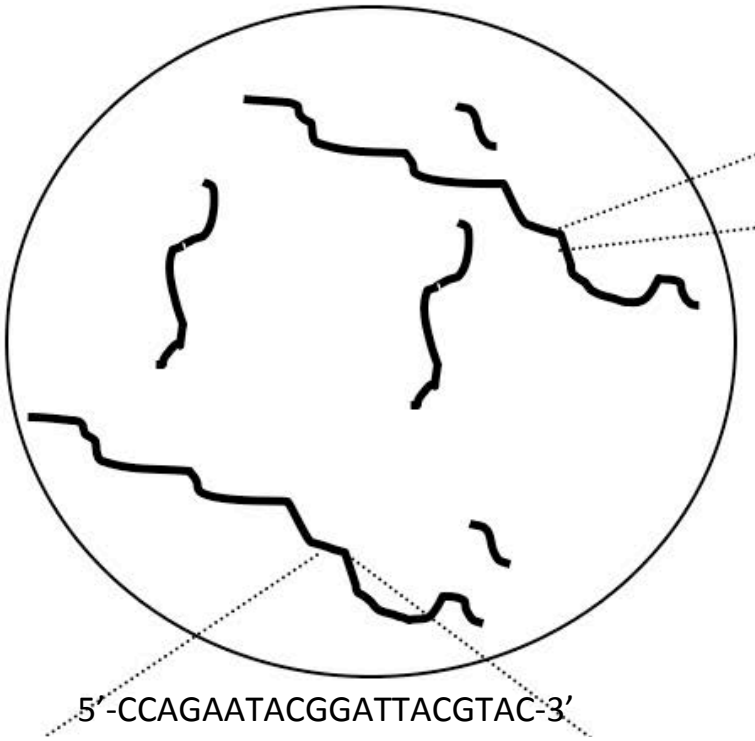
Schematic of chromosomal DNA in the nucleus of a cell



5’-CCAGTATACGGATTACGTAC-3’

Gene A sequence: makes functional protein

Circle one. The cell is prokaryotic/ *eukaryotic*?

Circle one. The cell is Haploid/ *diploid*?

Note: For this question, chromosomes that are similar in size/shape are considered homologous chromosomes.

Gene A sequence: makes NO protein

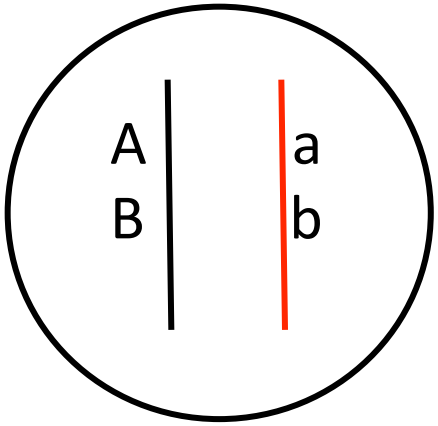
Circle one. The cell is homozygous/ *heterozygous* for the sequence provided. ***Note:*** *Compare the two sequences and see if they are same or different.*

Circle one. Genotype of cell for Gene A: AA/ *Aa*/ aa.

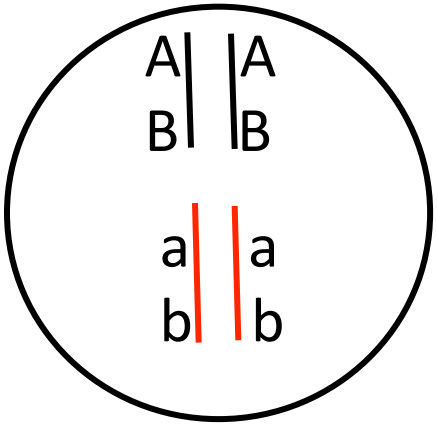
Summary slide

Figure 1: The mitotic and meiotic cell cycles. removed due to copyright restrictions. Please see: Marston, A.L., and A. Amon. "Meiosis: cell-cycle controls shuffle and deal." *Nature Reviews Molecular Cell Biology* volume 5(2004): 983–997.

