# Organism of the Day

## Steller's Jay

- Native to BC
- One of two NA species with crests on the head.
- Named after Georg Steller (not Stellar) who "discovered" the species.
- Use mud, moss, leaves, stems and sticks to build their nests.
- They eat eat both plant parts (seeds and fruits) and animals (arthropods, eggs, and chicks).

Scott Thompson

Linda Tanner

Please log into iClicker Cloud

# Introduction To Genetics
# &
# Cells Making More Cells

Class (BIOL121 Section 222)

Dr. Brett Couch

Date: Jan 8, 2017

Clicker Icon Box

Learning Outcomes

Interpreting Diagrams

Mitosis and the Cell Cycle

Mitosis Activity

Wrap-Up

Scott Thompson

Linda Tanner

# Course Goals for Genetics

A. Describe, diagram, and make predictions about cellular mechanisms and their effect on DNA at multiple scales.
B. Analyze different kinds of genetic data and explain how they are the result of cellular mechanisms.

# General Learning Outcomes for Today

**A1** Interpret, describe and draw diagrams and illustrate the overall structure and composition of eukaryotic genomes from the scale of DNA base pairs to genes to chromosomes.

**A2** Draw or interpret diagrams of chromosomes (including relevant genes and alleles) in cells of different haploid numbers and ploidy levels, through different stages of the cell cycle, during mitosis.

# What is the ploidy of the cell indicated with the arrow?

A. Haploid
B. Diploid
C. Polyploid
D. It is not possible to determine the ploidy from the figure.
E. I don't know

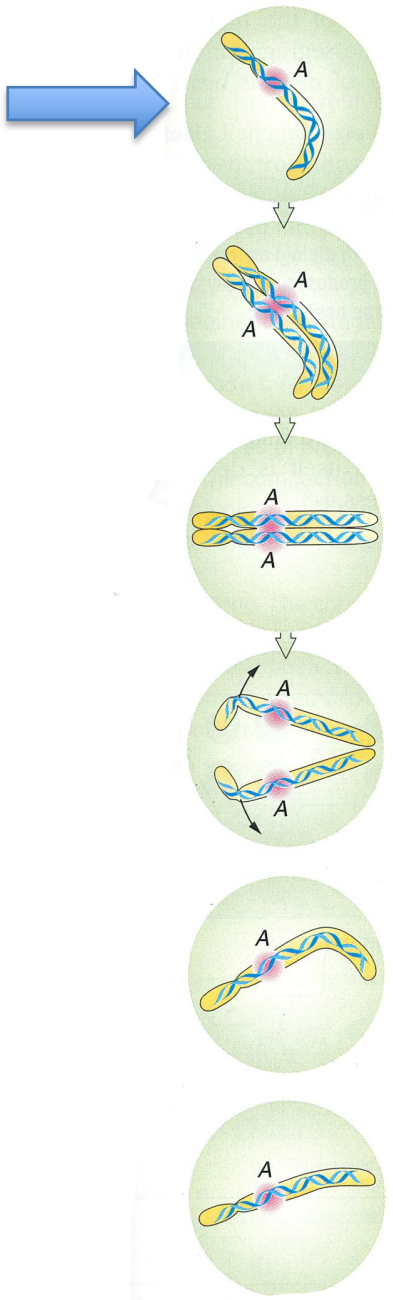



Image from Griffiths et.al
Modern Genetic Analysis
1999

# What is the ploidy of the cell indicated with the arrow?

A. Haploid
B. Diploid
C. Polyploid
D. It is not possible to determine the ploidy from the figure.
E. I don't know

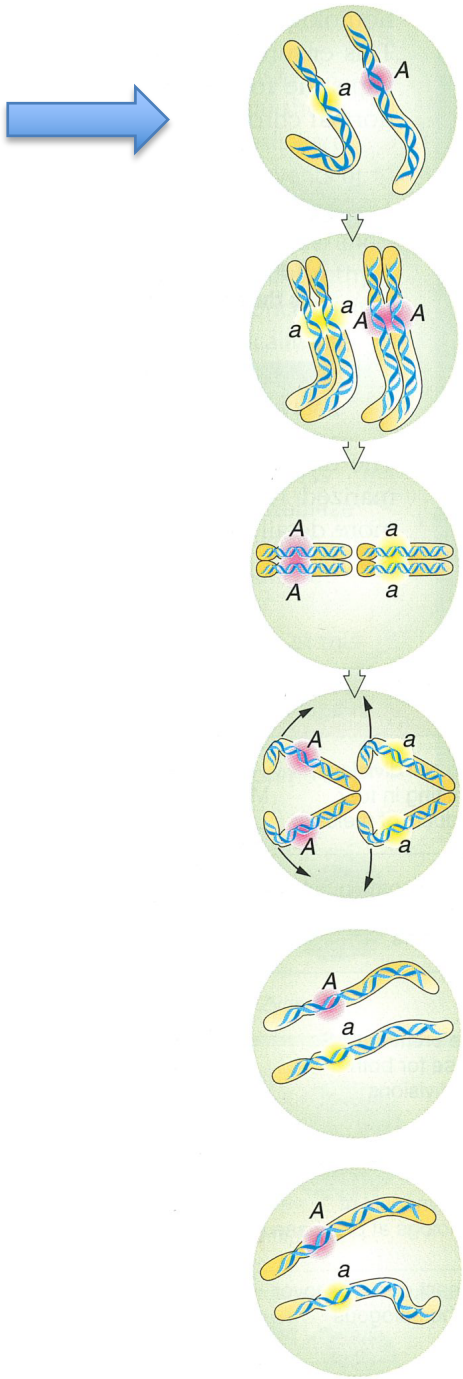



Image from Griffiths et.al Modern Genetic Analysis 1999

# What happened between the image of cell #1 and #2?

- Type your answer into iClicker cloud.
- Please do not put answers in the chat.

