



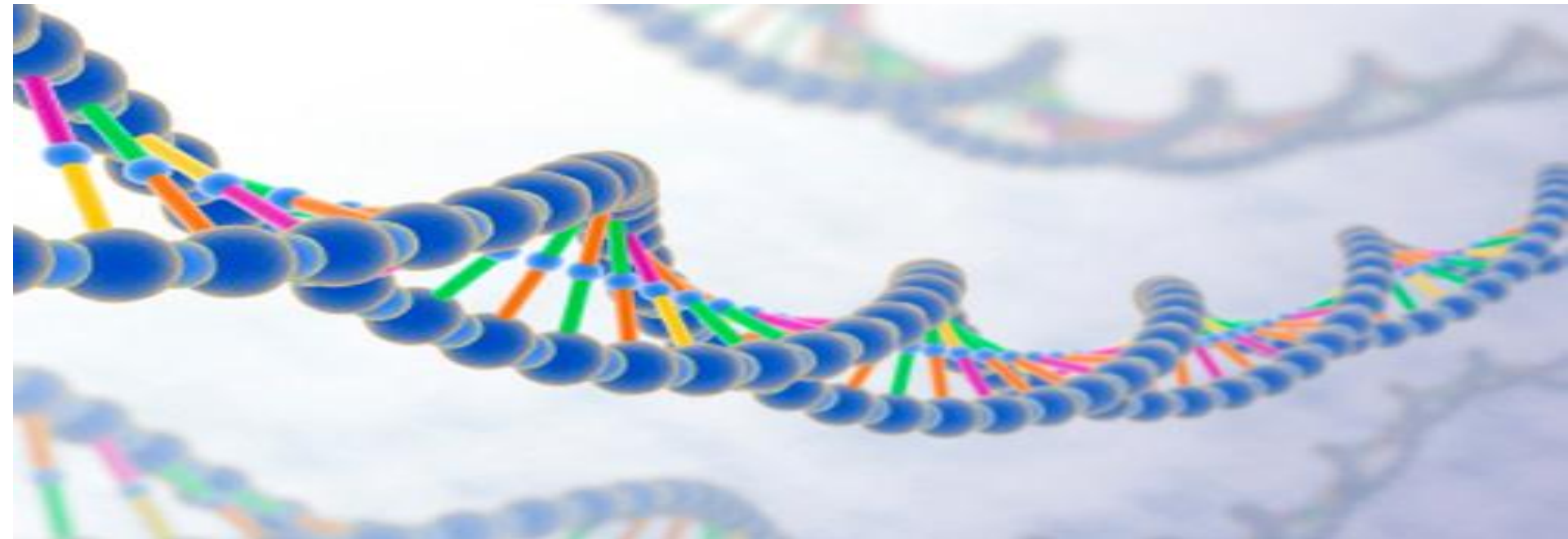
Freckles

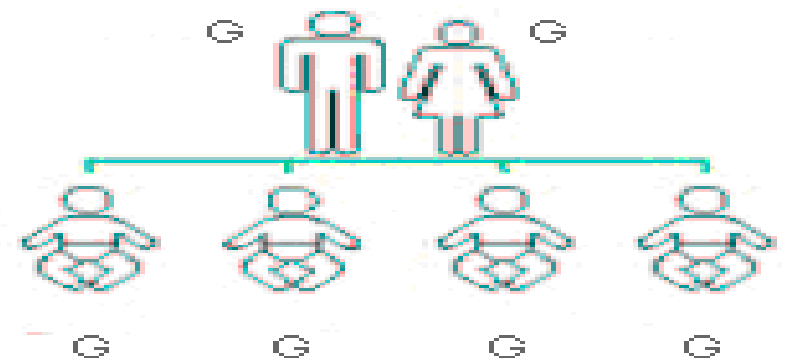
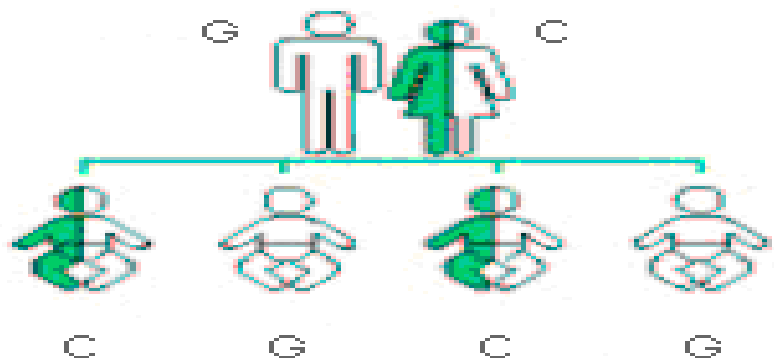
