

# Project - Animated Cell Cycle Flip Book

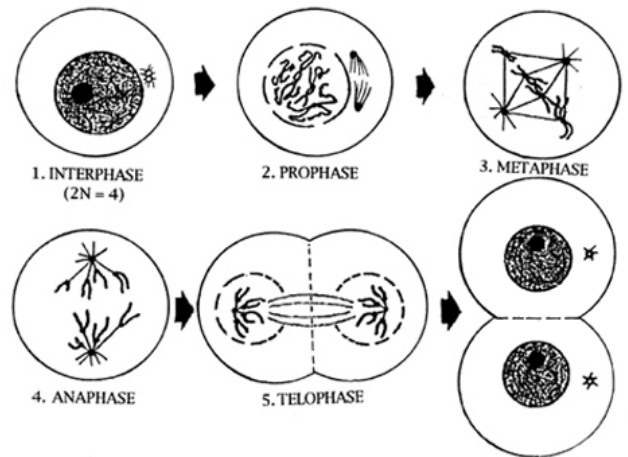
## Materials:

- 20 strips of index card approx. 1 ½ by 5 inches
- colored pencil or pen
- rubber band
- coin quarter

## Directions:

Begin by getting 10 index cards and cutting them in half, so as to have long 1 ½ by 5 inch strips. Make a title “page.” Since your cell will not begin to change shape until later, you should then draw the same sized cell on slides 2-12 in the same location. (This should be towards one end and leave enough room for final division.) You could use a nickel as a template or draw them another way, but it is important that the position and shape be constant for this part. After slide 12 you will have to change the shape of the cell until you end up with 2 cells.

This is an illustration of an animal cell going through mitosis. Using an animal cell with **4 chromosomes** as a model, draw the events in the cell cycle as follows:



Top strip titled **Mitosis** illustrated by Your Name

Strip no. – general outline

2 interphase

3-5 early prophase

6-9 early to late prophase

10-12 metaphase

13-14 proceed thru late anaphase

15-19 telophase

20 2 daughter cells

Use these notes as an aid to get the procession of pictures correct.

Each drawing should vary only slightly from the one before it. When the book is flipped through quickly, the process of mitosis should appear to be in motion.

A technique is to draw a cell at a distinct phase and then work between different drawings. Or follow the specific steps outlined below. **You should take care to keep the cell size and position similar.** And be sure to orient the chromosomes similarly as you step through the pictures.

You must write the major events of the parts of the cell cycle on slides: #7, 11, 13 & 18 on the back of the cards. Please keep the text on the 2/3 of the card toward the side of the drawings.

## INTERPHASE & EARLY PROPHASE

“resting phase” where no visible changes in the cell. Cell is preparing to divide.

2. Nucleus is contained within nuclear membrane  
Nucleolus is present

A pair of centrioles lying at right angles to each other is located near the nucleus  
DNA is invisible

3. Nuclear DNA is a mass of thin, twisted threads - CHROMATIN
4. Chromatin coils up to form rod-like CHROMOSOME PAIRS
5. Each chromosome starts to move.  
nuclear membrane begins to slowly disintegrate

### **PROPHASE**

**Supercoiling and thickening of chromosomal material.**

- 6-8. 2 chromosomes joined by a CENTROMERE  
2 pairs of centrioles begin to move towards opposite ends of the cell  
spindle fibers extend from centrioles to form star-shaped asters  
other spindle fibers join together to form a sphere  
doubled chromosomes begin to move toward equator
9. nuclear membrane and nucleolus disappear

### **METAPHASE**

**Thickened chromosomes line up at middle of cell.**

10. Chromosomes become attached by their centromeres to spindle fibers
11. Centromeres are lined up at equator
12. Centromeres divide.  
Chromosomes separate into single-stranded chromosomes

### **ANAPHASE**

**Cell starts to separate, as most readily seen in the nucleus.**

13. Centromeres split.  
Poles move farther apart.  
Duplicated chromosomes are dragged apart to opposite poles.
14. Cleavage furrow begins to constrict

### **TELOPHASE**

**Physical division occurs.**

15. Chromosomes reach opposite poles
16. Spindle fibers and asters disappear  
Cleavage furrow continues to constrict
17. New nuclear membrane forms around each new set of daughter chromosomes  
Nucleolus reappears
18. Chromosomes uncoil again to form a thread-like mass - CHROMATIN
19. **CYTOKINESIS** - Cytoplasm divides  
Cleavage furrow pinches off
20. 2 new cells have formed

Scoring: 40 pts total

**Your flipbook must contain the following:**

- Title page: Your name and process illustrated [2 pts]
- 19 sequential frames that clearly illustrate the process [19 pts]
- Write a description of what is happening in the phase in your drawing on 4 slides: #7, 11, 13 & 18 [3 pts each = 12 pts]
- Creativity, Neatness, Effort [7 pts]