Nucleus of a cell (genotype AaBb) undergoes **mitosis**.

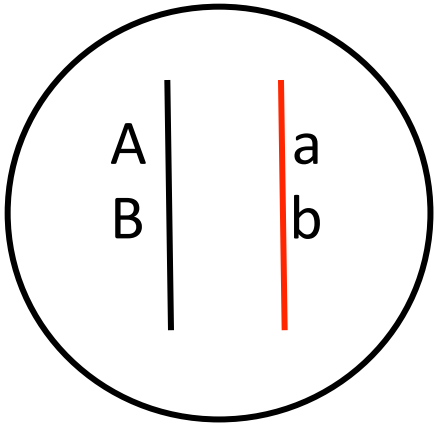


DNA Replication
(S phase)



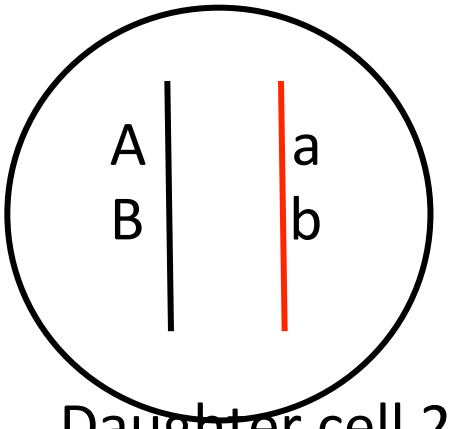
Draw the alignment of chromosome during Metaphase

Draw the chromosome and show the arrangement of respective alleles in each daughter cell



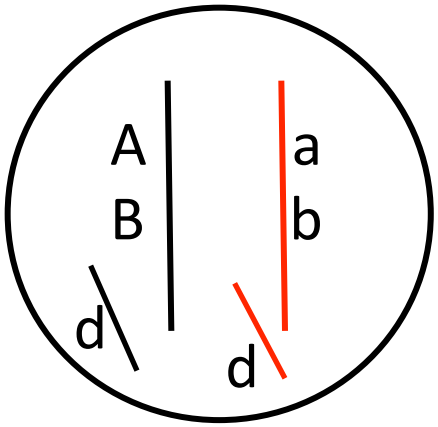
Daughter cell 1

+

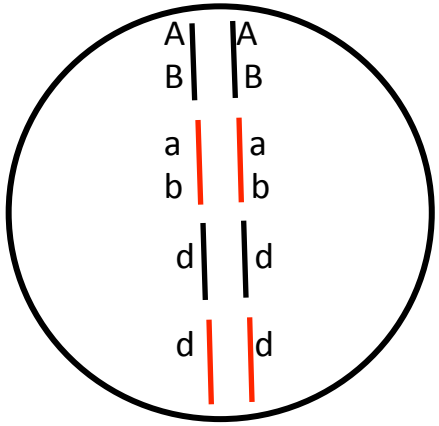


Daughter cell 2

Cell (genotype AaBbdd) undergoes **NON-disjunction during mitosis**.

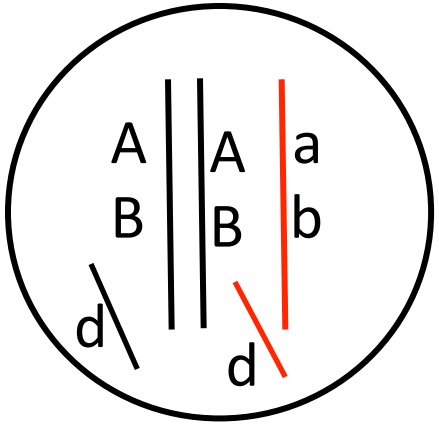


DNA Replication
(S phase)