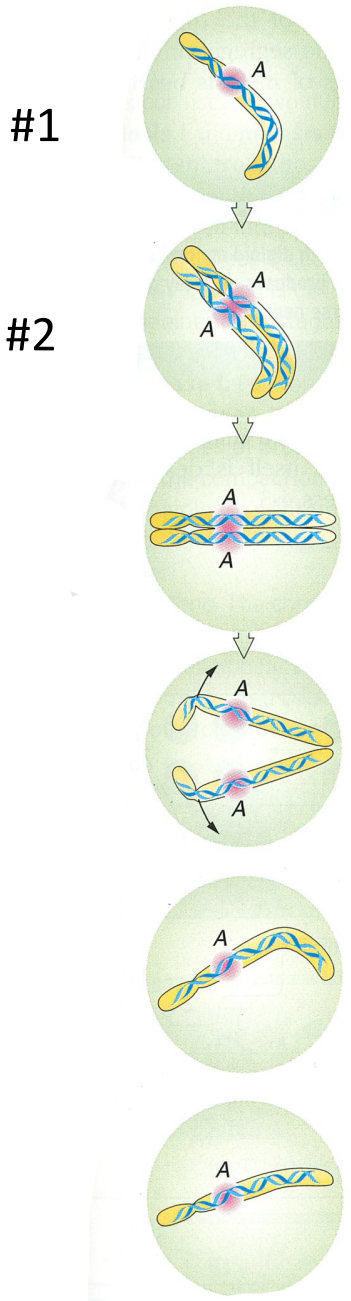
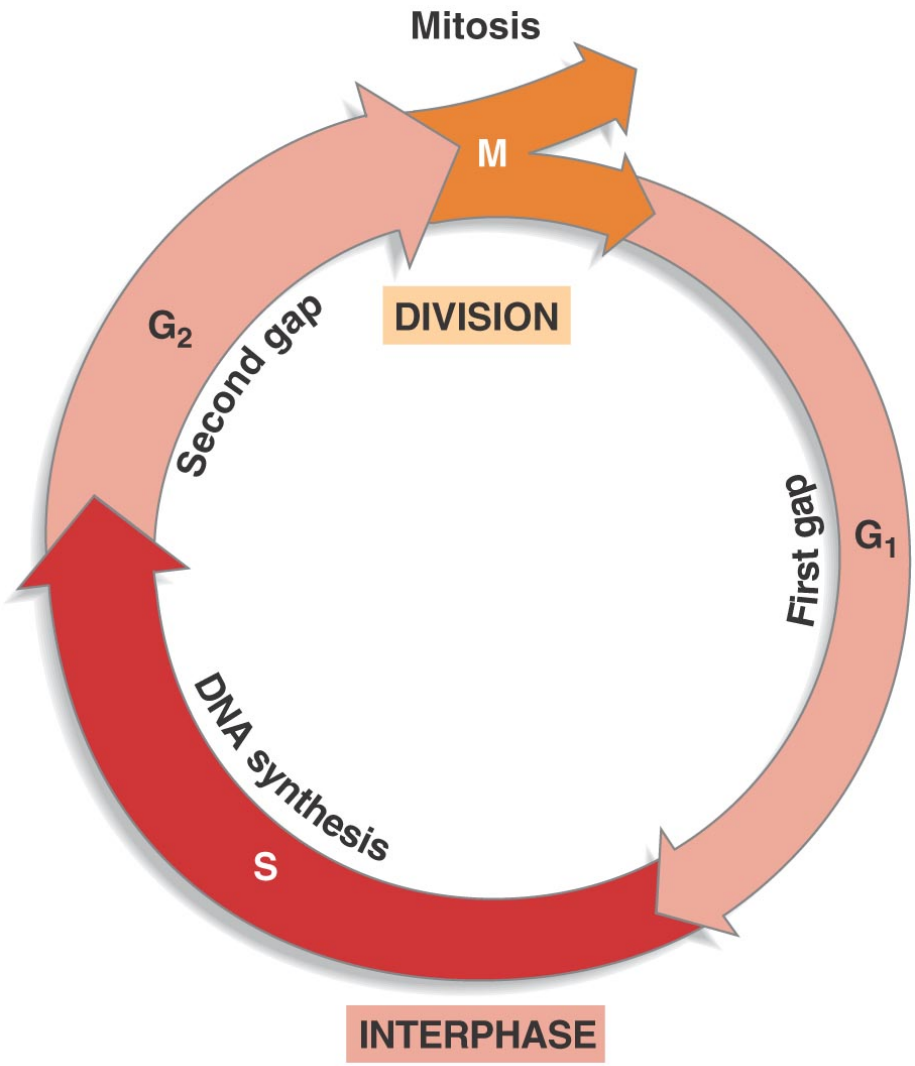



Image from Griffiths et.al Modern Genetic Analysis 1999

# The Cell Cycle Is Broken into Four Major Stages

- G1 – First Gap
  - Cell Growth
- S – DNA synthesis
  - Chromosomes are copied
- G2 – Second Gap
  - Preparation for division
- M – Mitosis
  - Nuclear division
  - Cell Division



# What is the ploidy of the cell indicated with the arrow?

A. Haploid
B. Diploid
C. Polyploid
D. It is not possible to determine the ploidy from the figure.
E. I don't know

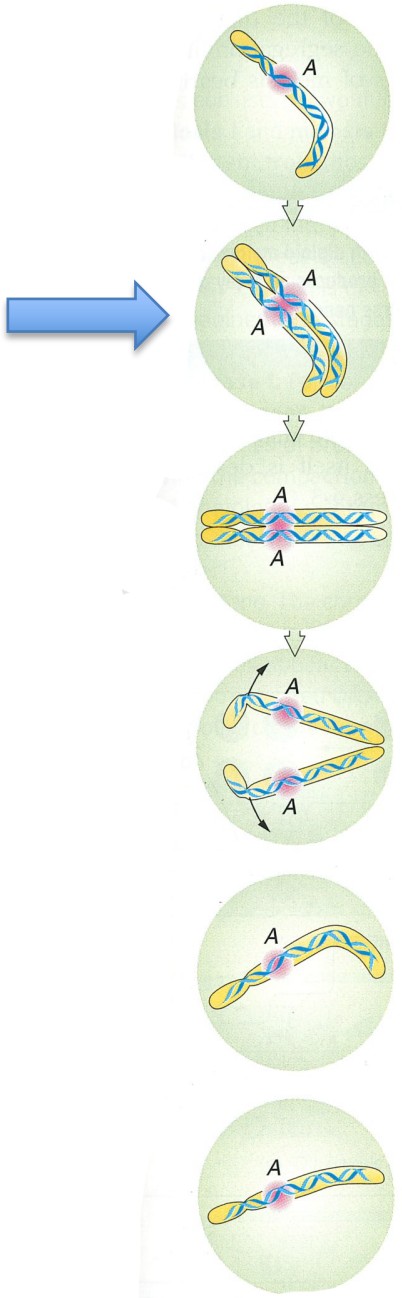



Image from Griffiths et.al Modern Genetic Analysis 1999

# What stage is depicted in the cell indicated with the arrow?

- Type your answer into iClicker cloud.
- Please do not put answers in the chat.

