Part 01

The diagram of the following figure represents a hypothetical cell with four chromosomes: a pair of long homologs and a pair of short homologs. The **O** locus, which has the alleles O and o, is in the long pair; the **H** locus, which has the alleles H and h, is in the short chromosomes. Assume that the genotype of the cell is **OoHh**, represent in the figure the segregation of those genes during the formation of the gametes. Identify and describe all the phases of the division indicated by the letters (ex: A- interphase: simple chromosomes, not paired).

A picture containing screenshot, colorfulness, design

Description automatically generated

|  |  |
| --- | --- |
| **Genotype** | **Frequency (%)** |
|
| O |  |
|
| o |  |
|
| H |  |
|
| h |  |
|
|  |  |
|
| OH |  |
|
| Oh |  |
|
| oH |  |
|
| oh |  |
|

Part 02

Now consider that the genes O (O, o) and Z (Z, z) are in the long pair and that H (H, h) is in the short pair. Suppose that crossing over occurs in **30%** of the cells, which are the possible **gametes and their frequencies**? Show all possible gametes using the figure below:

A screenshot of a computer

Description automatically generated with low confidence

|  |  |
| --- | --- |
| Genotype | Frequency (%) |
|
| O |  |
|
| o |  |
|
| H |  |
|
| h |  |
|
| Z |  |
|
| z |  |
|
| OH |  |
|
| Oh |  |
|
| oH |  |
|
| oh |  |
|
| OZ |  |
|
| Oz |  |
|
| oZ |  |
|
| oz |  |
|
| ZH |  |
|
| Zh |  |
|
| zH |  |
|
| zh |  |
|
| OZH |  |
|
| OZh |  |
|
| OzH |  |
|
| Ozh |  |
|
| oZH |  |
|
| oZh |  |
|
| ozH |  |
|
| ozh |  |
|

Part 03

Draw the sub-stages of prophase I, including explanation of each one. Explain in which stage of prophase crossing over occurs and the importance of this cellular process.