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BIOL121 - In-Class Worksheet Meiosis -2021W2

Learning Outcomes:

A2 Draw, interpret or explain diagrams of chromosomes (including relevant genes and alleles) in cells of different ploidy levels, at different stages of the cell cycle, during meiosis and mitosis.

A3 Given the genotype of a diploid cell, predict the possible genotype combinations of the four cells produced by a single or multiple meiotic divisions and when applicable distinguish gametes with original allele combinations from gametes with new combinations.

1) A plant that is $2n=6$ cell has the genotype $A_1A_2; C_1C_3; B_1B_4; D_2D_2$. The "A" and "C" genes are on the same arm (same side of the centromere) of chromosome "1". The "A" gene is closest to the centromere. The A_1 and C_3 alleles are on the same homolog. The "B" gene is on chromosome "2" and the "D" gene is on chromosome "3". The numbering of chromosomes is arbitrary. Label the alleles on the chromosomes of your cell. Be sure to represent your chromosomes so that homologous pairs can be identified.

In a cell where crossing over between homologs has not occurred, draw the chromosomes within cells at i) G_1 ii) metaphase of meiosis I, iii) metaphase of meiosis II and iv) the resultant products.

Draw the position(s) of: i) the spindle, ii) centromere iii) and alleles on the chromosomes of your cell (where applicable).

i) G_1 phase	ii) metaphase of meiosis I

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iii) metaphase of meiosis II

iv) the resultant products

2) Given the $2n=6$ cell from question 1, list all of the possible haploid genotypes that could be produced by multiple meiotic divisions (i.e. multiple cells undergo meiosis).

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3) Given the cell from question 1, draw the arrangements of chromosomes at metaphase 1 of meiosis that would result in daughter cells with the genotypes:

i) $A_1 C_3 B_1 D_2$ and $A_2 C_1 B_4 D_2$ [2 cells of each genotype] or

ii) $A_1 C_3 B_4 D_2$ and $A_2 C_1 B_1 D_2$ [2 cells of each genotype].

i)

ii)

4) Draw the arrangements of chromosomes at metaphase 1 of meiosis if a single crossover event had occurred between the A and C genes during prophase 1. The products should be drawn as resolved (i.e. the arrangement of alleles that results from the crossover event).

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5) BONUS! Draw the arrangements of chromosomes at metaphase 1 of meiosis if a single crossover event had occurred between the A gene and the centromere during prophase 1.