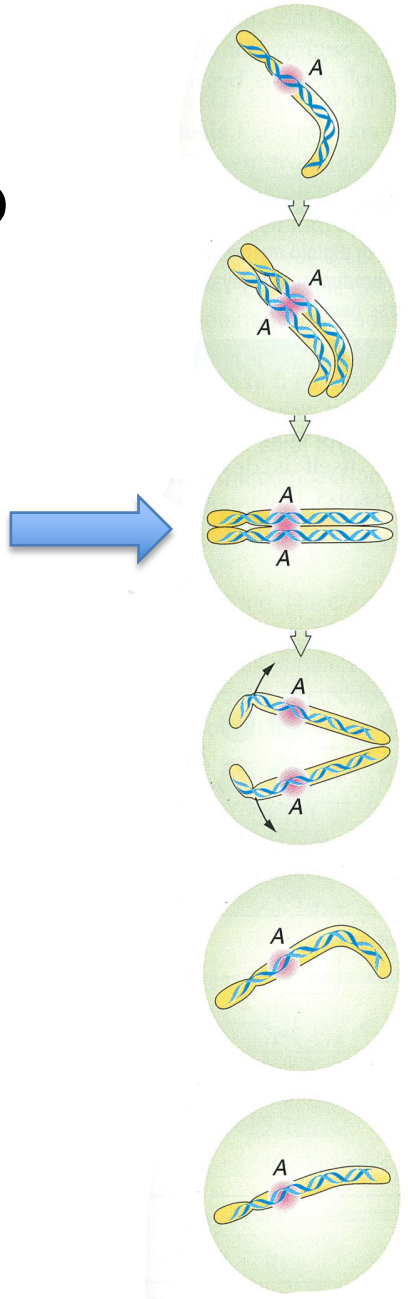



Image from Griffiths et.al Modern Genetic Analysis 1999

# What stage is depicted in the cells indicated with the arrow?

- Type your answer into iClicker cloud.
- Please do not put answers in the chat.

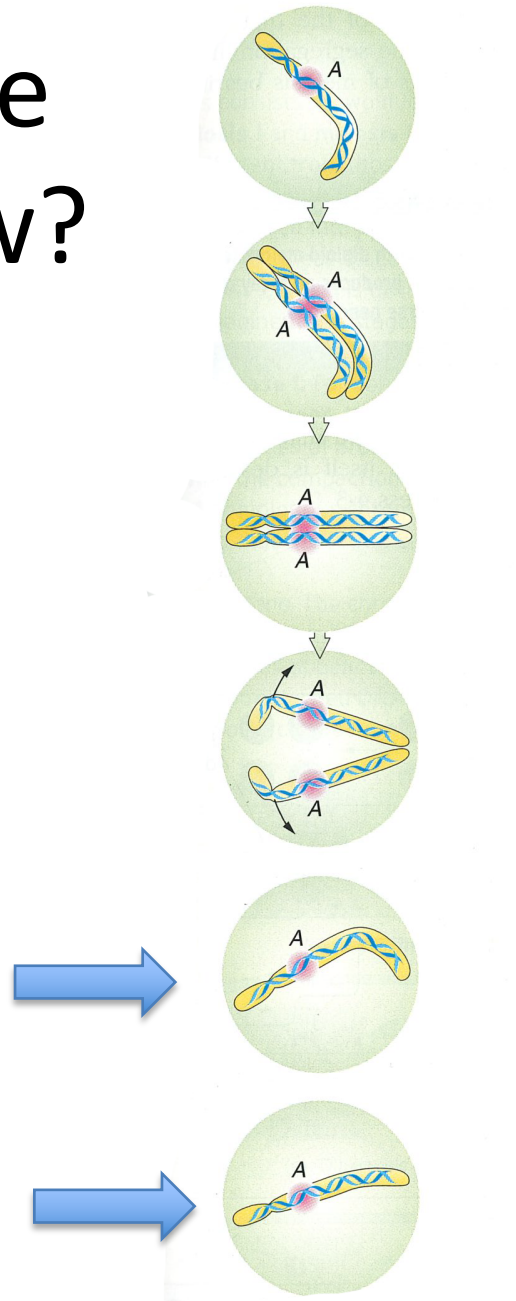
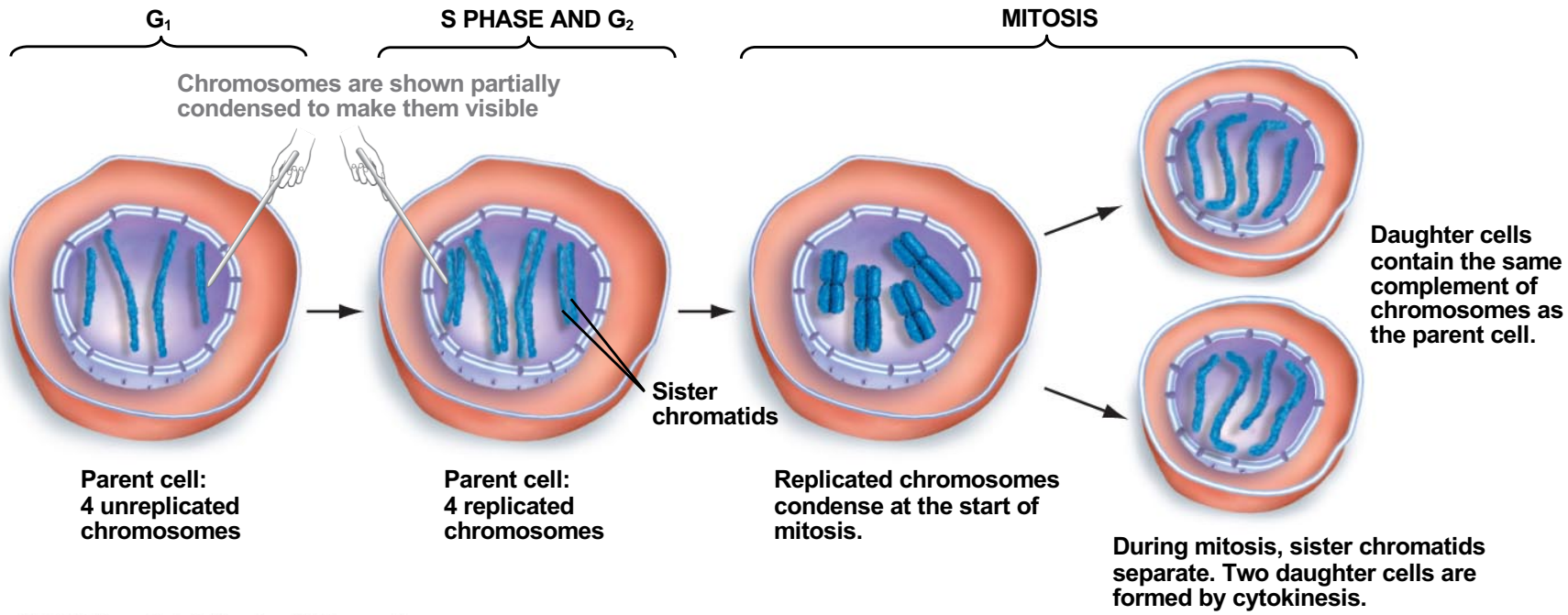