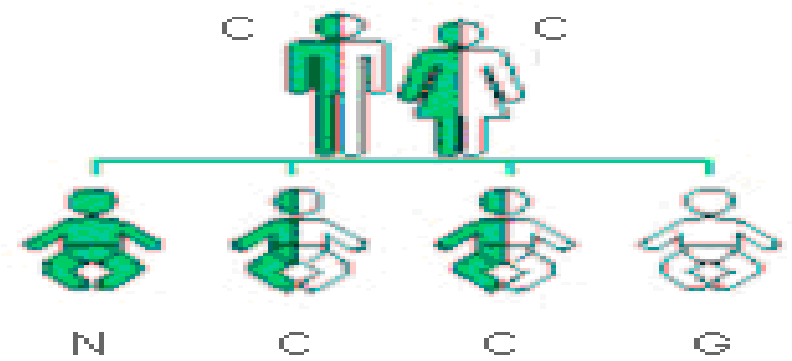
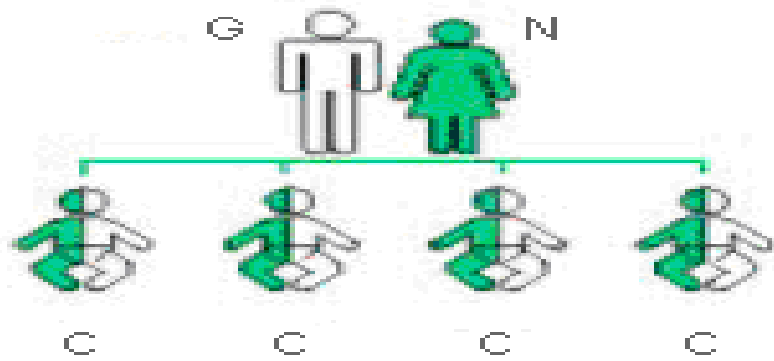
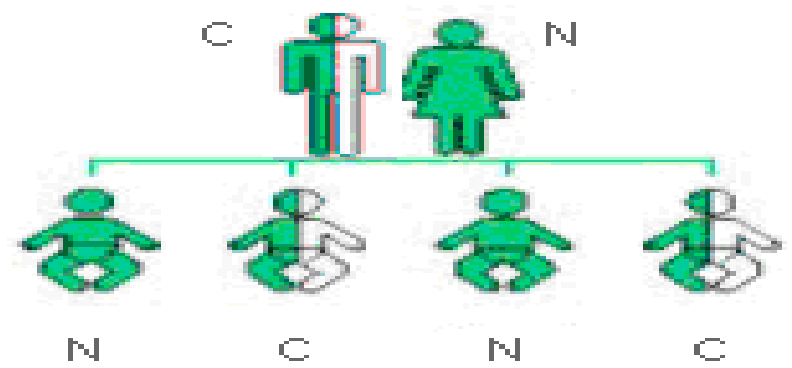
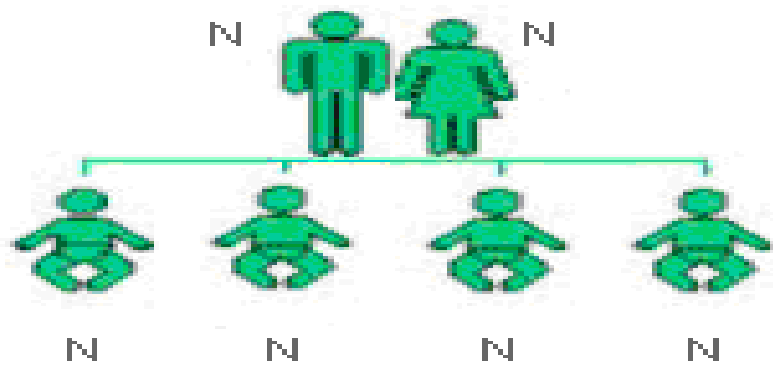


