HEREDITY

VOCABULARY PART II:

- Phenotype
  - Observable characteristics or traits
- Genotype
  - Gene makeup
  - Capital letters represent dominant genes and lowercase represent recessive genes
- Pure bred
  - Offspring that are identical to their parents
- Hybrid
  - Mixture of two pure breeds
- P generation
  - Parent generation

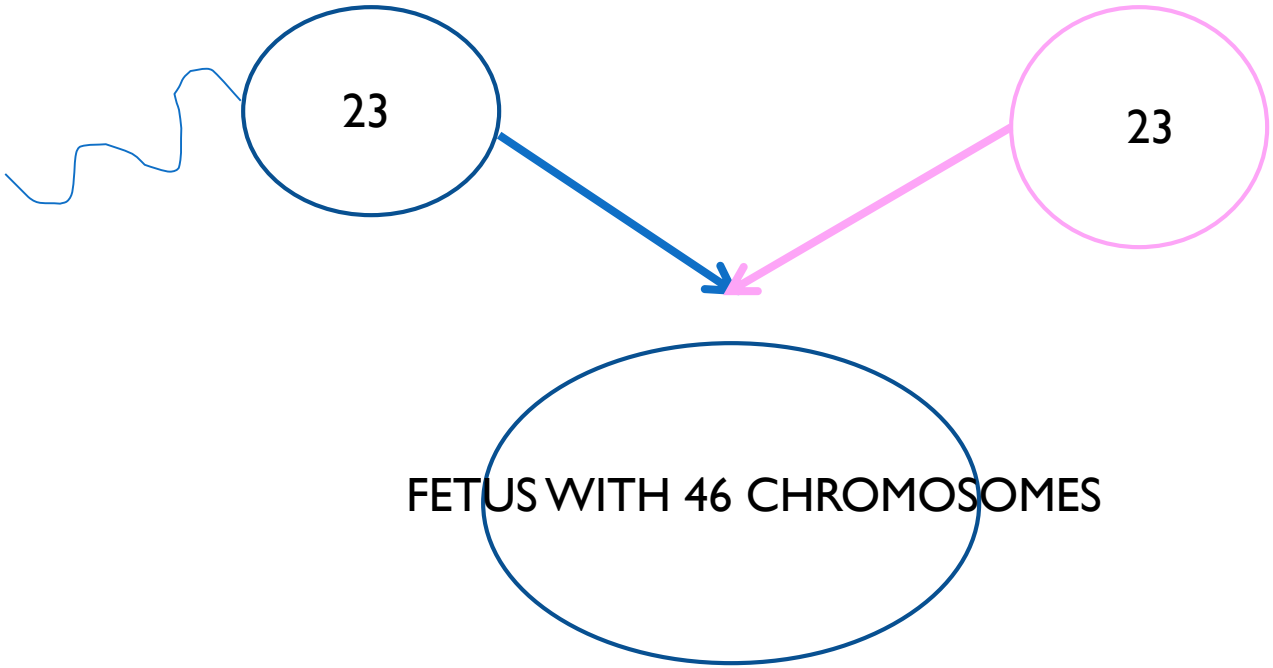
VOCABULARY PART II CONTINUED:

- F_1 generation
  - Filial generation 1, offspring of the parents (P generation)
- F_2 generation
  - Filial generation 2, offspring of the F_1 generation
- Dominant
  - Traits that dominate over other traits and are expressed
- Recessive
  - Traits that are not expressed
- Phenotypic Ratio
  - Ratio of phenotypes in an offspring.
  - Ex. 3 tall plants for every 1 dwarf plant has a ratio of 3:1
- Genotypic Ratio
  - Ratio of genotypes in offspring
  - Ex. 1 tall plant, 2 tall/dwarf, 1 dwarf (1:2:1)

BACKGROUND:

- Genetics is the study of how traits are passed from parent to child through genes and chromosomes
- Sperm and egg: 23 chromosomes
- All other cells: 46 chromosomes

