

Modeling Mitosis

How do cells make more of themselves?

You may have seen fruit flies buzzing around a bowl of fruit. They are tiny, but if you look closely you may see red or white eyes. Like all living organisms, fruit flies grow. Growth occurs when cells reproduce or make copies of themselves. Mitosis is the process by which a cell divides into two daughter cells, each of which has the same number of chromosomes as the original cell. In this investigation you will simulate mitosis in fruit flies.



Materials

- Mitosis Template on large piece of paper
- 16 pipe cleaners of 2 different colors and 4 matching lengths
- Beads
- Colored pencils

Procedure

- Obtain the Mitosis Template. The circles represent a fruit fly body cell in different stages of the cell cycle and mitosis.
- Get a set of pipe cleaners to represent chromosomes. One color will represent the maternal chromosomes and the other color will represent the paternal chromosomes. Chromosomes occur in homologous pairs (homologous means having a similar structure). So use the same length of pipe cleaner for each homologous pair. You should have two sets of four different lengths of pipe cleaners.
- Begin by assembling a diploid set of chromosomes for a fruit fly as they exist during most of interphase (specifically the Gap 1 or G1 phase). A diploid set contains pairs of homologous chromosomes. Each chromosome at this point will be a single strand. You will have an extra set of each length and color left over.

1. What is the diploid number of chromosomes in a fruit fly? _____
2. How many homologous pairs of chromosomes does a fruit fly have? _____
3. Referring to the Mitosis Template diagram, name the steps that are part of **mitosis**.

4. Which steps are parts of the rest of the cell cycle? _____

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- In late interphase (specifically the synthesis or S phase), the amount of DNA doubles. That means each chromosome now doubles. Select a matching pipe cleaner (same length and color) for each chromosome and slide both through a bead. You now should have a set of eight doubled chromosomes arranged in homologous pairs.
- Review the mitosis diagrams in your lab manual, posters, and models and move the chromosomes through the rest of the steps on your Mitosis Template.
- Then, draw your final results on your own Mitosis Template provided on the last page of this handout. Use different colors to represent the maternal and paternal chromosomes. Complete the table describing key events that occur in each phase, making sure to include appropriate terminology.

Applying your knowledge

Fill in Table 1 with the correct information.

Table 1: Cell cycle and mitosis in fruit flies

Step	Number of cells	Number of chromosomes in each nucleus	Number of homologous pairs in each nucleus
Interphase (G1)			
Cytokinesis			

5. What is the purpose of mitosis?

A diploid set of human chromosomes contains 23 homologous pairs (46 chromosomes). Fill in **Table 2** with the correction information regarding human body cells.

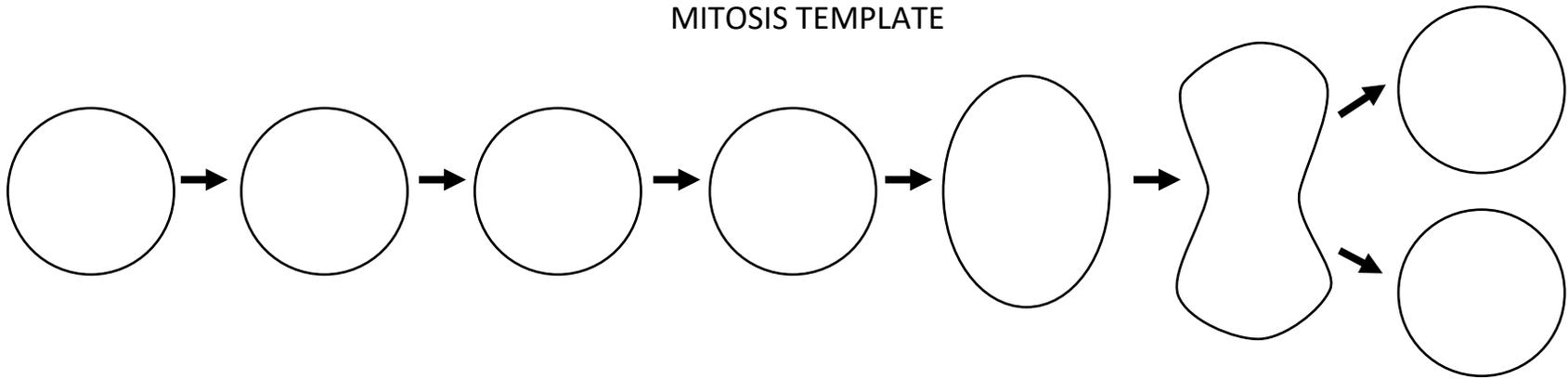
Table 2: Cell cycle and mitosis in humans

Step	Number of cells	Number of chromosomes in each nucleus	Number of homologous pairs in each nucleus
Interphase			
Cytokinesis			

6. Why is it necessary to double the amount of genetic material before mitosis begins?

7. The two daughter cells end up with an exact copy of the genetic material from the parent cell. How does your simulation support this statement?

MITOSIS TEMPLATE



Interphase	Late Interphase	Prophase	Metaphase	Anaphase	Telophase	Cytokinesis & Interphase