No Freckles

Chapter 11

Introduction to Genetics

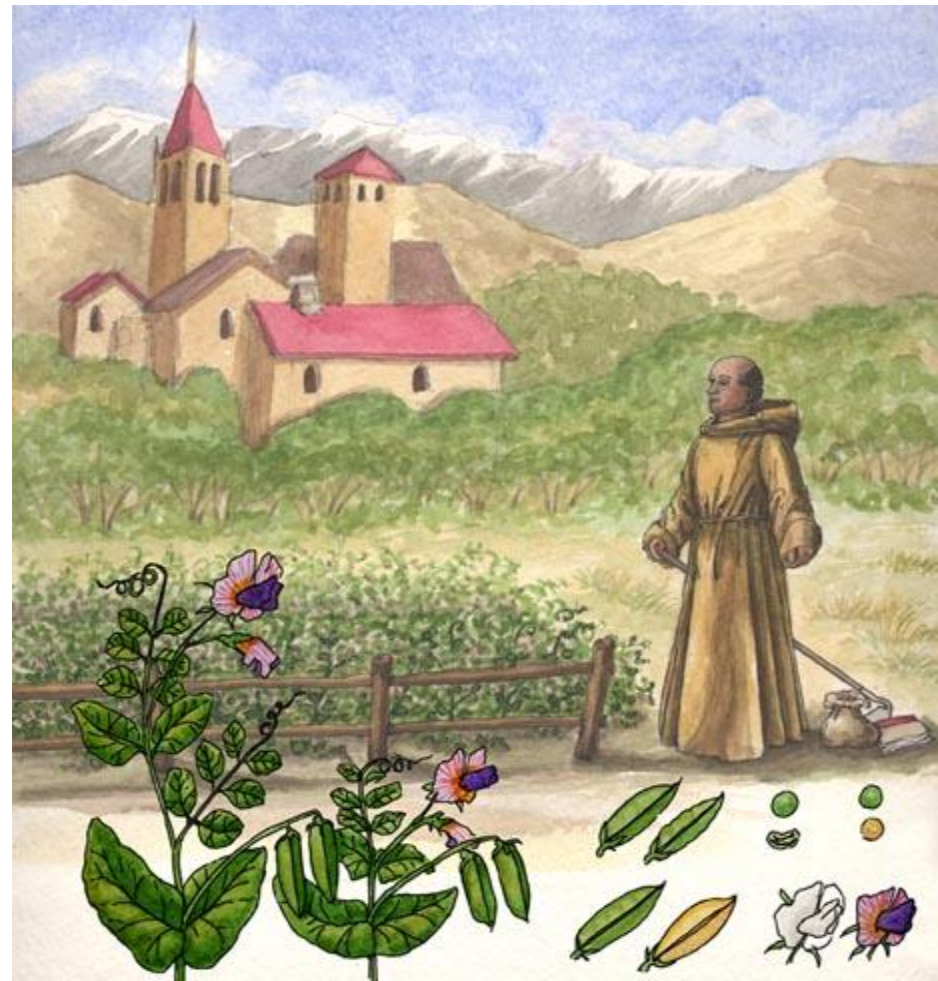




 = Non-Affected
  = Carrier
  = Gaucher Disease

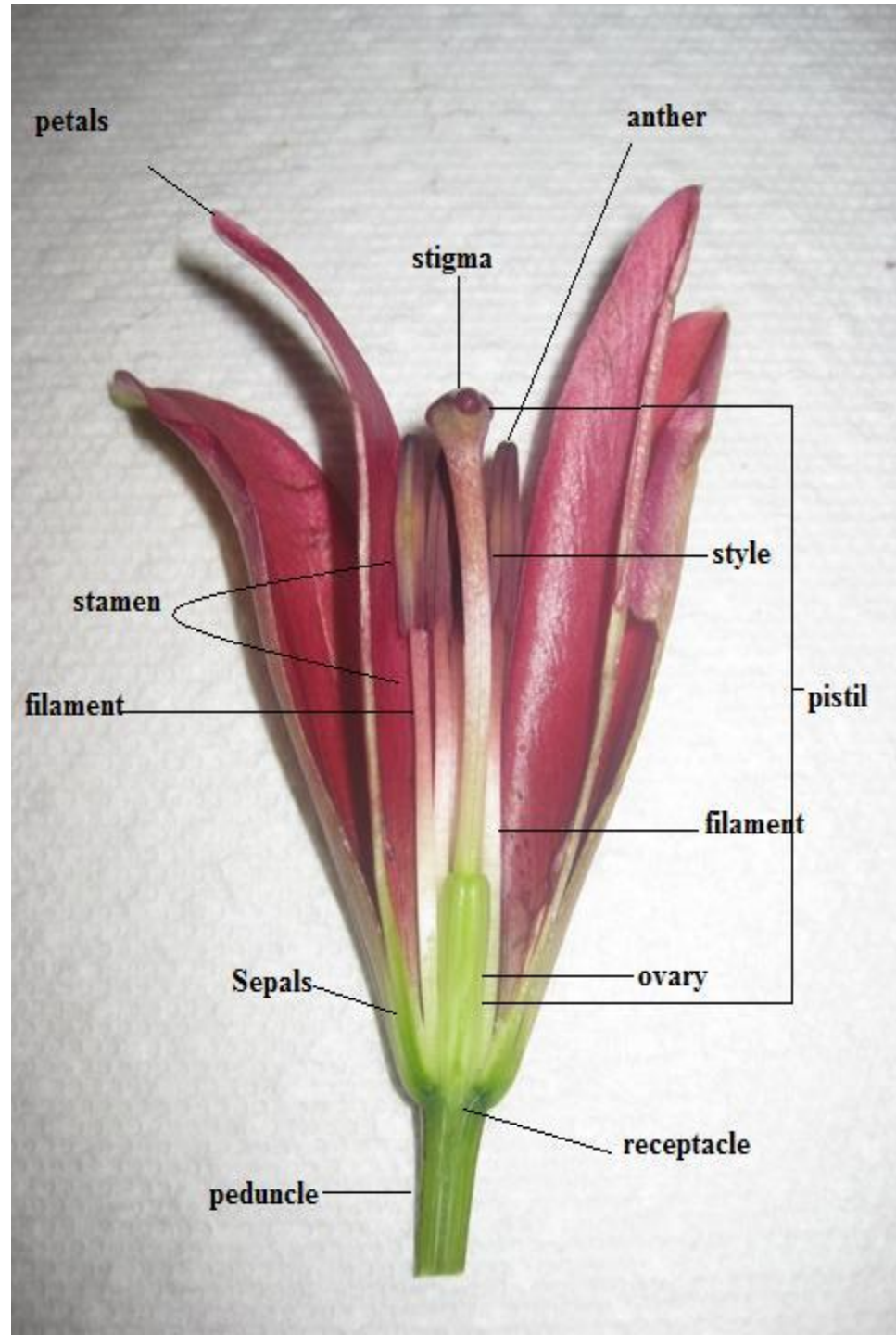
11.1 Gregor Mendel

- Genetics is the scientific study of heredity
 - How traits are passed from one generation to the next
- Mendel
 - Austrian monk (1822)
 - Used Pea Plants (crossed and looked at Off-spring)



Pea Plant










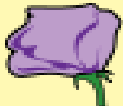




- Have both male (sperm) and female (eggs) on same flower
 - Fertilization –
when sperm and egg meet



