Stop-Motion Mitosis Animation Project

Stop motion (also known as **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. (http://en.wikipedia.org/wiki/Stop_motion)

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; camera, ring stand, paper, markers

Procedure: Using available materials, construct a model of a cell for each stage of the cell cycle. Take a mnimum 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 into Stop-Motion software 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 pics and create the animation for you. It does limit you in that you cannot add sound. iMovie or Windows Movie Maker is available also but it will be a little more labor intensive.

Grading: 3 grades will be taken during this project – 1 test grade for the final project (grading sheet attached), 1 daily grade for the planning sheet, 1 daily grade for participation/effort during lab day

Schedule: Day 1 – Introduction, Team Planning day (plan materials, gather ideas)

Day 2 & 3 – Taking pictures Day 4- Uploading to computer and creating animation

Some websites that may help:

http://www.wikihow.com/Create-a-Stop-Motion-Animation

http://www.stopmotionpro.com/

http://www.jellycam.co.uk/

http://mrscadybiology.wikispaces.com/Bio+I+Hall+of+Fame

Phase Requirements: These stages and labels will be required on your pictures and will need to stay up throughout the stage:

- Interphase
- Prophase
- Metaphase
- Anaphase
- Telophase
- Cytokinesis

Interphase

- Start with four single-stranded chromosomes. Make sure you represent the cell membrane and nucleus. Before a cell begins mitosis, each chromatid replicates, or makes an exact copy of itself. (Note: In a real cell, the DNA is not visible as chromosomes during Interphase as it is loosely arranged in the form of chromatin- but for this lab, we will start with somewhat visible chromosomes.)

- Label the centromere, sister chromatids, nuclear membrane, cell membrane, and chromosomes. (Anything that appears new or needs to be stressed in you animation should be labeled.)

- Answer the following questions about Interphase on your own paper by writing the question and answer :

    - 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?
    - If you were looking under a microscope at a cell, what would tell you that it is in Interphase (i.e., what can be seen and what is not seen that would indicate mitosis is not yet occurring)?

Prophase

- Next model Prophase. The nuclear membrane is starting to break down and the Centrioles have moved to opposite poles. The spindle fibers are forming from the Centrioles. Label all the parts. Answer the following questions:
    - What is the purpose of spindle fibers?

Metaphase

- For Metaphase, line up your chromosomes up on the equatorial plane. The spindle fibers should attach to the chromosomes in the correct place. Label the chromosomes, chromatids, and spindle fibers. Answer the following questions:
    - At this point, the spindle fibers growing out of the poles resemble a star-shaped structure. What is this called?
    - Where do the spindle fibers attach to the chromosomes?

Anaphase

- For the next stage, Anaphase, separate the double-stranded chromosomes; move them toward opposite poles. Answer the following question?
    - How many chromosomes do you have now?

Telophase

- In Telophase, the nuclear membrane reforms around the new sets of chromosomes. The chromosomes begin to unwind and become thin strands again. Answer the following questions:
    - 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

- Cytokinesis begins during Telophase and continues after Telophase. Make sure you show the formation of a cleavage furrow and the split into two new cells.
    - What is the role of the cleavage furrow?
    - How would this process differ for a plant cell?

- After you are finished taking your pictures, you are ready to make your movie. If you are comfortable with Windows Movie Maker, you can create the video using it. If not, then you will need to download Jelly-Cam. If you want, you may include movie title and credits. We will talk about saving it when it is done.

Analysis

Answer these questions on the same sheet with the questions from the procedure.

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. How many chromosomes are present in each daughter cell in this lab?
6. Why was it necessary to replicate the chromosomes during the S(synthesis) phase before mitosis began?
7. 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?
8. Number the following steps in the correct order and tell which stage it occurs in:
    a. A cleavage furrow or cell plate forms, separating the nuclei.
    b. Chromosomes line up at the equator and chromatids are attached to spindle fibers.
    c. Nuclear membrane and nucleolus reappear.
    d. Genetic material replicates and is joined at the centromere.
    e. Centromeres divide and single-stranded chromosomes move to 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:

Planning sheet (daily grade)

Lab grade (Participation grade per group)

Project: (Test Grade, see rubric below)

Are all the phases included and labeled? (5 points each phase)

Are the important cell parts labeled? (20 points total)

Does the model resemble the cell during mitosis? (10 points)

Are Procedure questions and Analysis questions answered? (40 points)

Are all the phases included and labeled?	30 All 6 phases are labeled and represented	25 5 phases are labeled and represented	20 4 phases are labeled and represented	15 3 phases are labeled and represented	10 2 phases are labeled and represented	5 1 phase is labeled and represented
Are all the important cell parts labeled?	20 All important cell parts on procedure are labeled accurately	16 80% of important cell parts on procedure are labeled accurately	12 60% of important cell parts on procedure are labeled accurately	8 40% of important cell parts on procedure are labeled accurately	4 20% of important cell parts on procedure are labeled accurately	
Does the model resemble the cell during mitosis?	10 The cell model accurately depicts the events in mitosis	8 The cell model mostly depicts the events in mitosis	6 The cell model somewhat depicts the events in mitosis	4 The cell model doesn't really depict the events in mitosis	2 The cell model doesn't depict the events of mitosis	
Are all the Procedure and Analysis questions written and answered correctly on the student's own paper?	40 All questions are written out and answered correctly on students' own paper	32 80% of the questions are written out and answered correctly on students' own paper	24 65% of the questions are written out and answered correctly on students' own paper	16 50% of the questions are written out and answered correctly on students' own paper	8 35% of the questions are written out and answered correctly on students' own paper	