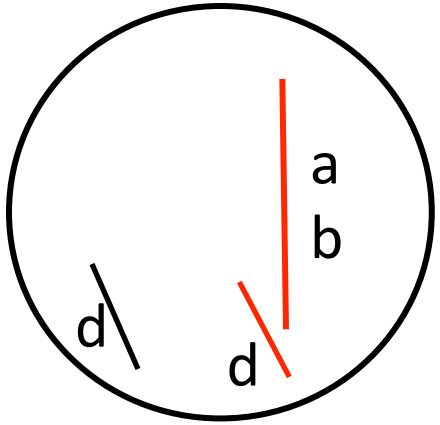
Draw the alignment of chromosome during Metaphase

Draw the chromosome and show the arrangement of respective alleles in each daughter cell



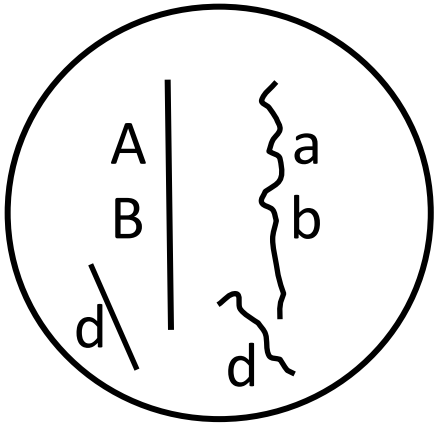
Daughter cell 1

+

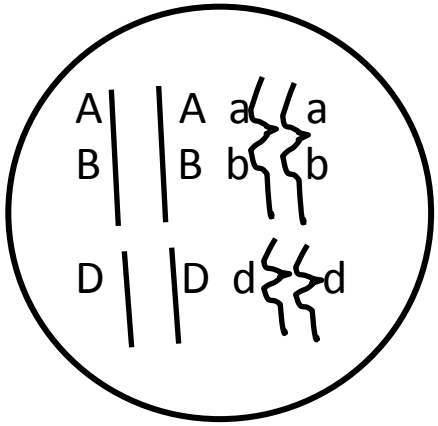


Daughter cell 2

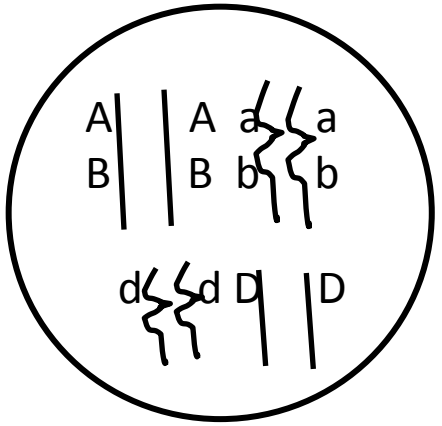
Cell (genotype AaBbdd) undergoes **Meiosis**



Replication



OR



Alignment 1

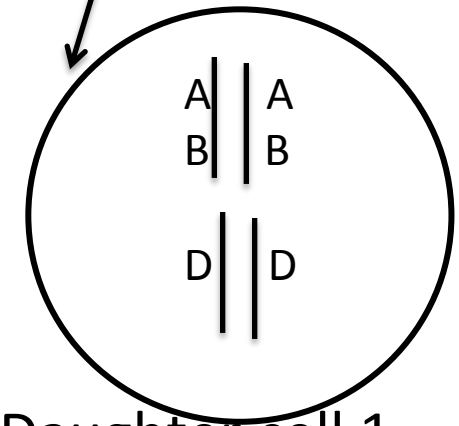
Alignment 2

paternal homolog

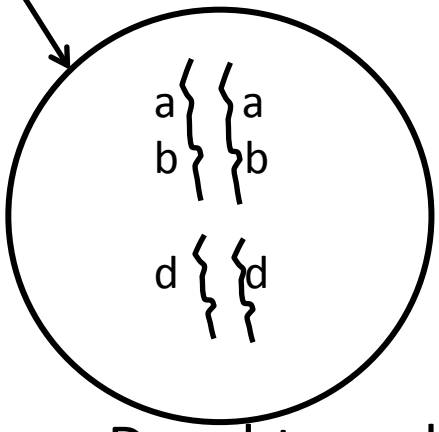
maternal homolog

Draw two possible alignment of replicated chromosome during Metaphase-I (ASSUME NO RECOMBINATION)