7 Traits

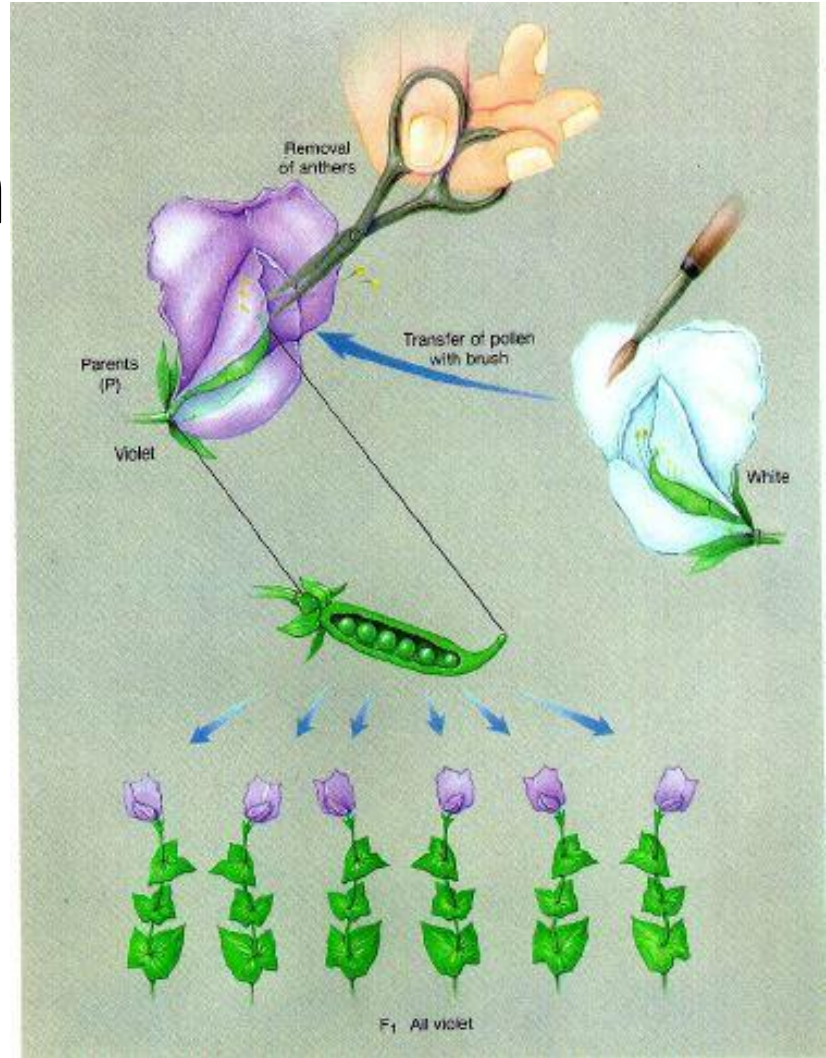
- **True Breeding** – when a plant is allowed to self- pollinate and it produces offspring **identical** to themselves

Example: Tall plants – **Always** produce tall offspring.

Seed		Flower	Pod		Stem	
Form	Cotyledons	Color	Form	Color	Place	Size
						
Grey & Round	Yellow	White	Full	Yellow	Axial pods, Flowers along	Long (6-7ft)
						
White & Wrinkled	Green	Violet	Constricted	Green	Terminal pods, Flowers top	Short (<1ft)
1	2	3	4	5	6	7

Pollination

- Cross – One plant gives the sperm (male) while the other gives the egg (female)
- Self – plant gives both male and female reproductive cells to produce the offspring.



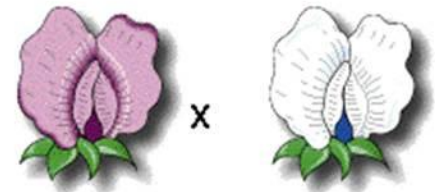
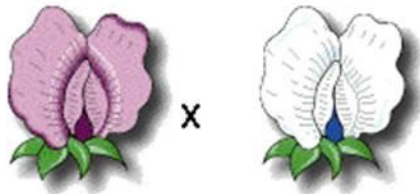
- When 2 contrasting traits (purple X white) (P) were crossed the offspring were called hybrids (F₁)

Generations

- **P -- purple x white**

PARENTAL CROSS

Pollen (purple) Ovule (white) Ovule (purple) Pollen (white)