FERTILIZATION AND SEX DETERMINATION:



- One pair of the 46 chromosomes is the sex chromosomes
- Mom gives X and X, Dad gives X and Y, Male determines sex
- If sperm Y joins with X from egg →boy
- If sperm X joins with X from egg → girl

GENES

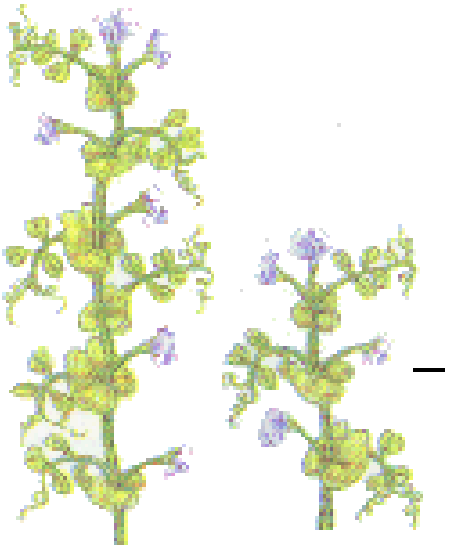
- Each chromosome carries many genes
- Some traits have one gene (ie. blood type)
- Some traits are the result of pairs of genes together:
  - Ex. Hair colour, eye colour, height
- Genes can either be dominant or recessive
  - Dominant: cancels out trait carried by recessive gene
    - Ex. Brown eye colour is dominant over blue
  - Recessive: for trait to appear must get recessive gene from BOTH parents
    - Ex. Both parents have blue eyes → child will have blue eyes

PUNNETT SQUARES:

- Used to illustrate the possible outcomes (offspring) of a mating or cross
- Steps to construct a Punnett Square:
  1. Determine parental genotypes
  2. Determine the possible genotypes of the gametes of each parent
  3. Write these genotypes in the exterior of the squares
  4. Fill in the interior and interpret the genotype and phenotype of the next generation
- Same genes (tt): homozygous
- Different genes (Tt): heterozygous

EXAMPLE:

- Consider the cross between a purebred tall plant (TT) and a purebred dwarf plant (tt)
  1. Determine parental genotypes
     - TT – tall and tt - dwarf
  2. Determine the possible genotypes of the gametes of each parent
     - Tall can only have T gametes, dwarf can only have t gametes



EXAMPLE CONTINUED:

3. Write these genotypes in the exterior of the squares

tt dwarf gametes	TT tall gametes: T	T
t		
t		

4. Fill in the interior and interpret the genotype and phenotype of the next generation

tt dwarf gametes	TT tall gametes: T	T
t	Tt	Tt
t	Tt	Tt

Genotypes: 4 Tt phenotypes: 4 tall plants

EXAMPLE 2:

- Consider the cross of 2 F1 plants from the last cross

1. Parental genotypes:
   - Tt and Tt
2. Gametes:
   - T (tall) or t (dwarf) for both parents
3. Fill in the table:

Tt tall gametes

Tt tall gametes

	T	t
T		
t		

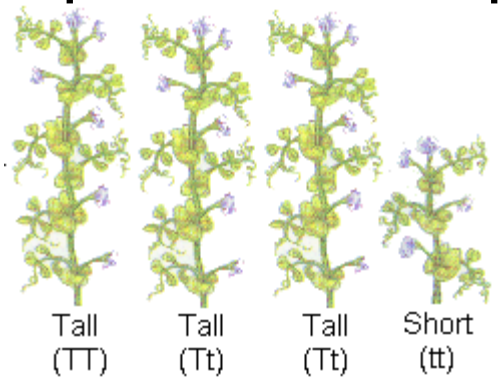
EXAMPLE 2 CONTINUED:

