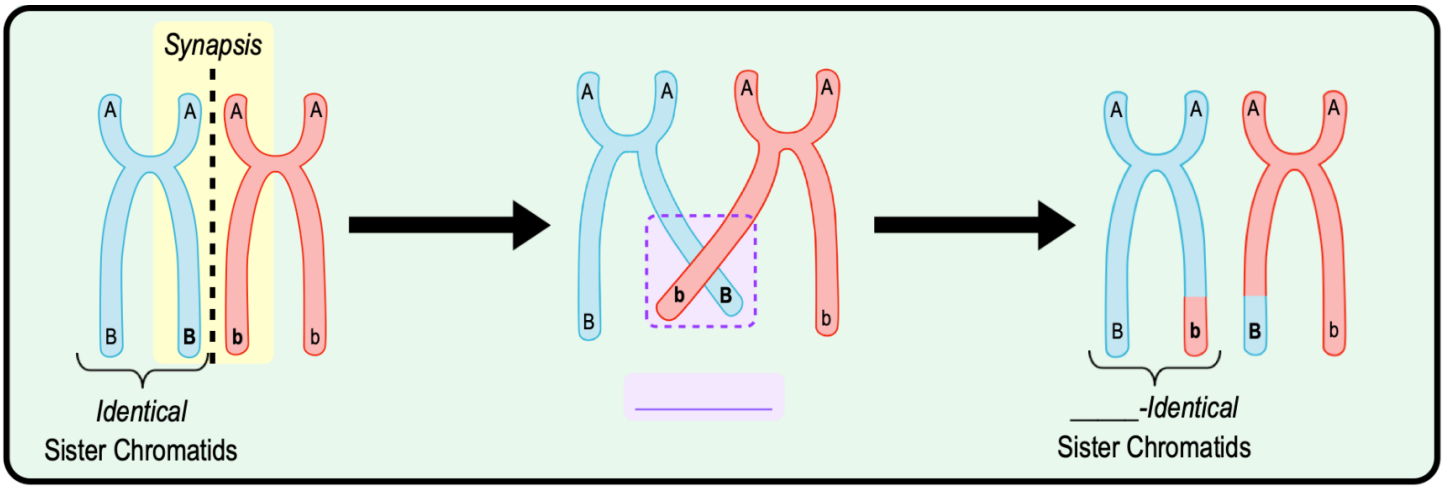
CONCEPT: GENETIC VARIATION DURING MEIOSIS

●Meiosis creates genetic *diversity* via _____ events: 1) *Crossing Over* & 2) *Independent Assortment*.

●**Crossing Over**: process in which pairs of homologous chromosomes _____ genetic material.

- □ Forms _____-identical-sister chromatids during _____ I of meiosis I.
- □ **Synapsis**: process where homologous pairs _____ their DNA sequence at similar *alleles*.
- □ **Chiasma**: sites of crossing over (attachment sites) between homologous chromosomes.

EXAMPLE: Crossing Over during Prophase I.



PRACTICE: Which of the following processes occurs when homologous chromosomes cross over in meiosis I?

a) Two sister chromatids get tangled, resulting in one re-sequencing its DNA.
b) Two sister chromatids exchange identical pieces of DNA.
c) Maternal alleles are "corrected" to be like paternal alleles and vice versa.
d) Corresponding segments of non-sister chromatids from homologous chromosomes are exchanged.

PRACTICE: Crossing over involves each of the following *EXCEPT*:

a) The transfer of DNA between two non-sister chromatids.
b) The transfer of DNA between two sister chromatids.
c) The formation of a synaptonemal complex.
d) The alignment of homologous chromosomes.
e) All of the above are involved in crossing over.