- **F₁ (hybrids) – purple (all of them)**
– This was a surprise to Mendel

11.2

Crosses and Probability



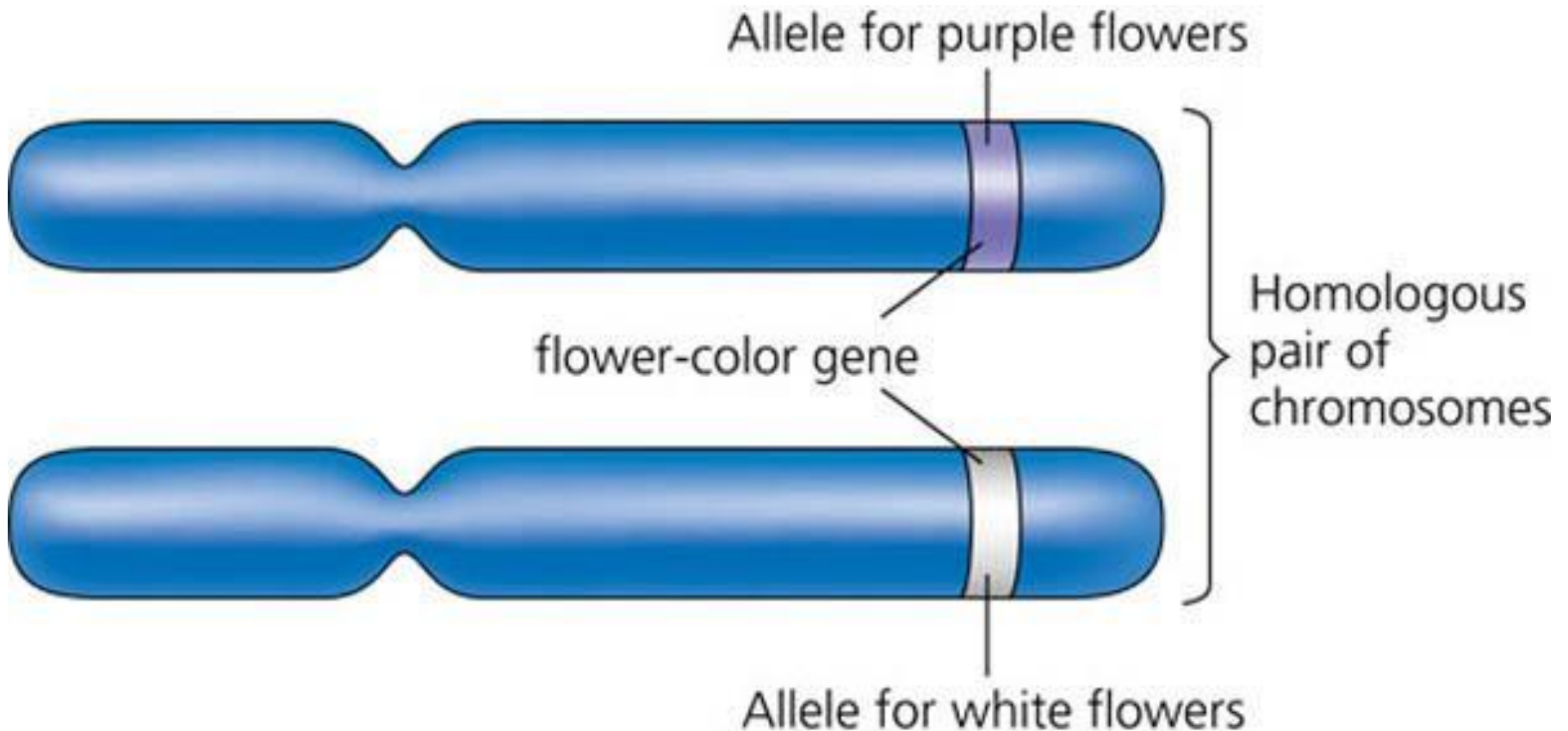
Trait

- A specific Characteristic that can vary from person to person
 - Example:
 - Seed color
 - Flower color
 - Height
 - Eye color
 - Ear lobe attachment



Chemical Factors

- Genes – chemical factors that determine traits
 - Alleles – the different forms a gene comes in



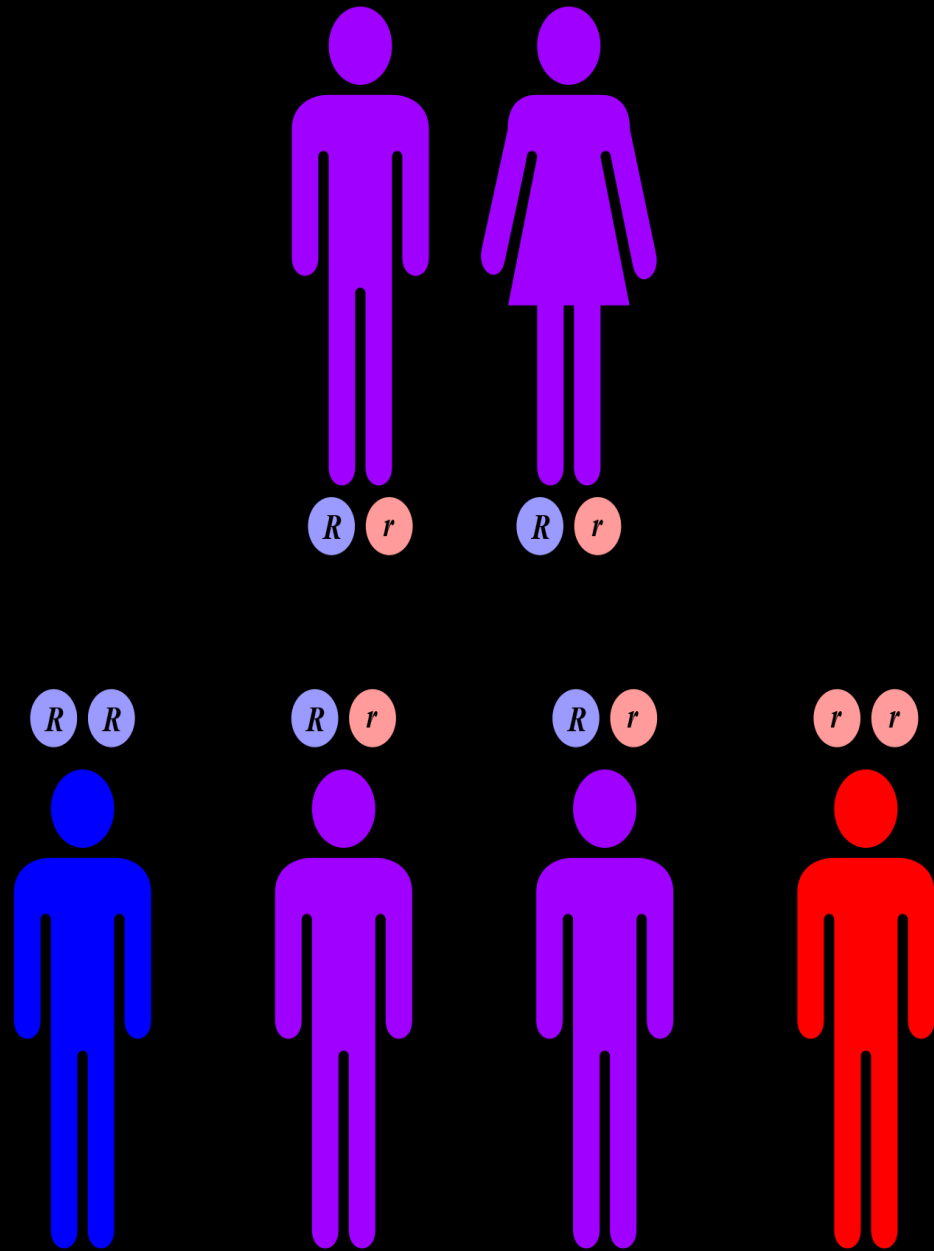
Genes and Alleles

- Gene – the chemical factor (DNA) that determines traits. Genes are a section of DNA that code for one trait. All of your DNA code for all of your traits
 - Alleles are the different forms that the Genes can come in.
 - Example:
 - Gene = Seed color DNA code
 - Alleles = Yellow or Green DNA code