Give the arrangement of alleles on chromosomes in the daughter cells produced from alignment 1 after Meiosis I

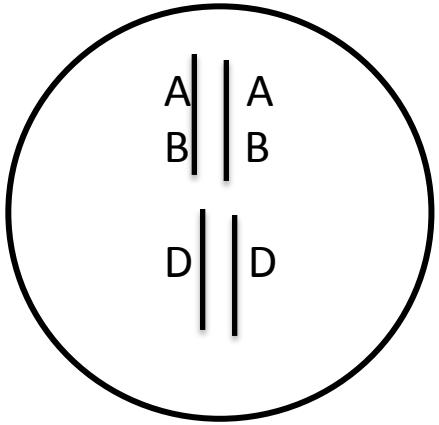


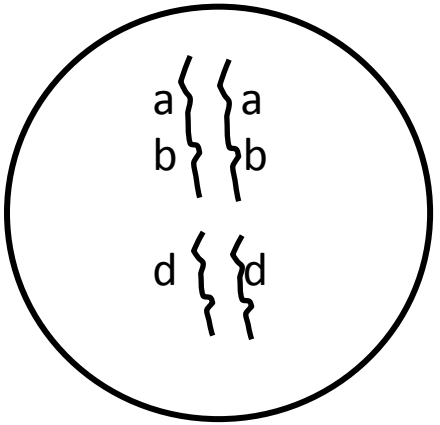
Daughter cell 1



Daughter cell 2

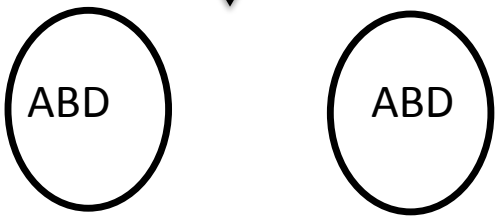
Meiosis question continued…



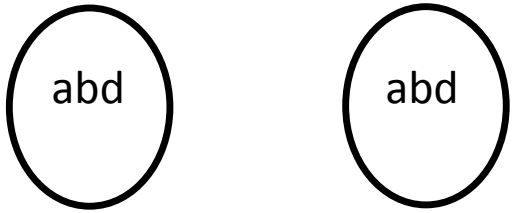


Daughter cell 1 from Meiosis 1 from alignment 1

Daughter cell 2 from Meiosis 1 from alignment 1