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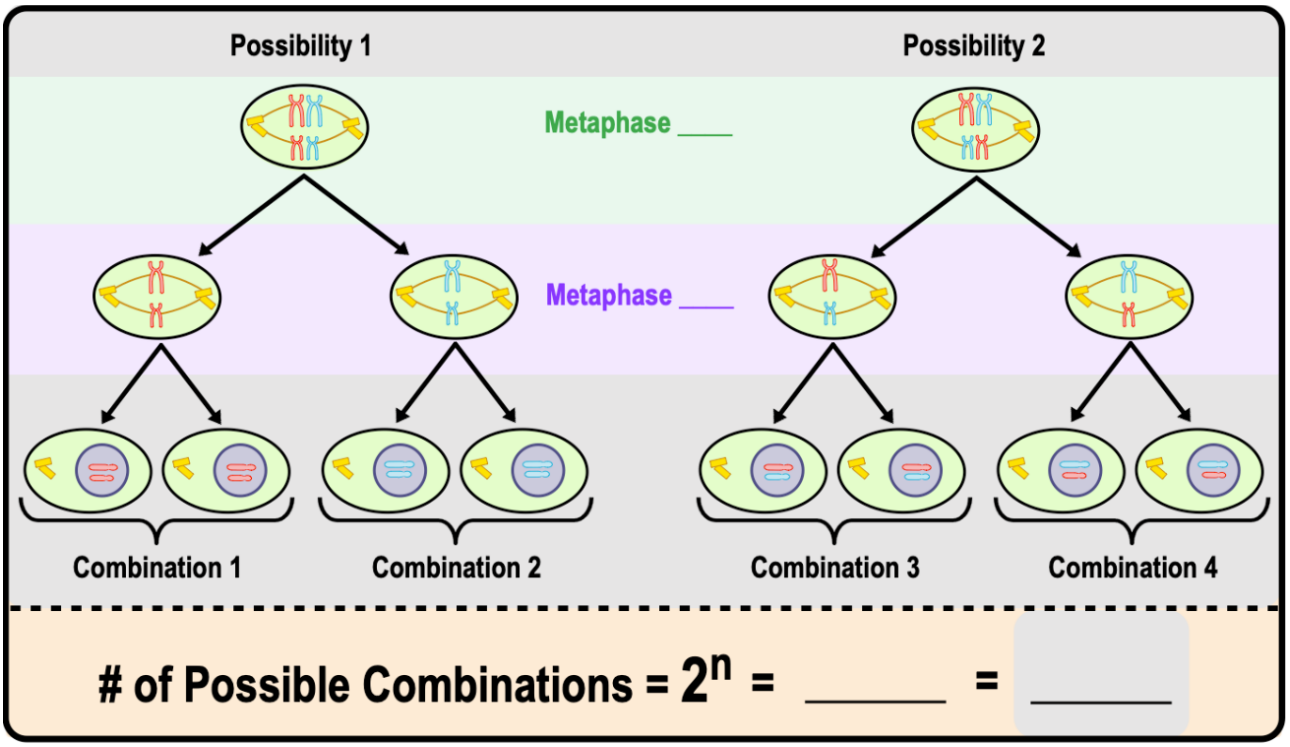
Independent Assortment

●During _____ I, pairs of homologous chromosomes are *independently* & _____ aligned.

□ Results in an ENORMOUS amount of *possible* genetic _____ during meiosis.

□ To calculate # of combinations, use the equation _____ (n = haploid # of chromosomes).



EXAMPLE: For a species with a haploid number of 23 chromosomes, how many combinations of maternal and paternal chromosomes are possible for the gametes based on the independent assortment of chromosomes during meiosis?

a) 23.
b) 46.
c) About 1,000.
d) About 8 million.

PRACTICE: How many genetically unique gametes can be created in an organism with 4 chromosomes?

a) 256.
b) 23.
c) 16.
d) 1 million.
e) 4.

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PRACTICE: During which of the following processes does independent assortment of chromosomes occur?

a) In meiosis I only.

b) In meiosis II only.

c) In mitosis and meiosis I.

d) In mitosis and meiosis II.

e) In meiosis I and meiosis II.

PRACTICE: Independent assortment of chromosomes is a result of which of the following processes?

a) The random way each pair of homologous chromosomes lines up at the metaphase plate.

b) The random combinations of eggs and sperm during fertilization.

c) The random distribution of the sister chromatids into the two daughter cells.

d) The diverse combination of alleles that may be found within any given chromosome.