Mendel's Conclusions

1. Inheritance
determined by genes
(factors) passed from
one generation to the
next

1. Occur in two
Contrasting alleles
(forms)



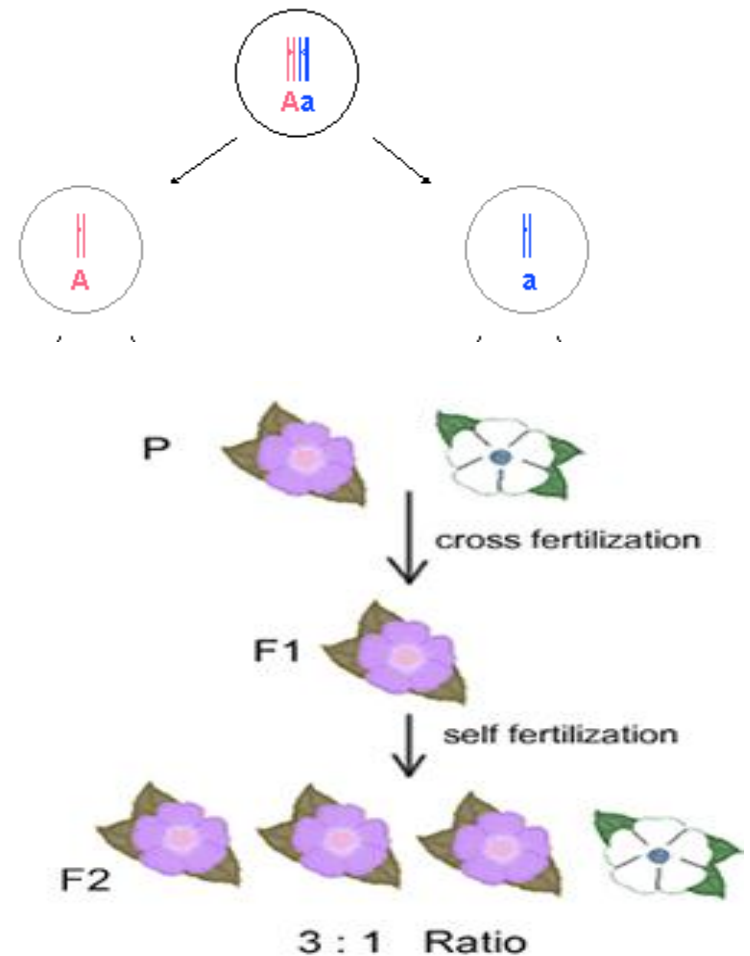
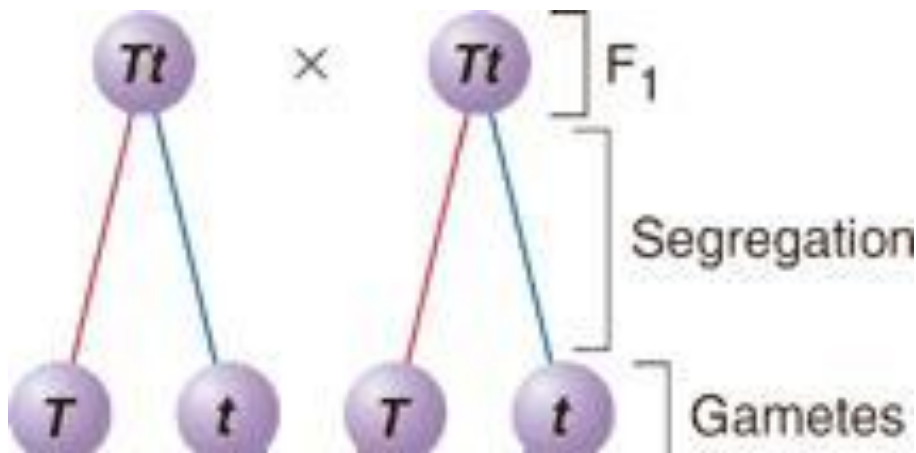
Principal of Dominance

- Some alleles dominant (hide) other alleles (recessive)



Segregation

- The two alleles separate when forming gametes (sperm or egg)
 - Process of Meiosis



Punnet Square

- Probability: The likelihood that an event will occur. It is likely that a flipped coin will come up heads 1 out of 2 times or (50% of the time)
- Predict Possible offspring
- Tall (Tt) X Tall (Tt)

	G	g
G	GG	Gg
g	Gg	gg

	T	t
T		
t		

- **Homozygous**

Same alleles (aa or AA)

