**Stop-Motion Mitosis Animation Project**

Stop-motion (aka stop-action) is an animation technique to make a physically manipulated object appear to move on its own. The object is moved in small increments between individually photographed frames, creating the illusion of movement when the series of frames is played as a continuous sequence.

**Objective**: Study the behavior of chromosomes during mitosis.

**Materials:** Various items to represent the cell parts such as-buttons, pipe cleaners, straws, noodles, yarn, clay/Play-Doh, paper clips, felt, etc.

**Procedure:** Using your chosen materials, construct a model of a cell for each stage of the cell cycle. Take a minimum of 24 pictures of the different stages of the cycle. Make very small changes to transition from phase to phase (5-6 pictures between each phase change). Label the stages and important parts of the cell as you are taking your pictures. Upload the pictures to a software program to create your Stop-motion video.

**Technology Part:** You will upload your pictures into a program that will help you create your animation. JellyCam is a free download that will upload your pictures and create the animation for you. iMovie or Windows Movie Maker can also be used.

**Grading:** You will receive two grades for this assignment—1 classwork/homework grade for the Planning Sheet and 1 formal grade for the Procedure & Analysis Questions and the Stop-motion Animation. Please see rubric for specific grading of the project.

**Label Requirements:** The following phases and labels will be required on your pictures and will need to stay up throughout the stage (as appropriate):

Interphase

Prophase

Metaphase

Anaphase

Telophase

Cytokinesis

Centromere

Sister Chromatids

Nuclear membrane

Cell membrane

Chromosomes

Centrioles

Spindle fibers

Cleavage furrow

**Due Dates:**

Planning Sheet: 10/29

Procedure Questions, Analysis Questions, & Stop-motion Animation Video: 10/29

Directions: Answer the following questions in **complete sentences**. Please organize questions in groups by the phase name. Each member should agree on the answer and have a copy. YOU WILL ONLY SUBMIT ONE COPY TO ME TO BE GRADED.

\*Remember…you are responsible for this information!! Be sure you understand what happens in each phase of mitosis.

**Procedure Questions:**

Interphase:

* How does one chromatid compare to its sister chromatid?
* Can you tell the difference between the original and the replicated strand?
* What are visual clues that tell you that this cell is in Interphase?

Prophase:

* What is the purpose of spindle fibers?
* How is this stage different from Interphase?

Metaphase:

* At this point, the spindle fibers growing out of the poles resemble a star-shaped structure. What is this structure called?
* Where do spindle fibers attach to the chromosomes?
* What can you use to remember what happens during this phase of mitosis?

Anaphase:

* During this phase, how does the number of chromosomes change (when compared to prophase)?

Telophase:

* Why are the chromosomes split and pulled to opposite poles?
* How does this help with cell division?
* What happens to the chromosomes at this point?
* What cellular parts disappear and what parts reappear at this stage of mitosis?

Cytokinesis:

* What is the role of the cleavage furrow?
* How does this process differ for a plant cell?

**Analysis Questions:**

Answer these questions after the Procedure Questions.

1. What is the final step of the cell cycle that follows Telophase?
2. What are the two identical “offspring” cells that come from the parent cell?
3. Why is mitosis important?
4. What does mitosis do that the cell would do wrong if it just split down the middle in cell division?
5. Why is it necessary to replicate the chromosomes during the S (synthesis) Phase before mitosis begins?
6. A common biological study specimen, the fruit fly, has four pairs of chromosomes in each cell. As it grows, it reproduces more cells via mitosis. How many chromosomes would you expect to find in each new cell?
7. Number the following steps in the correct order and tell which stage it occurs in:
   1. A cleavage furrow or cell plate forms, separating the nuclei.
   2. Chromosomes line up at the equator and chromatids are attached to spindle fibers.
   3. Nuclear membrane and nucleolus reappear.
   4. Genetic material replicates and is joined at the centromere.
   5. Centromeres divide and single-stranded chromosomes move to the poles.

Group Members Names: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Planning Sheet

You will need to plan what materials you will need to represent the cell parts and get your labels created so that when you are ready to take pictures, you can focus on just taking pictures rather than getting things together.

**Interphase:**

Important steps to highlight: What materials and labels do I need?

**Prophase:**

Important steps to highlight: What materials and labels do I need?

**Metaphase:**

Important steps to highlight: What materials and labels do I need?

**Anaphase:**

Important steps to highlight: What materials and labels do I need?

**Telophase:**

Important steps to highlight: What materials and labels do I need?

**Cytokinesis:**

Important steps to highlight: What materials and labels do I need?

**Grading Rubric for Questions and Video**

PLEASE TURN IN ONE COPY FOR YOUR GROUP

