Online Onion Root Tips: Determining time spent in different phases of the cell cycle

**Background Information:** The Biology Project is an interactive online resource for learning biology, developed at The University of Arizona. This interactive activity will answer the question, do all phases of the cell cycle require the same amount of time for completion? The answer can be found by simply counting the number of cells in each phase of mitosis and interphase in an onion root tip. Many cells in a specific phase indicate a long period of time required for completion of that phase. Few cells in a specific phase indicate a short period of time required for completion of that phase. Onion cells require 12 hours to complete the cell cycle (interphase – interphase). The amount of time needed for each phase can be calculated by taking the % of cells in each phase and multiplying by 720 minutes (12 hours).

**Purpose:** To determine how much time dividing cells spend in each phase of the cell cycle.

**Procedure:**
Follow the instructions step by step and answer questions as you go.

1. On the web browser type the following web address:
   [http://www.biology.arizona.edu/cell_bio/cell_bio.html](http://www.biology.arizona.edu/cell_bio/cell_bio.html)
2. Under the ACTIVITIES section, **click ONLINE ONION ROOT TIPS: PHASES OF THE CELL CYCLE**
3. Read the information and answer the following questions:
   a. Why are onion roots used for studying the cell cycle and mitosis?
   
   b. How are the chromosomes in each cell made visible?
   
   c. How many phases of the cell cycle are there? Name them.
   
4. Take a minute to watch as the “cyber cell” goes through division. Can you identify each phase?
5. **Click NEXT**
6. The life cycle of the cell is typically divided into 5 major phases. After reading the background information, answer the following questions:
   a. What is a cell doing in interphase?
   
   b. What can be said about chromosomes during interphase?
c. During interphase the nucleus is very visible in the cell. What happens to the nucleus during mitosis?

d. Where are chromosomes found during metaphase?

e. How do the chromosomes get there?

f. Explain the appearance of a chromosome during anaphase.

g. At the end of telophase, what material may begin to divide?

7. **Click NEXT**
8. Follow the directions given. A copy of the data table has been provided for you. Enter data at the **END** of the activity.

**Data:**

<table>
<thead>
<tr>
<th></th>
<th>Interphase</th>
<th>Prophase</th>
<th>Metaphase</th>
<th>Anaphase</th>
<th>Telophase</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of cells</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Percent of cells</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Time in minutes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>720 min</td>
</tr>
</tbody>
</table>

**Analysis/Conclusion:**

1. Determine the amount of time required for each phase of the cell cycle, record on the above data table. **Hint:** see background information.
2. Using your data, prepare a circle graph which indicates the number of minutes that onion cells spend in each phase of the cell cycle. The circle is divided into 18 minute intervals. Use colored pencils to shade each region. Be sure to complete a key.

3. Which phase requires the longest time for completion?

4. Why is it important that a cell spend the majority of its time in this phase?

5. What important changes occur in the nucleus during the longest phase of mitosis?

6. Why do you think so much time is spent in this phase?

**Assessment:**

1. Click on CELL BIOLOGY
2. Click on THE CELL CYCLE AND MITOSIS
3. Click on TEST YOURSELF (11 PROBLEMS)

Complete the tutorial. You must correctly answer each question before you may proceed to the next question.