Comparing Reproduction

ASEXUAL vs. SEXUAL

asexual	similarities	sexual
- 1 parent	- creates offspring	- 2 parents
- identical genetics	- offspring gorw/develop	- genetic variation
- quicker & less energy	- use DNA	- slower & more energy
advantages		*advantages*
- well-adapted (stable environment)		- increased diversity
- large # offspring quickly		- adapt to changed (unstable environment)
- reliable (fewer steps)		- genetic variation
- no need for a mate		
- less time & energy		

MEIOSIS vs. MITOSIS

meiosis	similarities	mitosis
- 2 divisions = 4 daughter cells	- interphase	- 1 division = 2 daughter cells

Comparing Reproduction (cont)

- genetic variation	- forms of reproduction	- genetically identical
- half # chromosomes (23)	- stage names	- same # chromosomes (46)
- sex cells/gametes		- somatic cells

Meiosis Definitions

- heredity:	transmission of traits from 1 generation to the next
- gametes:	haploid reproductive cells (egg/sperm)
- gene locus:	gene's specific location on the length of a chromosome
- karyotype:	display of chromosomes matched up with their pairs (based on length)
- homologous chromosomes:	pair of chromosomes that have the same length, stain pattern, and genes controlling the same characteristics
- sex chromosome:	chromosome responsible for determining the sex of an individual
- autosome:	chromosome NOT directly involved in determining sex
- diploid cell~	2 chromosome sets (2n) = 46; somatic cells
- haploid cell~	1 chromosome set (n) = 23; gametes

Meiosis Background

Meiosis I is called?

↳ reductional division

Meiosis II is called?

↳ equational division

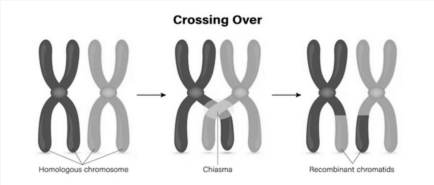
Original source of all genetic diversity?

↳ mutations

Term for different version of a gene?

↳ alleles

Variation



- crosing over: genetic rearrangment between sister chromatids by exchanging corresponding segments of DNA

↳ combining DNA from 2 parents into a single chromosome = *variation*

- independent assortment: each pair of homologous chromosomes are positioned independently of other pairs

↳ each daughter cell represents 1 outcome --- formula: 2^n

- random fertilization~

↳ fusion of gametes (2^{23} x 2^{23}) = *variation*

Genetics Definitions

- blending hypothesis~	genetic material contributed by both parents mixes (like paint)
- particulate hypothesis~	parents pass on genes that retain their separate identities in offspring (like deck of cards)

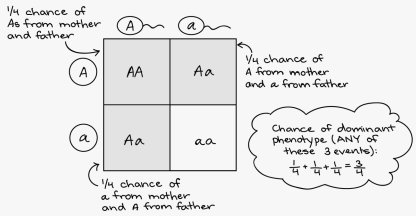
Genetics Definitions (cont)

- true-breeding strain~	plants, that after many generation of self-pollination, have produced only the same variety as the parent (homozygous)
- hybridization:	crossing of 2 true-breeding varieties
- P generation:	the true-breeding *parent* individuals
- F1 generation:	hybrid offspring arising from a parental cross *('first filial)*
- F2 generation:	offspring from the interbreeding of the F1 generation *(second filial)*
- homozygous:	2 identical alleles
- heterozygous:	2 different alleles
- phenotype:	physical/physiological traits
- genotype:	genetic makeup/set of alleles
- testcross:	breeding an organism of unknown genotype w/ *homozygous recessive* to determine the unknown genotype
- monohybrid cross:	cross between 2 organisms that *heterozygous* for the trait
- dihybrid cross:	cross between 2 organisms that are *heterozygous* for *both* traits

Mendel's 3 Laws

1. **Law of Dominance**: Some alleles are dominant and cover up the recessive alleles.
2. **Law of Segregation**: An organism has two alleles for each gene but they can only pass on one.
3. **Law of Independent Assortment**: Genes found on separate chromosomes are inherited independently of each other.

