

Name: _____ Period: _____ Date: _____

Ms. Randall Anatomy and Physiology

Lab activity: Modeling Mitosis

Background: Mitosis is simply described as having four stages—prophase, metaphase, anaphase, and telophase; the steps follow one another without interruption. The entire four-stage division process averages about one hour in duration, and the period between cell divisions, called interphase, varies greatly but is considerably longer.

During **interphase** the chromosomes are dispersed in the nucleus and appear as a network of long, thin threads or filaments, called the chromatin. At some point before prophase begins, the chromosomes replicate themselves to form pairs of identical sister chromatids; the DNA of the chromosomes is synthesized only during interphase, not while mitosis is in process.

During **prophase** the two chromatids remain attached to one another at a region called the centromere, but each contracts into a compact tightly coiled body; the nucleolus and, in most cases, the nuclear envelope break down and disappear. Also during prophase the spindle begins to form. In animal cells the centrioles separate and move apart, and radiating bundles of fibers, called asters, appear around them. Some sets of fiber run from one centriole to the other; these are the spindle fibers. In plant cells the spindle forms without centrioles.

During **metaphase** the chromosomes congregate at a plane midway between the two ends to which the spindle tapers. This is called the equatorial plane and marks the point where the whole cell will divide when nuclear division is completed; the ends of the spindle are the poles to which the chromatids will migrate. The chromatids are attached to the spindle fibers at the centromeres.

During **anaphase** the two chromatids of each chromosome separate and move to opposite poles, as if pulled along the spindle fibers by the centromeres. During **telophase** new nuclear envelopes form around the two groups of daughter chromosomes (as they are now called), the new nucleoli begin to appear, and eventually, as the formation of the two daughter nuclei is completed, the spindle fibers disappear. The chromosomes uncoil to assume their dispersed distribution within the interphase nucleus. Cytokinesis, which may begin before or after mitosis is completed, finally separates the daughter nuclei into two new individual daughter cells.

Objective: To model the phases of mitosis

Materials Needed:

6 Oreo Cookies (per group of two)

2 Tablespoons assorted color rod-shaped candy sprinkles

6 Toothpicks (2 per group member)

3 paper towels (1 per group member)

Directions:

- 1) Using your textbook or other classroom resources, find an image of the cell cycle that includes: **interphase**, mitosis (**prophase, metaphase, anaphase** and **telophase**) and **cytokinesis**.
- 2) Using the image you found, you will create a model for each stage of the cell cycle listed above.
- 3) Your group has two members, and each member will model three stages⁴⁾. Carefully remove the top cookie from all six cookies by twisting the top cookie in a circular motion while holding the bottom cookie with your other hand. The bottom cookie with the cream filling attached will be used for your models (Note: You may eat the top cookie, or lay it aside.).
- 5) The cream filling represents the cytoplasm of the cell. You must create the structures inside the cell that play a role in the cell cycle using candy sprinkles.
- 6) The toothpicks may be used to remove or divide the cytoplasm or to move around the sprinkles.
- 7) Once you have created a model for each stage of the cell cycle, summarize what is happening in each stage in the table below.

Stage	Summary of Important Events
Interphase	
Prophase	
Metaphase	
Anaphase	Mitosis
Telophase	
Cytokinesis	

- 8) Once you have modeled each stage and summarized the key events, ask your teacher to review your models and summary.
- 9) Once your teacher confirms that your models and summary are accurate, you and your group may consume what remains of your Oreo cookie model.
- 10) Clean-up: Discard all materials from your lab once your teacher approves of your models and summary. Wipe off all surfaces to remove crumbs.

Bonus:

How creative are you? Can you think of a sentence to help you remember the order of events in the cell cycle?

Example: In private, my teacher always cries.

I-_____ P-_____ M-_____ T-_____ A-_____ C-_____

The best mnemonic device (sentence) will receive an extra Oreo ☺.