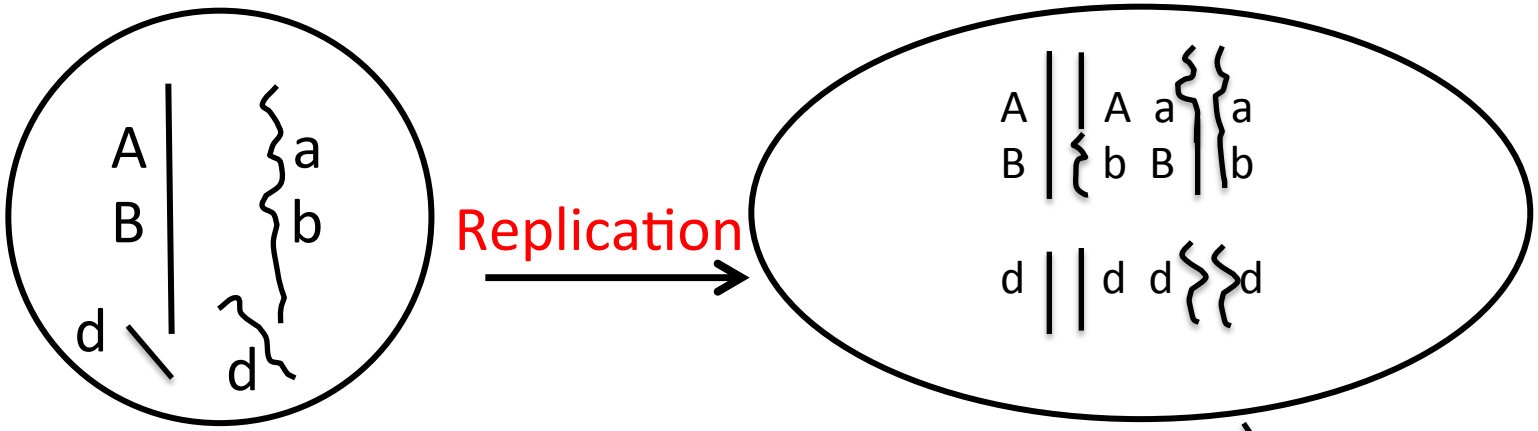
Gamete 1 Gamete 2



Gamete 3 Gamete 4

Give the genotype of each gamete

Cell (genotype AaBb) undergoes **Meiosis**

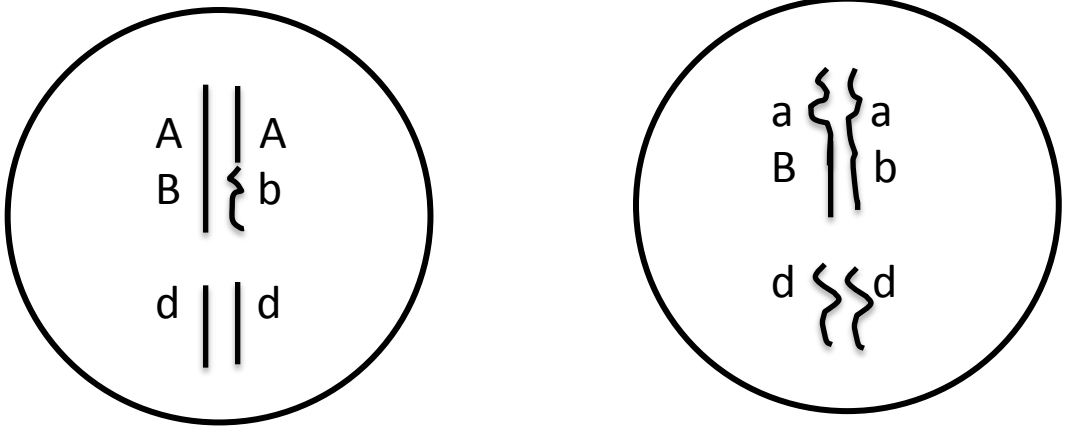


paternal homolog

maternal homolog

Draw the alignment of replicated chromosome during Metaphase-I **FOLLOWING RECOMBINATION**

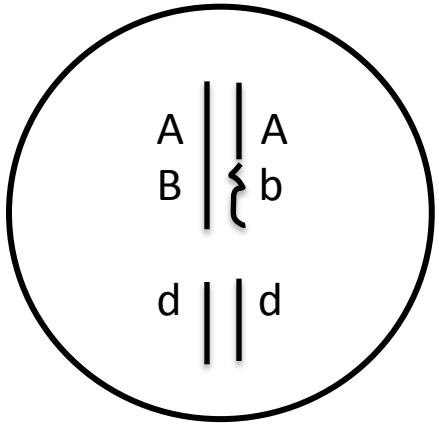
Give the arrangement of alleles on chromosomes in the daughter cells after Meiosis I



