram?

A. mitosis, which produces gametes

B. mitosis, which produces body cells

C. meiosis, which produces gametes

D. meiosis, which produces body cells

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