Probability

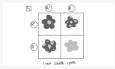


- **multiplication rule of probability:** probability of independent events occurring at the same time is the *product of their individual proababilties*
- **addition rule of probability:** probability of mutually exclusive events occurring is the *sum of their individual probabilities*

Incomplete Dominance

- **incomplete dominance:** phenotype between both parents
↳ genotype isn't completely dominant
↳ use capital letter with a superscript
↳ C ➞ protein ➞ trait

Codominance



- **codominance:** 2 alleles that each affect the phenotype in separate ways
↳ use capital letter and superscript
↳ R' ➞ protein ➞ item A ➞ red
↳ R ➞ protein ➞ item B ➞ pink

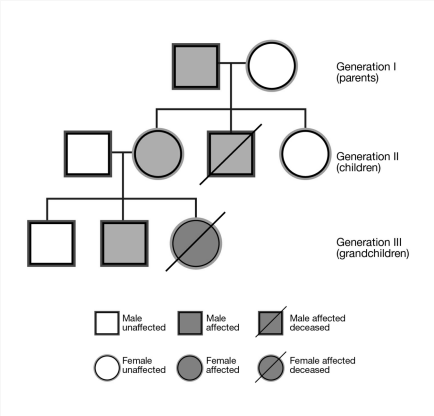
Blood Types

A	I^AI^A/I^Ai
B	I^BI^B/I^Bi
O	ii
AB	I^AI^B
alleles present=	3
recessive allele=	O
codominant alleles=	A & B

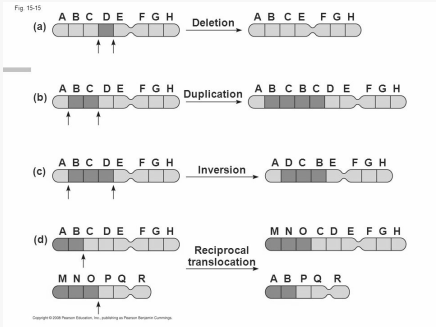
Sex-linked Genes

- **male** = XY
- **female** = XX
- **X inactivation:** most of 1 X chromosome in each cell becomes inactivated
- **Barr bodies:** inactive X chromosome condenses
-**gene SRY** (sex-determining region of Y): Y gene results in a male
↳ makes transcription factor that binds to other genes causing them to transcribe
- **sex-linked genes:** genes on sex chromosomes
- father passes Y to sons & X to daughters
- mother passes X to sons/daughters
- **sex determination in birds:**
↳ sex chromosome in *egg*
↳ *male* = ZZ
↳ *female* = ZW

Pedigree Chart



Chromosomal Mutations



- large scale chromosomal mutation = *change in phenotype*
- *three possible causes of mutations:*

1. physical/chemical disturbances
2. errors during meiosis
3. random mutation

Chromosomal Disorders

- nondisjunction:	pair of homologous chromosomes/sister chromatids fail to separate
- aneuploidy:	1 or more chromosomes have extra copies/deficient number
- monosomic (monosomy)**:**	diploid cell that has *1 copy* of a chromosome (not 2)
- trisomic (trisomy)**:**	diploid cell that has *3 copies* of a chromosome (not 2)
- polyploidy:	organism has more than *2 complete chromosome sets*
- Down syndrome:	extra chromosome 21 (trisomy)
- Klinefelter syndrome:	extra X chromosome in males (XXY)
- Turner syndrome:	loss of X chromosome in females (X0)
- XXY:	extra Y chromosome in males
- XXX:	extra X chromosome in females

Genomic Imprints

genomic imprints:

> expression of an allele in offspring depends on whether the allele is inherited from mother/father

When does it occur?

> during gamete formation

What chemical change does it involve?

> methyl group added to cytosine nucleotides (inactivates alleles)

Which organelles contain their own DNA?

> mitochondria & chloroplasts

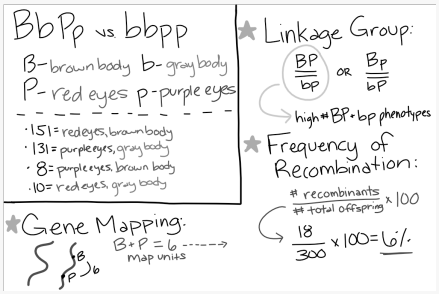
When do these organelles get passes to offspring?

> during fertilization, mitochondrial DNA from mother

Why are genetic defects of mitochondrial genes likely to affect the functioning of the nervous/muscular system?

> they are the most susceptible to energy deprivation (which ATP comes from mitochondria)

Linkage Group



- **linkage group:** all the loci that "move together" in inheritance
- **frequency of recombination:** the frequency that crossing over will occur between two genes
- **gene map:** chromosome map that shows the relative locations of genes
- **linked genes:** located close enough together on a chromosome that they tend to be inherited together
- **'wild type':** phenotype most commonly observed