Group Number _____

Names_____

BIOL121 - In-Class Worksheet Meiosis

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.

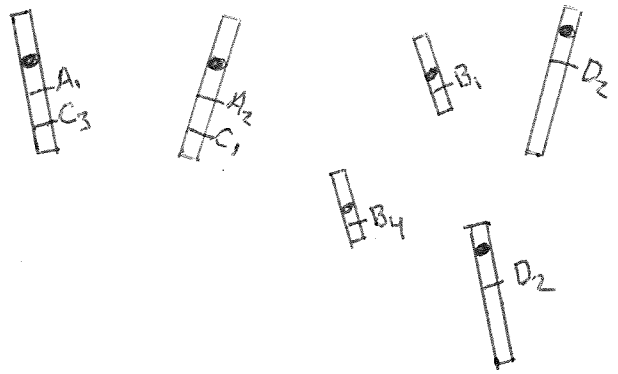
A3 Given the genotype of a diploid cell, predict the possible genotype combinations of the four cells produced by a single or multiple meiotic divisions and when applicable distinguish gametes with original allele combinations from gametes with new combinations.

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 "C" 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.

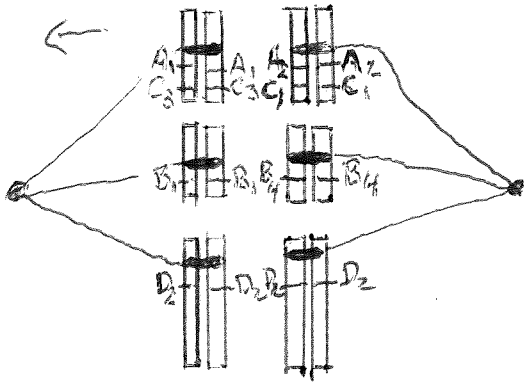
In a cell where crossing over between homologs has not occurred, draw the chromosomes within cells at i) G_1 ii) metaphase of meiosis I, iii) metaphase of meiosis II and iv) the resultant products.

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

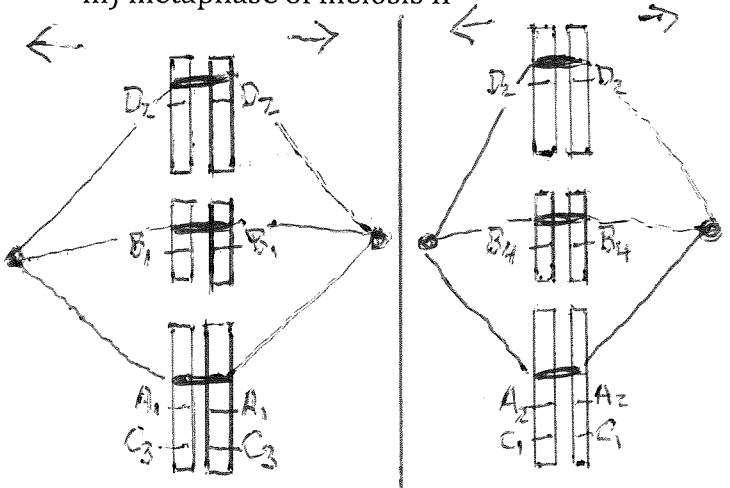
i) G_1 phase



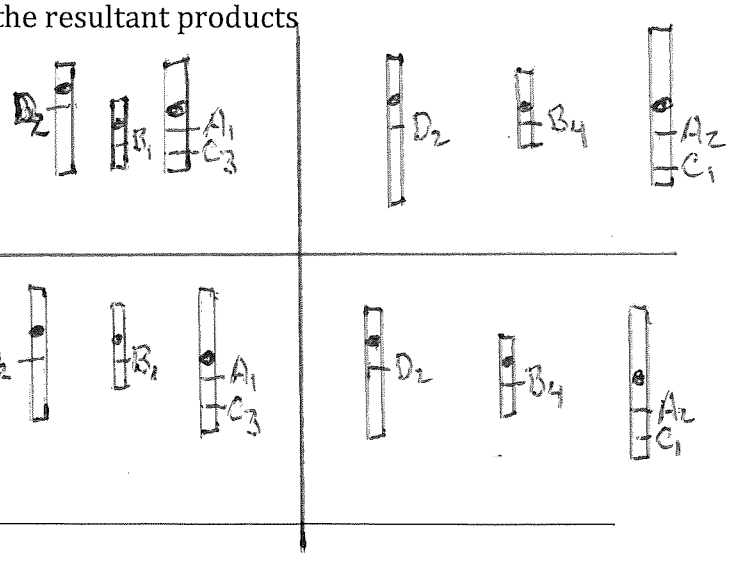
ii) metaphase of meiosis I



iii) metaphase of meiosis II



iv) the resultant products



Cell 1 Cell 2

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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).

$D_2 B_1 A_1 C_3$ / $D_2 B_4 A_1 C_3$ / $D_2 B_1 A_2 C_1$ / $D_2 B_4 A_2 C_1$] Independent assortment only

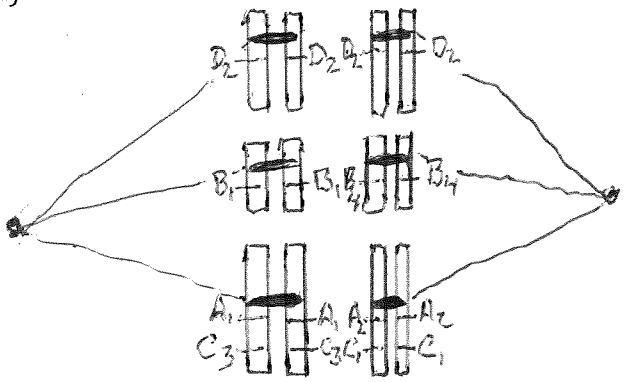
$D_2 B_4 A_1 C_1$ / $D_2 B_1 A_2 C_3$ / $D_2 B_2 A_2 C_3$ / $D_2 B_2 A_1 C_1$] additional genotypes due to crossing over

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:

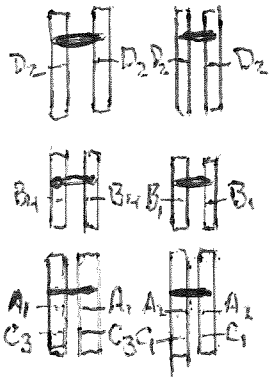
i) A_1 C_3 B_1 D_2 and A_2 C_1 B_4 D_2 [2 cells of each genotype] or

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

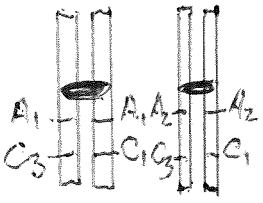
i)



ii)



4) Draw the arrangements of chromosomes at metaphase 1 of meiosis if a single ~~recombination~~ crossover event had occurred between the A and C genes during prophase 1.



The other chromosomes are not shown

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