Image from Griffiths et.al Modern Genetic Analysis 1999

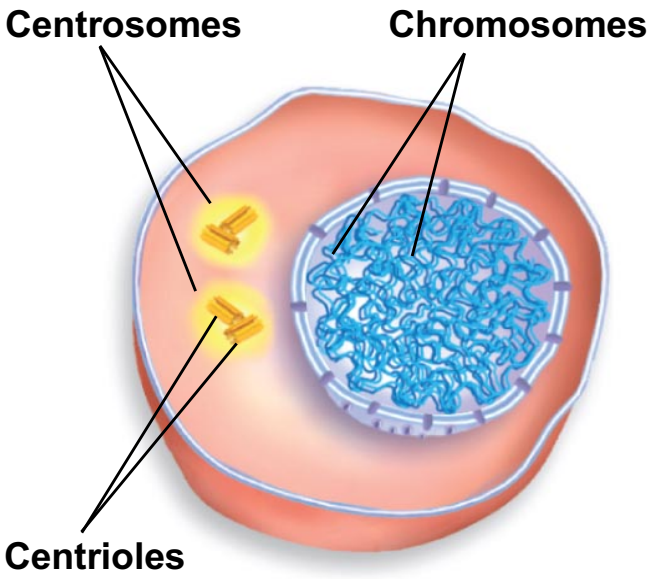
# An Overview of Mitosis

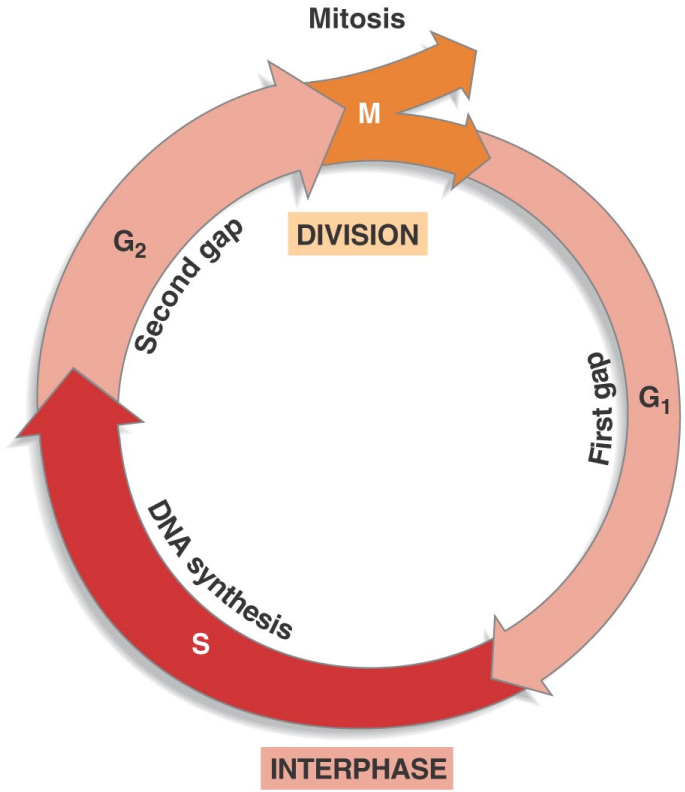


# Mitosis and Cytokinesis

## PRIOR TO MITOSIS

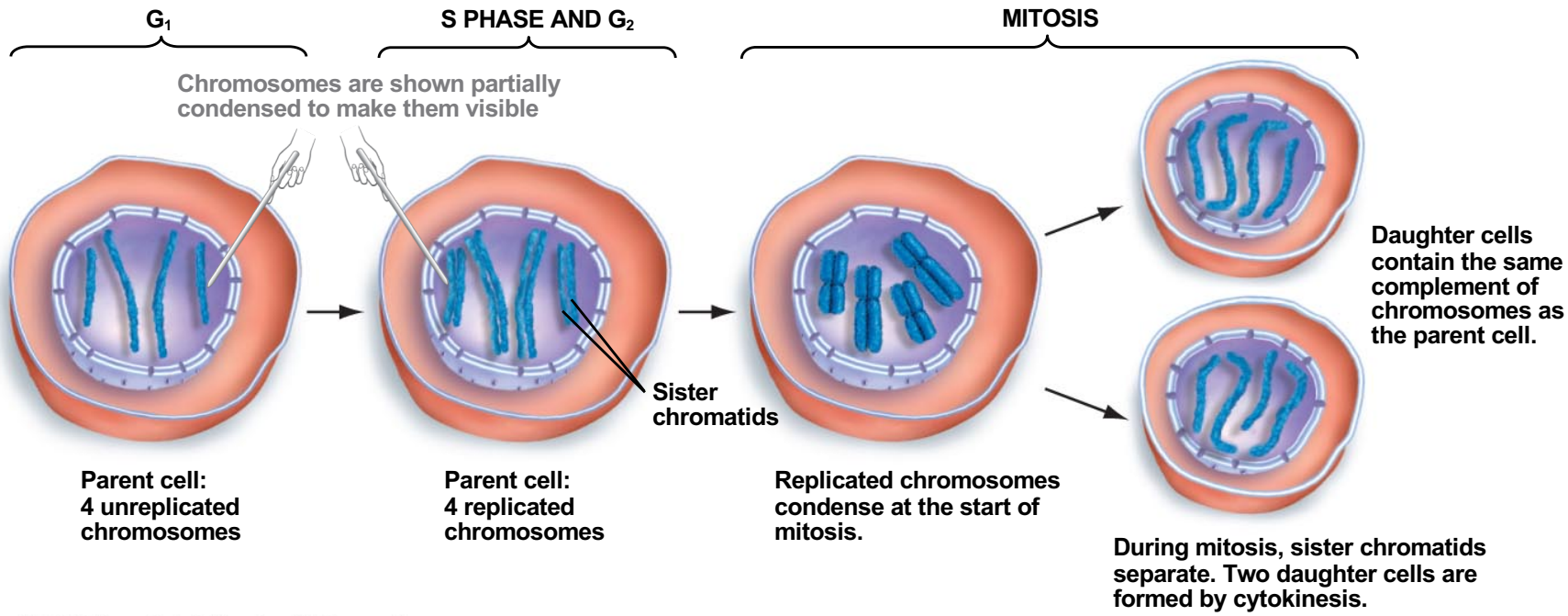
**Chromosomes replicate.**




**1. Interphase: After chromosome replication, each chromosome is composed of two sister chromatids. Centrosomes have replicated.**