- **Heterozygous**

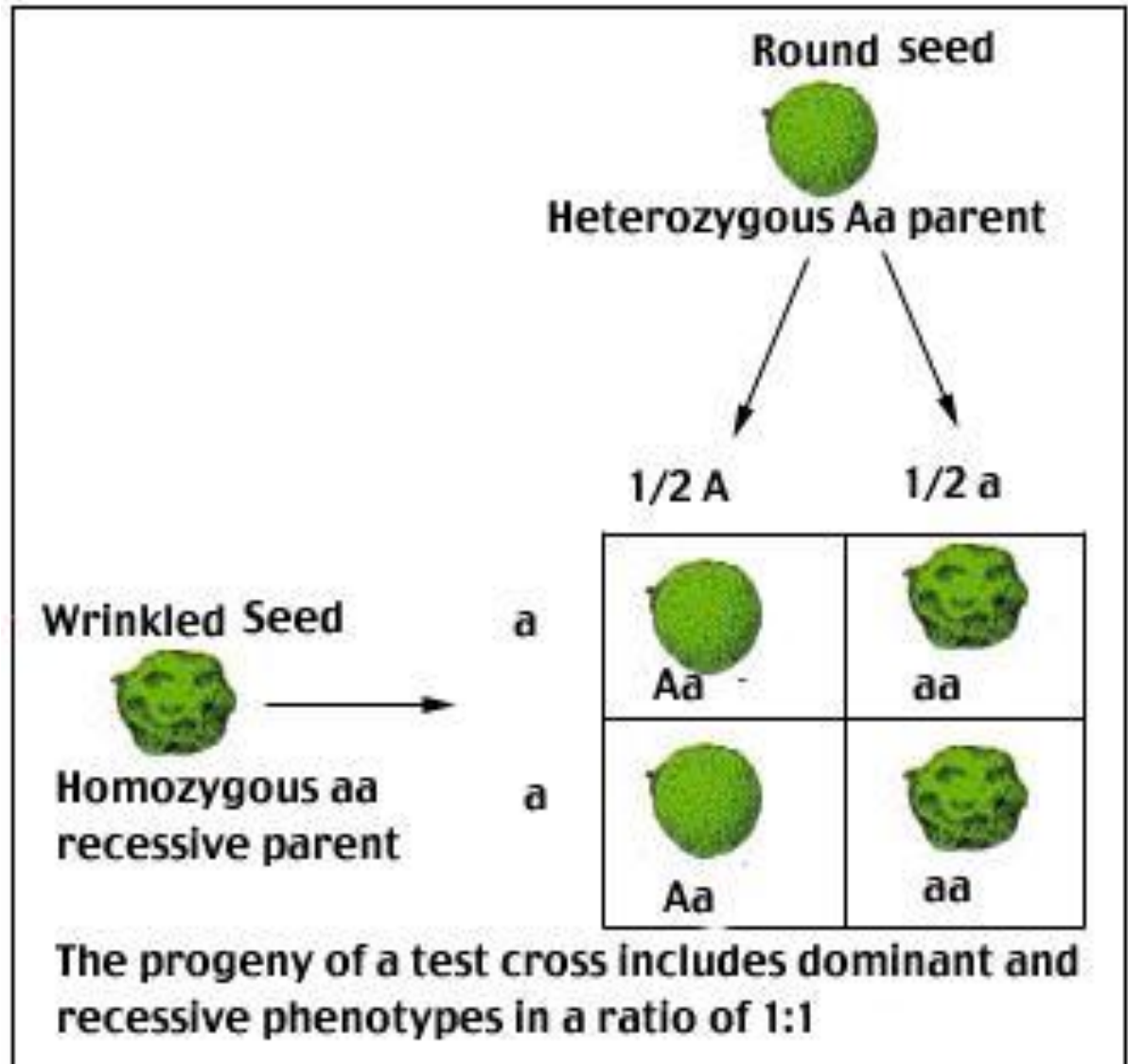
Different alleles(Aa)

- **Phenotype**

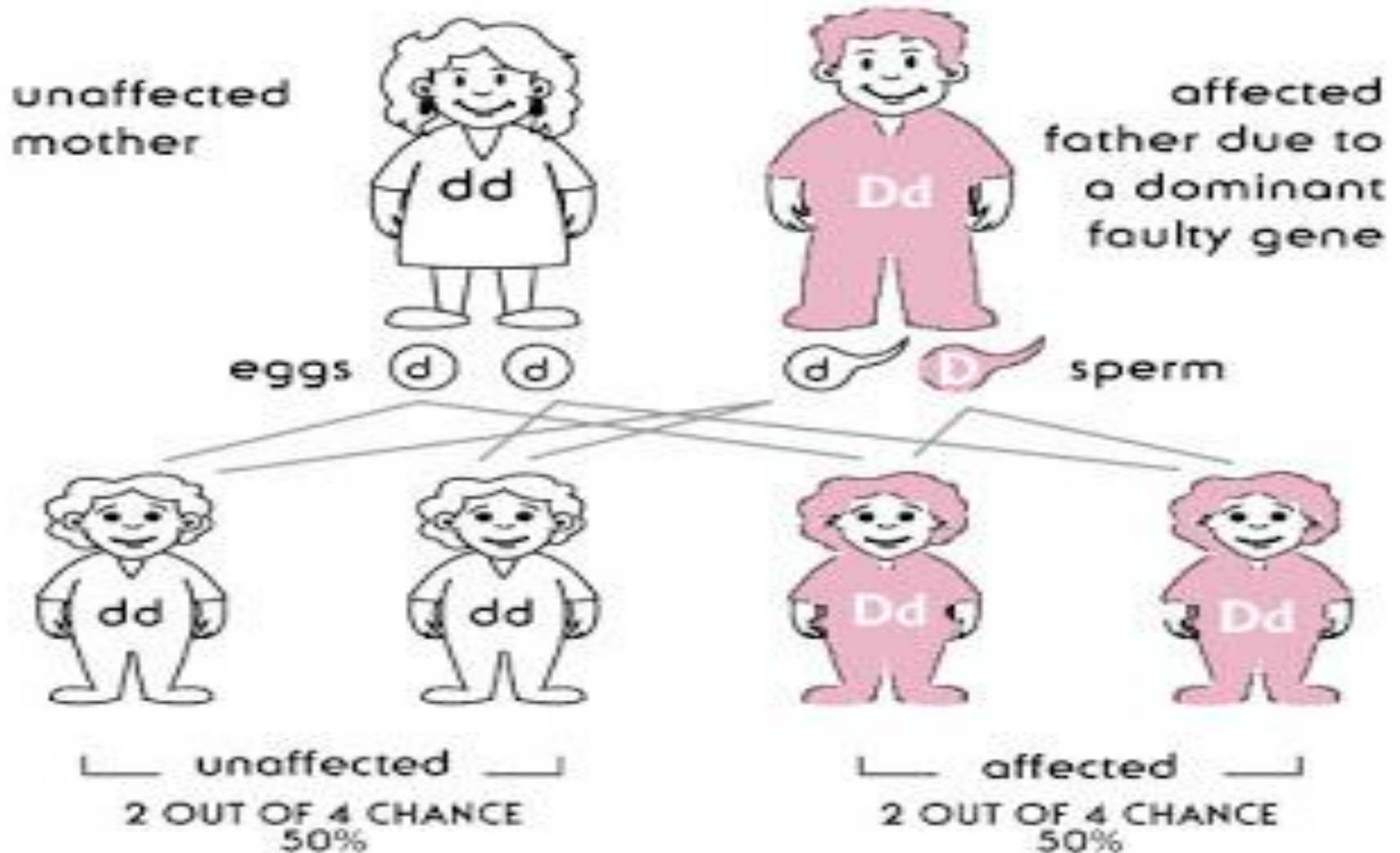
Outward (wrinkled)