4. Complete the cross:

Tt tall gametes	T	t
T	TT	Tt
t	Tt	tt

Genotypic ratio: 1 TT: 2 Tt: 1tt

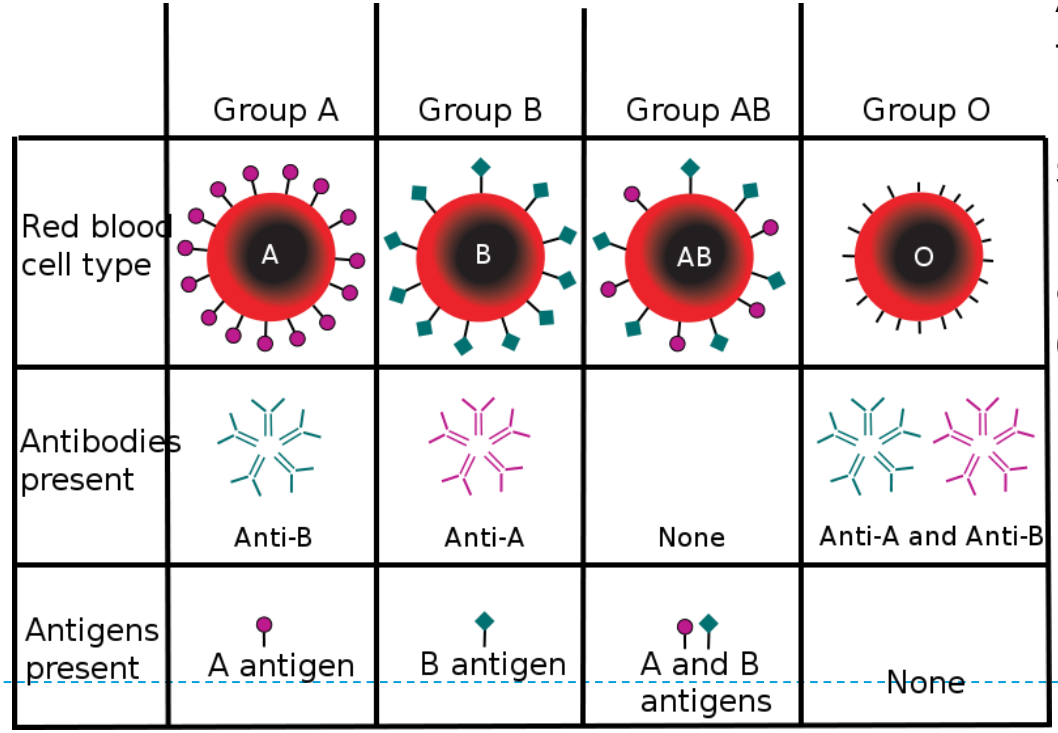
Phenotypic ratio: 3 tall plants: 1 dwarf plant



BLOOD TYPES:

- There are 4 different blood types: A, B, AB, and O
- Blood type is based on the antigens or surface molecules present on your red blood cells
- Have antibodies against other blood types (except O) so you cannot receive other blood types

Type AB can receive any blood because they do not have any antibodies, they are universal acceptors



Anyone can receive type O blood because it has no surface antigens People with type O are universal donors

BLOOD TYPES CONTINUED

- A, B, AB, and O are the phenotypes
- The genotypes are as follows:
  - Blood type A:
    - Either I^AI^A or I^Ai^O
    - Therefore, because the phenotype is A, A is dominant over O
  - Blood type B:
    - Either I^BI^B or I^Bi^O
    - Therefore, because the phenotype is B, B is dominant over O
  - Blood type O:
    - Only i^Oi^O
    - Type O is recessive so you must have 2 copies of the O gene
  - Blood type AB:
    - Only I^AI^B
    - These are equally expressed so we call this co-dominance

BLOOD TYPES CONTINUED

- Blood types are either – or + due to the presence or absence of an "Rh factor"
- Rh factor is a surface molecule on red blood cells
  - + : have Rh factor
  - - : don't have Rh factor
- Mothers that are – can create antibodies against + babies if their blood mixes
  - Antibodies will kill off babies blood cells
  - Mothers are given medication to suppress this immune response