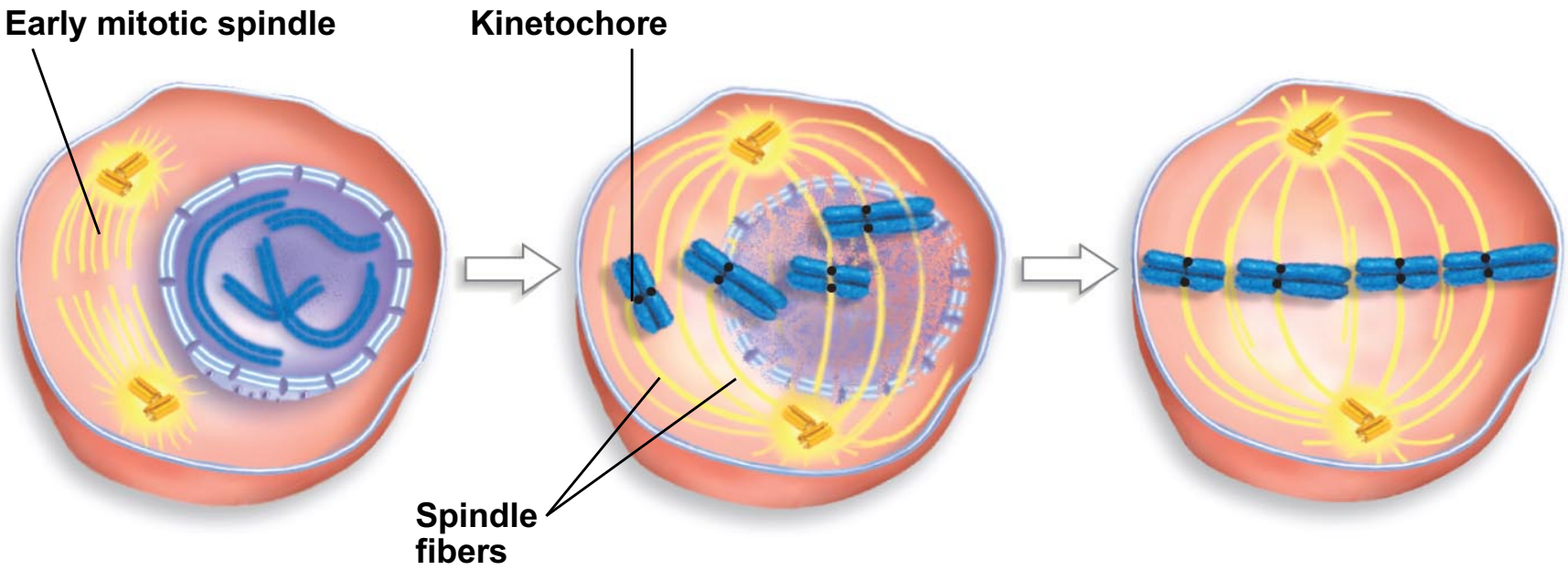
# Why are chromosomes shown as condensed in G1 in this figure?