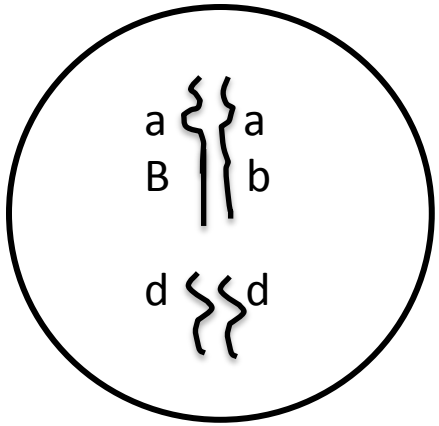
Daughter cell 1 of Meiosis I

Daughter cell 2 of meiosis -I

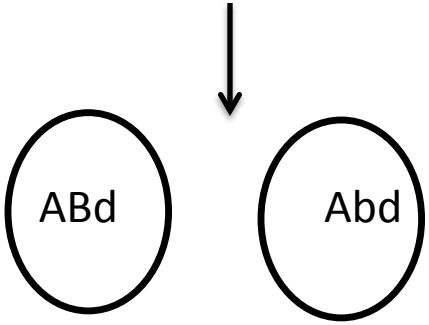
Meiosis question continued…



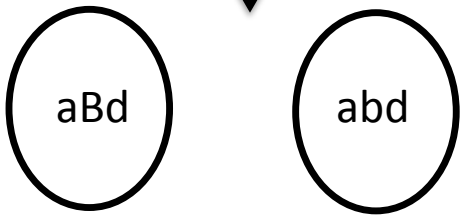
Daughter cell 1 from Meiosis 1



Daughter cell 2 from Meiosis 1



Gamete 1 Gamete 2



Gamete 3 Gamete 4

Give the genotype of each gamete

If the alleles of A and B gene assort independently, in what ratio would the above sets of gametes be produced? ***1: 1: 1: 1***

The following statements concern non-disjunction events during meiosis. Write "True" or "False" under each statement.

-Non-disjunction of homologs results in 4 abnormal gametes. ***T***

-Non-disjunction of homologs results in 2 abnormal gametes. ***F***

-Non-disjunction of chromatids in one daughter cell results in 2 normal and two abnormal gametes. *T*

-Non-disjunction of chromatids in one daughter cell results in 4 abnormal gametes. *F*

Summary: Monohybrid cross & Punnett square

Eye color → Phenotype

Gene A → Gene that regulates eye color

Allele A of Gene A → Regulates red eye color (dominant phenotype)

Allele a of Gene A → Regulates white eye color (recessive phenotype)

Parent 1 (red eye fly) (genotype: AA)

Parent 2 (white eye fly) (genotype: aa)

↓

Genotype of gametes: "A"

Genotype of gametes: "a"

↘ ↙

F1 offspring: red eye color, genotype "Aa"

↓

Genotype of gamete from F1: "A" or "a" in equal ratio

Monohybrid cross or (#1F1 X #2F1) →

Gametes from #2(F1)	Gametes from #1 (F1)	
	A	a
A	AA (Red)	Aa (Red)
a	Aa (Red)	aa(White)
Phenotype of F2	Red: white: 3:1	
Genotype of F2	AA: 2Aa: aa	

Monohybrid cross & Punnett square

Genotype of homozygous Parental plant that has green pears: *AA*

Genotype of homozygous Parental plant that has yellow pears: *aa*

Genotype of gametes from plant that has green pears: *A*

Genotype of gametes from plant that has yellow pears: *a*

F1 offspring: green pear, genotype "Aa"

Monohybrid cross of F1 X F1

Gametes from #2(F1)	Gametes from #1 (F1)	
	A	*a*
A	*AA*	*Aa*
a	*Aa*	*aa*
Genotypes ratio	*AA: 2Aa: aa*	
Phenotype ratio	*Green (3): Yellow (1)*	