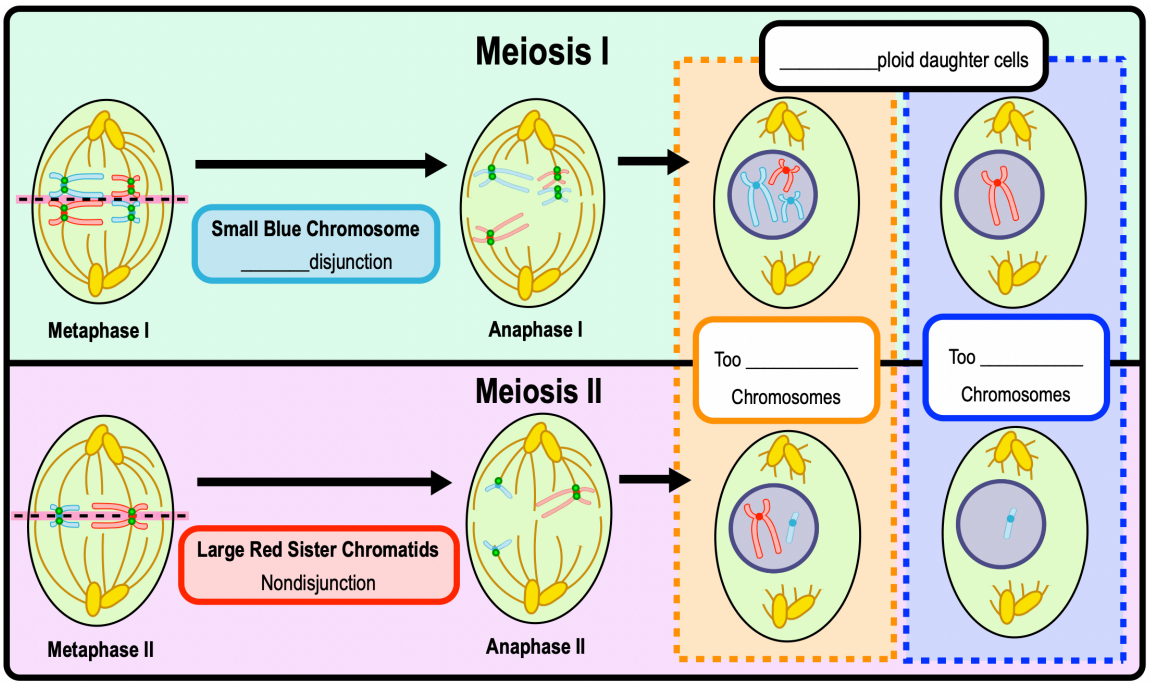
Nondisjunction

●An **ERROR** during meiosis I or II when chromosomes _____ to separate, resulting in *aneuploid cells*.

□ _____ **Cells:** cells containing either too many or too few chromosomes.

□ Can lead to genetic disorders (ex. trisomy-21/Down-Syndrome) or even cell death.

EXAMPLE: Nondisjunction during Anaphase I & II.



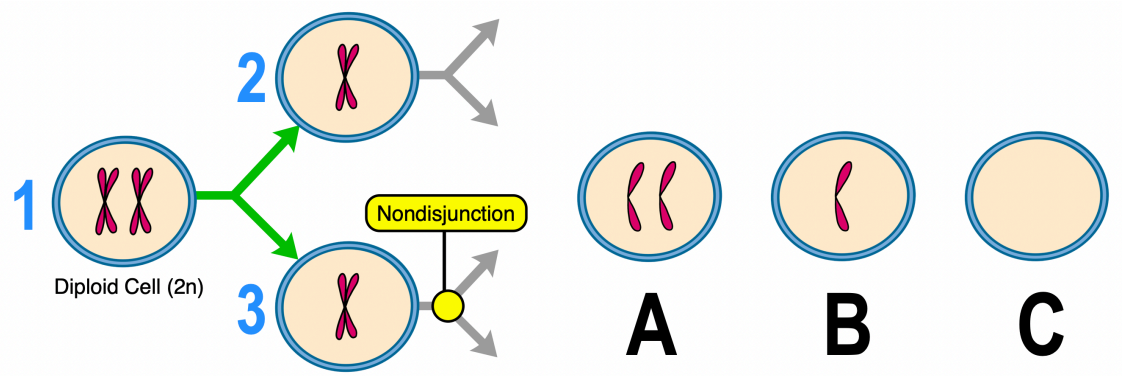
CONCEPT: GENETIC VARIATION DURING MEIOSIS

PRACTICE: Non-disjunction means that chromosomes:

a) Do not cross over during synapsis.
b) Do not replicate during interphase.
c) Have serious mutations.
d) Do not separate correctly from one another during anaphase.

PRACTICE: During meiosis, if nondisjunction occurs during anaphase II (shown below in cell #3) what are the possible gametes that can be produced from cell #3?

a) A only.
b) B only.
c) C only.
d) A & C.
e) B & C.
f) A & B.
g) All three.



PRACTICE: _____ cells have an extra or missing chromosomes after meiosis due to nondisjunction during Meiosis I.

a) Somatic cells.
b) Gametes.
c) Diploid Cells.
d) Aneuploid Cells.
e) Haploid Cells.
f) Sperm Cells.