# Mitosis and Cytokinesis

## MITOSIS

**Sister chromatids separate; one chromosome copy goes to each daughter nucleus.**

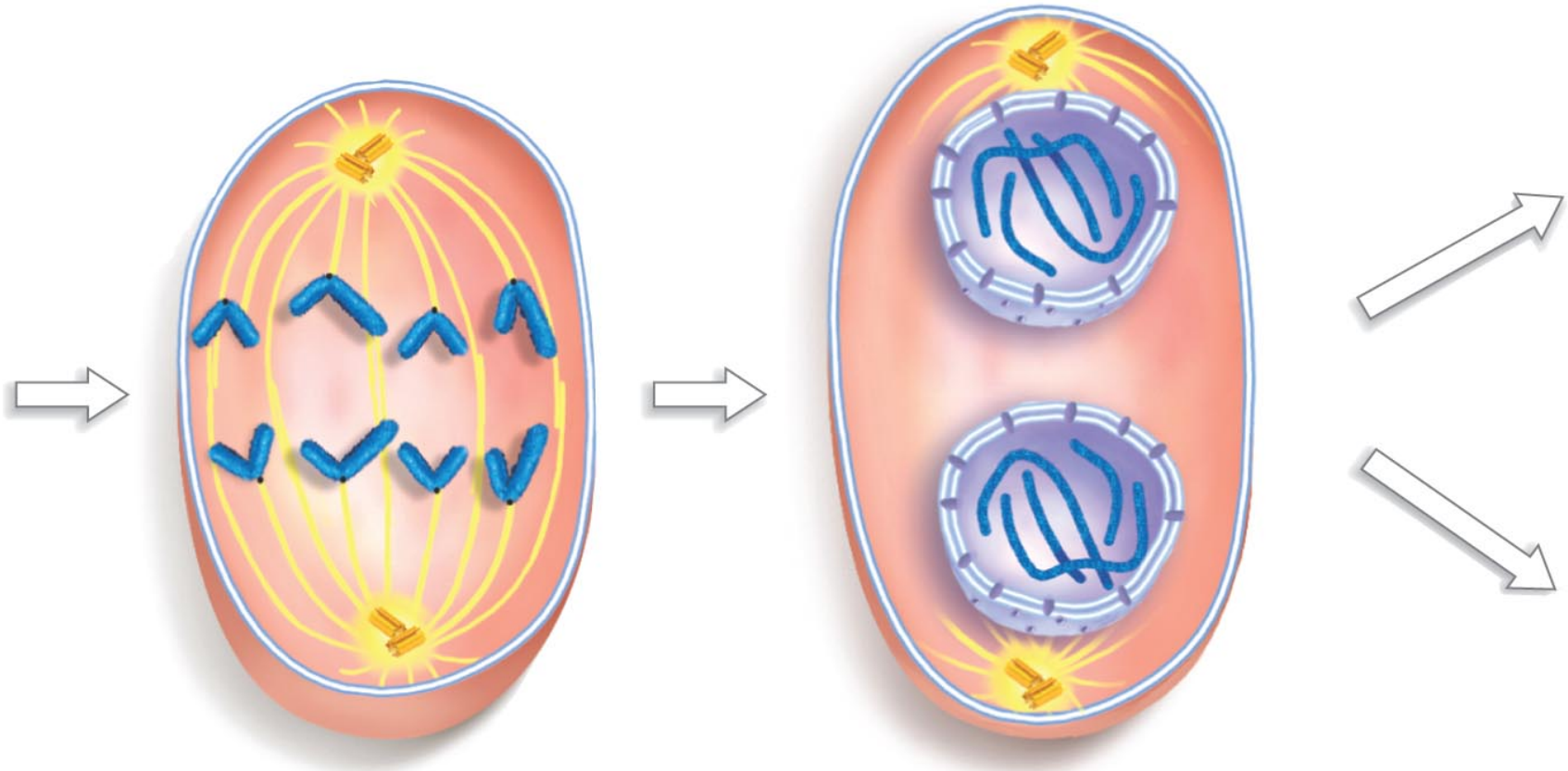



**2. Prophase:** Chromosomes condense, and mitotic spindle begins to form.

**3. Prometaphase:** Nuclear envelope breaks down. Spindle fibers contact chromosomes at kinetochore.

**4. Metaphase:** Chromosomes complete migration to middle of cell.

# Mitosis and Cytokinesis

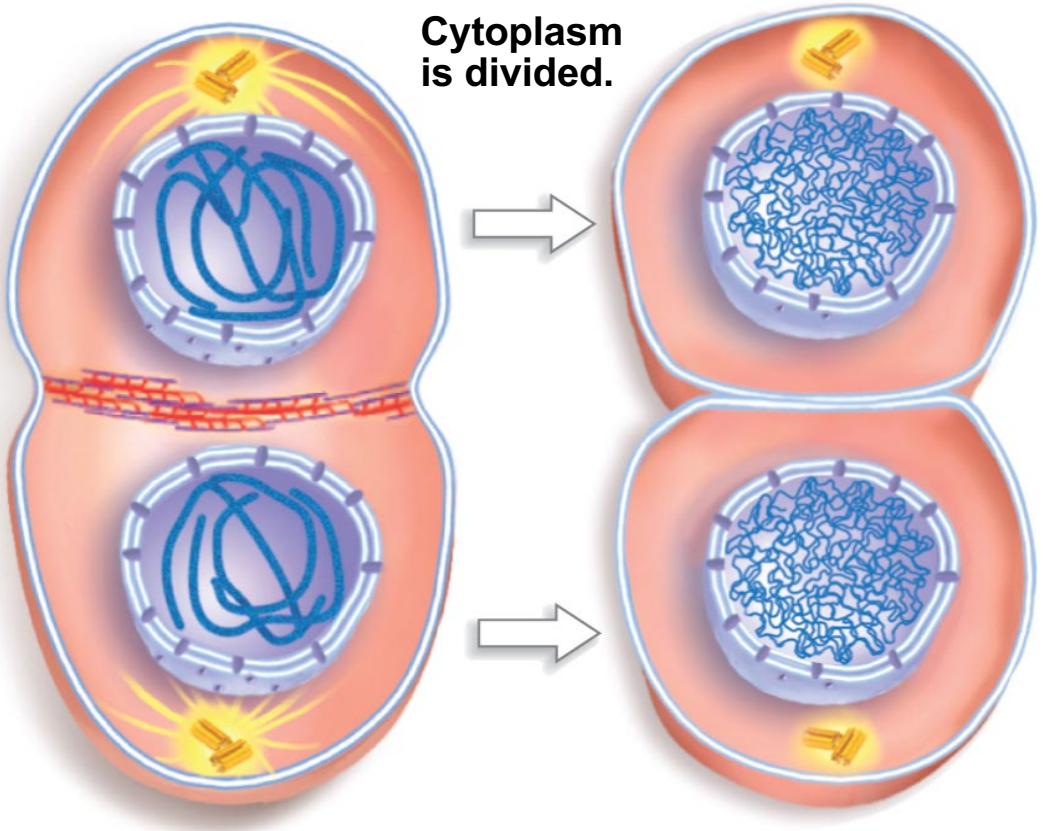


**5. Anaphase:** Sister chromatids separate. Chromosomes are pulled to opposite poles of the cell.

**6. Telophase:** The nuclear envelope re-forms, and the spindle apparatus disintegrates.

# Mitosis and Cytokinesis

## CYTOKINESIS




**7. Cell division begins:** Actin-myosin ring causes the plasma membrane to begin pinching in.

**8. Cell division is complete:** Two daughter cells form.

# In general, if a diploid cell of 2N=8 undergoes mitosis and cytokinesis, the result would be:

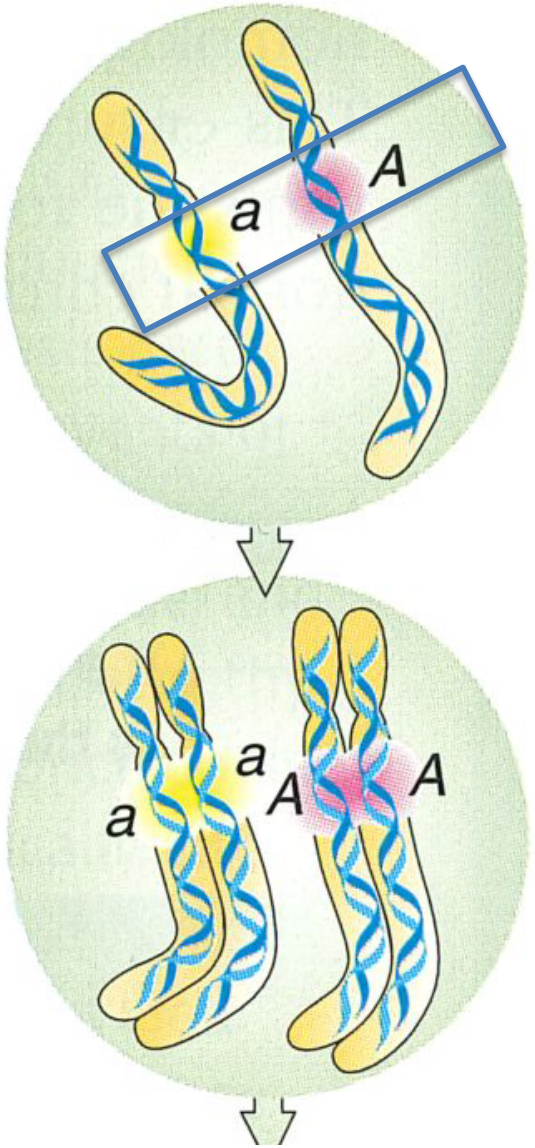
A. Four genetically different haploid cells (N=4).
B. Four genetically identical haploid cells (N=4).
C. Four genetically identical diploid cells (2N=8).
D. Two genetically different diploid cells (2N=8).
E. Two genetically identical diploid cells (2N=8).

A normal haploid cell from a particular species is known to contain 1.05 pg (picograms) of DNA. At what stages would the cell contain 2.1 pg of DNA?

i. During S phase.
ii. $G_1$ phase.
iii. $G_2$ phase.
iv. Metaphase

A. i and ii
B. ii and iii
C. iii and iv
D. i and iv
E. It would not contain 2.1 pg of DNA at any of these stages.

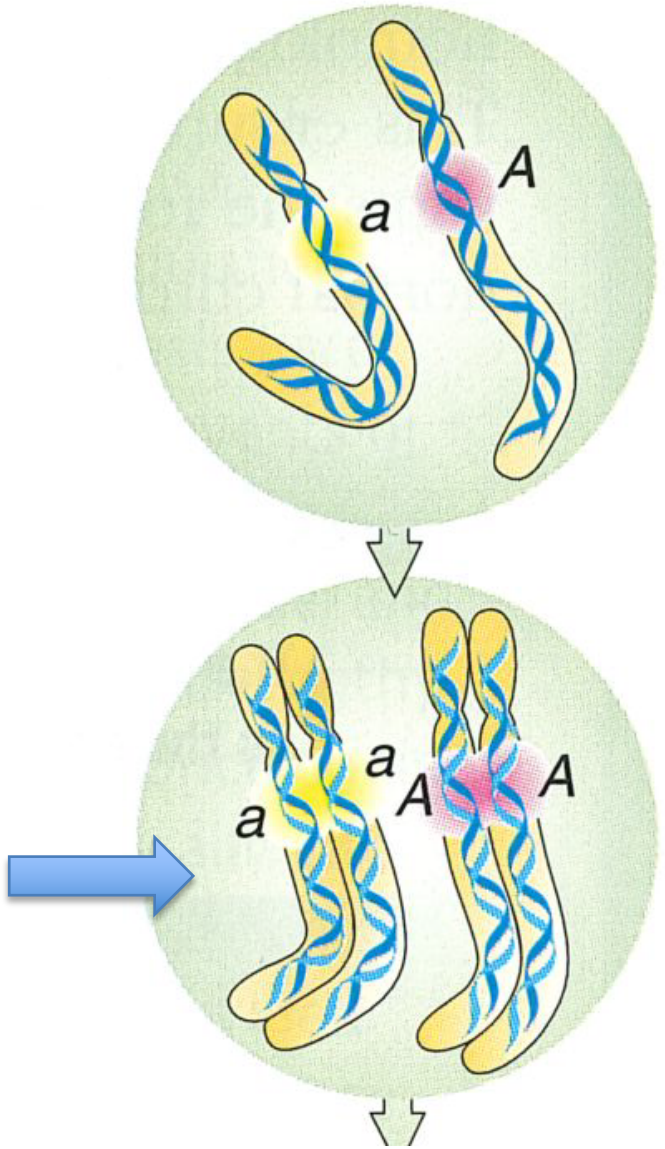
# What does the region of the chromosome surrounded by the box indicate?




