

Estimating Phases of the Cell Cycle

Introduction

The cell cycle is a sequence of growth and division that a eukaryotic cell undergoes during its lifetime. The cell cycle includes five stages, or phases. It begins with the first growth phase, called G1. In the G1 phase, the cell grows and carries out routine functions. It takes in nutrients for energy, growth, and the repair of damaged organelles. During this phase, the cell increases in size.

The second phase of the cell cycle is the S phase. In the S phase, the cell's chromosomes are copied. The duplication of chromosomes is critical because each daughter cell must receive a complete set of chromosomes. When the chromosomes become visible during the early phase of cell division, each chromosome consists of two identical sister chromatids. The centrioles, structures that aid in the division of genetic material during cell division, are also duplicated in the S phase.

The third stage of the cell cycle is the second growth phase, G2. In this phase, the cell prepares for the nucleus to divide. The cell grows and produces additional organelles and cytoplasm.

The fourth stage of the cell cycle is the M phase. In the M phase, the nucleus divides to form two nuclei in a process called mitosis. Mitosis ensures that each new cell receives a copy of every chromosome.

In this activity, you will model the time spent in each phase of the cell cycle by dividing a string into appropriate lengths representing the time spent in each of the phases.

Materials

- string or yarn
- meter stick or metric ruler
- scissors
- masking tape or labels

Procedure

1. Measure and cut a 50 cm length of string.
2. Pretend for the sake of this model that the 50 cm length of string represents the amount of time needed to complete an entire cell cycle once. Also, assume that it takes a particular cell type 24 hours to complete the entire cell cycle.
3. Your 50 cm string now represents one full 24-hour cell cycle. Decide with your partner how you would divide this string to show the time spent in each phase of the cell cycle.
4. The table shows the number of hours spent in each phase of the cell cycle for this hypothetical cell type.
5. Calculate the length of string in centimeters that should represent each phase of the cell cycle. Record this length in centimeters in the table below.
6. Measure and color the string into the appropriate lengths. Use the masking tape to label each piece of string for the phase it represents.

Data Table

Phase of Cell Cycle	Time Spent in Phase (hours)	Representative Length of String (cm)
G1	8	
S	10	
G2	5	
M	1	

Analysis

1. Which is the longest phase of the cell cycle? Which is the shortest?
2. What happens in the longest phase of the cell cycle?
3. What happens in both G phases of the cell cycle? What was the total time spent in the G phases of the cells in this activity?
4. How many centimeters long is the section of string representing the S phase?
5. How many centimeters long is the section of string representing the S phase? What happens in the M phase?