# Genetics 1

- Mendel's Experiments
- Mendel's Models
- Genetics Vocabulary
- Complex Models of Inheritance
- iClicker Question #1

**Labs start this week!**

- Due in Lab – Pre-Lab 01

- Genetics Survey due Friday

Mendel more experiments

Cross 3 pure-breeding Short X pure-breeding tall

↓

$F_1$ : all tall = one trait dissappears

Cross 4 $F_1$ tall X $F_1$ tall

F2 ↓

$F_1$ → re-appears in F2 1/4

787 : 271

tall : Short

~ 3 : 1

Mendel's model → underlying process that gi

Mendel's model → underlying process that gives these results

Mende's Model

1. genetic information comes in particles
2. each particle can have one of several forms
   ex. R – round  r – wrinkled
   T – tall  t – short
3. each plant has 2 particles
   ∴ 3 possible combinations
   RR → round
   Rr → round
   rr → wrinkled
4. each parent contributes 1 particle in their gametes (egg / sperm) to their offspring
5. each organism has 2 particles, 1 from mom + 1 from dad

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parents  male round (RR) X female wrinkled (rr)

gametes

sperm: R, R  egg: r, r

F1: Rr  Round
wrinkled is masked

cross 2  F1 X F1
Rr X Rr  female

F2  male

| | R ½ | r ½ |
|---|---|---|
| ½ R | RR | Rr |
| ½ r | Rr | rr |

round : wrinkled
3 : 1

Punnett Square → possible offspring

Example of an Exam Answer

# Example of an Exam Answer

Genetic model of pea-shape inheritance

- pea shape is controlled by 1 gene with 2 alleles

| genotype allele | contribution to phenotype |
|---|---|
| R | round (dominant) |
| r | wrinkled (r recessive) |

∴ RR, Rr → round
rr → wrinkled

Simple dominance

Earlobes


More complex models of inheritance

① Incomplete dominance

| allele | contribution to phenotype |
|---|---|
| A | red } incompletely dominant |
| a | white } incompletely dominant |

∴ AA – red
aa – white

Aa = pink (intermediate to red & white)

② Co-dominance → blood type

| allele | c. to p. | |
|---|---|---|
| $I^A$ | bld. type A | → co-dominant w/ $I^B$ |
| $I^B$ | " " B | → co-dominant w/ $I^A$ |
| i | O | → recessive to $I^A$, $I^B$ |

| genotype | | phenotype (blood type) |
|---|---|---|
| $I^A I^A$ | → | A |
| $I^B I^B$ | → | B |
| ii | → | O |
| $I^A i$ | → | A } simple dominance |
| $I^B i$ | → | B } simple dominance |

$I^B i$ → B

$I^A I^B$ → AB → co-dominance
both A and B

# Bio 111 Genetics Definitions:

**Character** = a heritable feature of an organism (ex. eye color, pea shape, etc.

**Trait** = one of many forms of a character (ex. blue eyes, brown eyes; round peas, wrinkled peas, etc.)

**Gene** = a particle of inheritance. "Seed shape in peas is controlled by one gene." In the simplest cases, each gene controls one **character** (ex. a gene for eye color or pea shape), and each **character** is controlled by one gene.

**Allele** = an alternative form of a gene. The different *alleles* of a **gene** control different *traits* of that **character.**
(ex. "The seed shape gene in peas has two alleles, each conferring a different trait:
R - round and r - wrinkled")
**wild-type allele** = the allele most commonly found in nature
**mutant allele** = an altered form of a gene that is different from wild-type

**Genotype** = the alleles present in an organism (ex. "RR", "Rr", "rr")
**homozygous** = both alleles are the same type (ex. "RR rr") a.k.a "true-breeding"
**homozygote** = an organism that is homozygous
**heterozygous** = both alleles are different (ex. "Rr")
**heterozygote** = an organism that is heterozygous

**haploid** = having only one allele of each gene; sometimes abbreviated "N". Gametes (eggs, sperm, etc.) are haploid and would therefore have genotypes like "r" or "R" but not "RR".
**diploid** = having two alleles of each gene; sometimes abbreviated "2N". Most cells of an individual are diploid and would therefore have genotypes like "RR", "Rr", etc.

**Phenotype** = the observable characteristics of an organism (ex. "round peas" or "wrinkled peas")

**dominant** = the phenotype observed in the heterozygote
types of dominance
(ex. A = red and a = white, so the homozygotes are AA - red and aa - white)
- **simple dominance** = the heterozygote looks like **one** of the homozygotes
  (ex. if A is simply dominant to a, then Aa would be red)
- **incomplete dominance** = the heterozygote's phenotype is **in between** the homozygotes (ex. Aa would be pink - in between red and white).