- Type your answer into iClicker cloud.
- Please do not put answers in the chat.

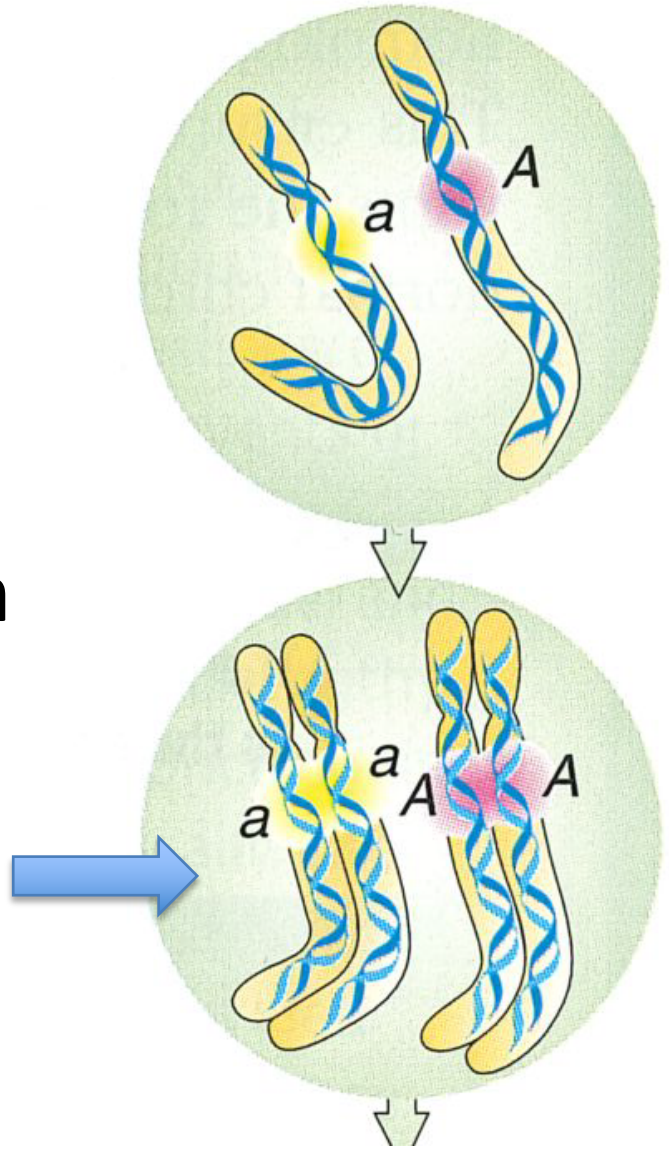
# How many chromatids are present in the cell indicated with the arrow?

- Type a numerical value (e.g. 0,1,2) into iClicker cloud.
- Please do not put answers in the chat.



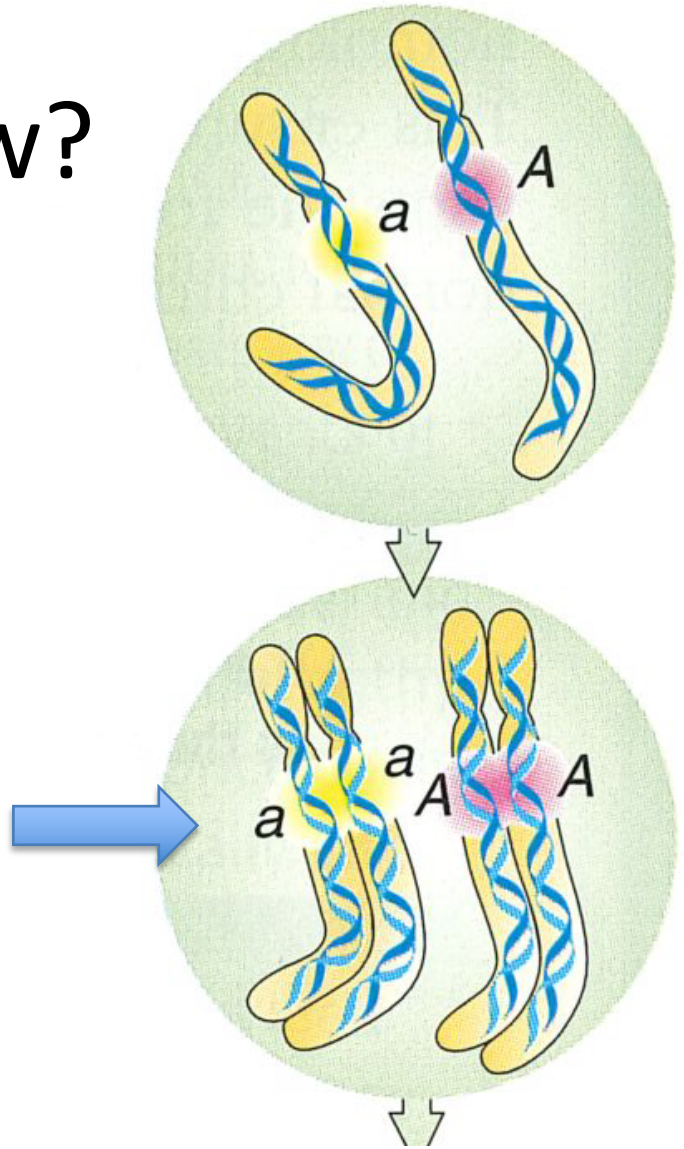
# How many chromosomes are present in the cell indicated with the arrow?

- Type a numerical value (e.g. 0,1,2) into iClicker cloud.
- Please do not put answers in the chat.

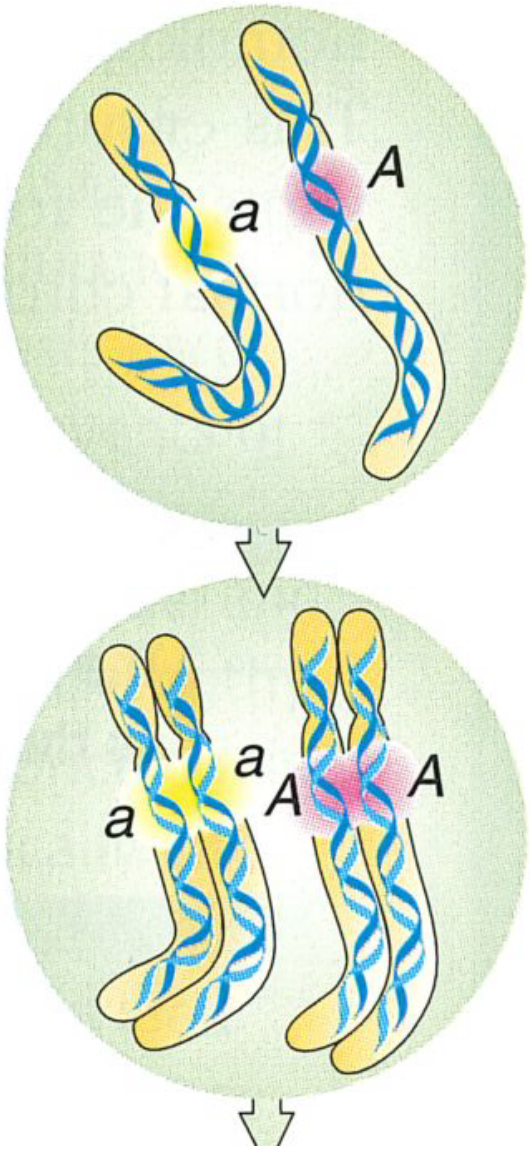


# How many dsDNA molecules are present in the cell indicated with the arrow?

- Type a numerical value (e.g. 0,1,2) into iClicker cloud.
- Please do not put answers in the chat.



In cell #1 the single DNA strands are indicated in one shade of blue. In cell #2 the single strands of DNA are indicated in different shades of blue. Why?



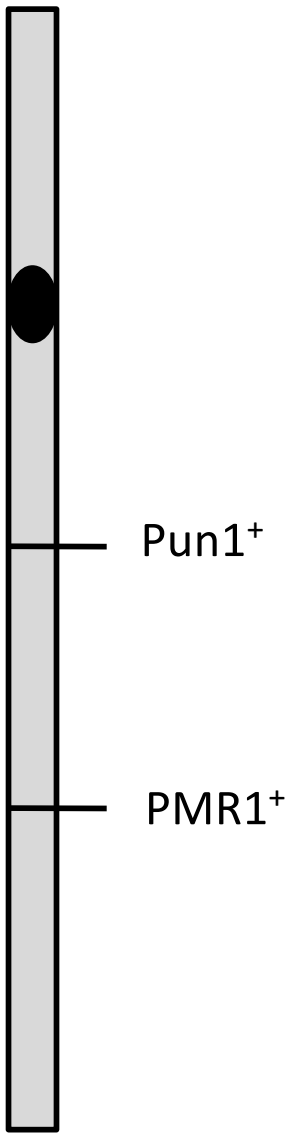
As a result of semi-conservative DNA replication, following DNA replication double stranded DNA (dsDNA) molecules:

A. dsDNA molecules in a cell contain one newly synthesized strand and one original (old) strand.
B. dsDNA molecules in a cell either contain original (old) strands or newly synthesized strands.
C. dsDNA molecules are composed of single strands that are a mixture of old and newly synthesized fragments.
D. dsDNA molecules in a cell are composed of only newly synthesized strands.

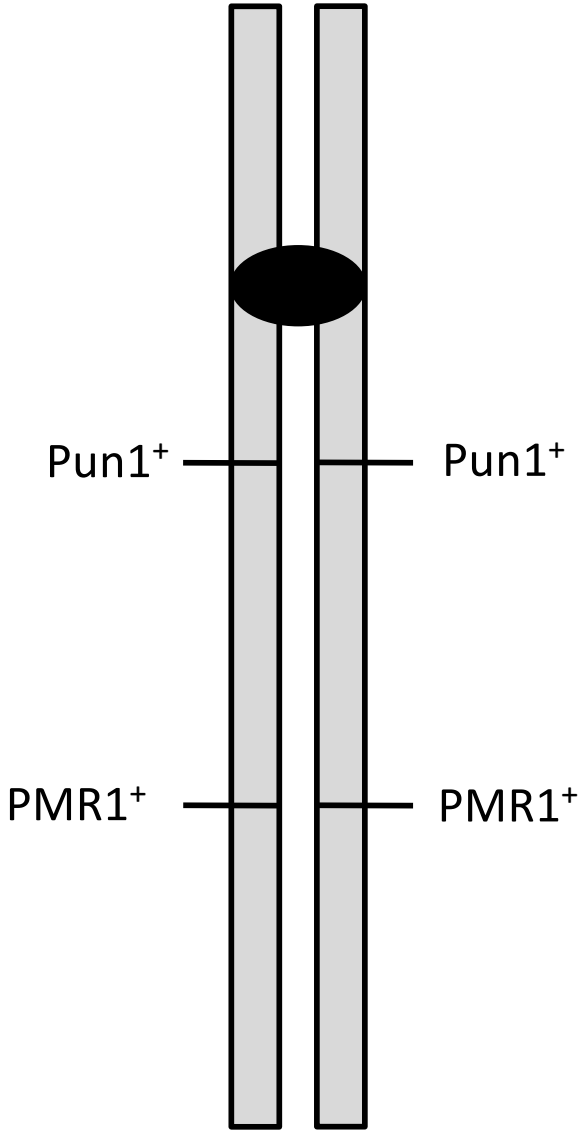
# Following DNA replication each chromosome is composed of two chromatids.

A. Each chromatid is composed of a dsDNA molecule with one newly synthesized strand and one original (old) strand.
B. One chromatid is composed of a newly synthesized dsDNA molecule. The other chromatid is composed of the original (old) dsDNA molecule.
C. One chromatid is composed of the old single stranded DNA molecule. The other chromatid is composed of the newly synthesized DNA molecule.
D. Both chromatids are composed entirely of newly synthesized dsDNA molecules.

# Diagramming Chromosomes in BIOL121




Un-replicated chromosome




Replicated chromosome (two chromatids)

# Genes, Alleles and Loci

- Diagram a diploid cell with a single type of chromosome.
- Diagram chromosomes in $G_1$
  - Chromosomes must be shown as condensed for clarity
- Diagram the location of the centromere
- Add genes to the chromosomes at different genetic loci
  - Wx (Waxy)
  - Xa26
- Indicate different alleles of the genes with a “+” or “–” sign.
- Diagram the same cell at metaphase of mitosis showing
  - Genetic loci, alleles, centromeres and the direction of chromosome movement
  - Diagram the resulting products.
- Submit this group activity through Gradescope.