- **Genotype**

2 Allele that make up gene (aa)

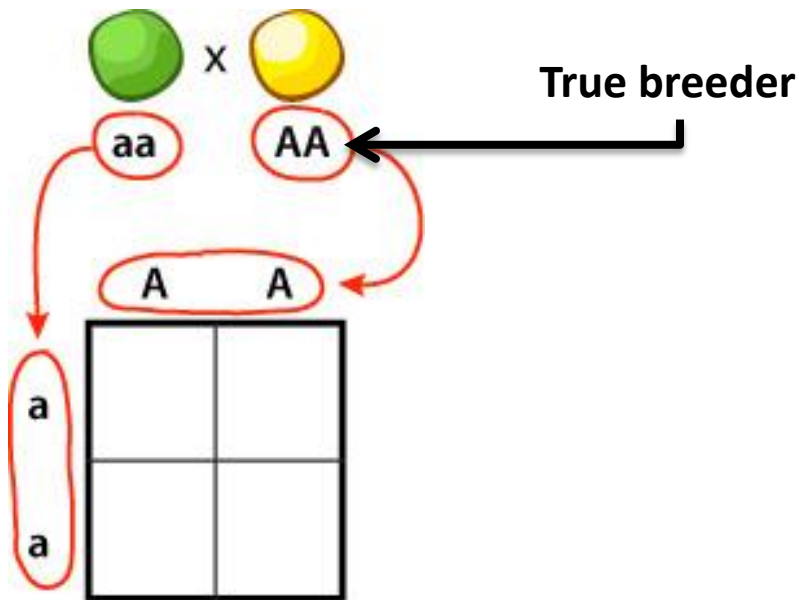


What is the phenotype, genotype of each parent? (Use color and letters to explain)

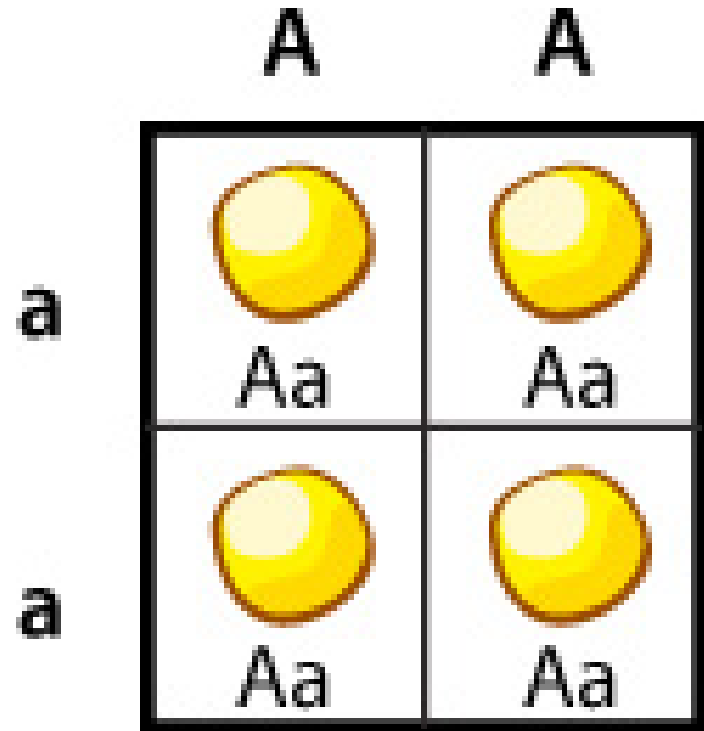


P Generation Cross (true breeders)

Step 1: Separate Alleles







Step 2:
Bring Alleles together in each box



F1 generation Cross (self Pollination)

Heterozygous (Aa) X Heterozygous (Aa)

	A	a
A	 AA	 Aa
a	 Aa	 aa

Ratios

Genotypic: 1:2:1

Phenotypic: 3:1

Practice Cross

- TT (Tall) X tt(short) – Do the P generation cross
- Do the F1 generation self pollination
- State the ratios of the F2 generation

11.3 Exploring Mendelian Genetics



Independent Assortment

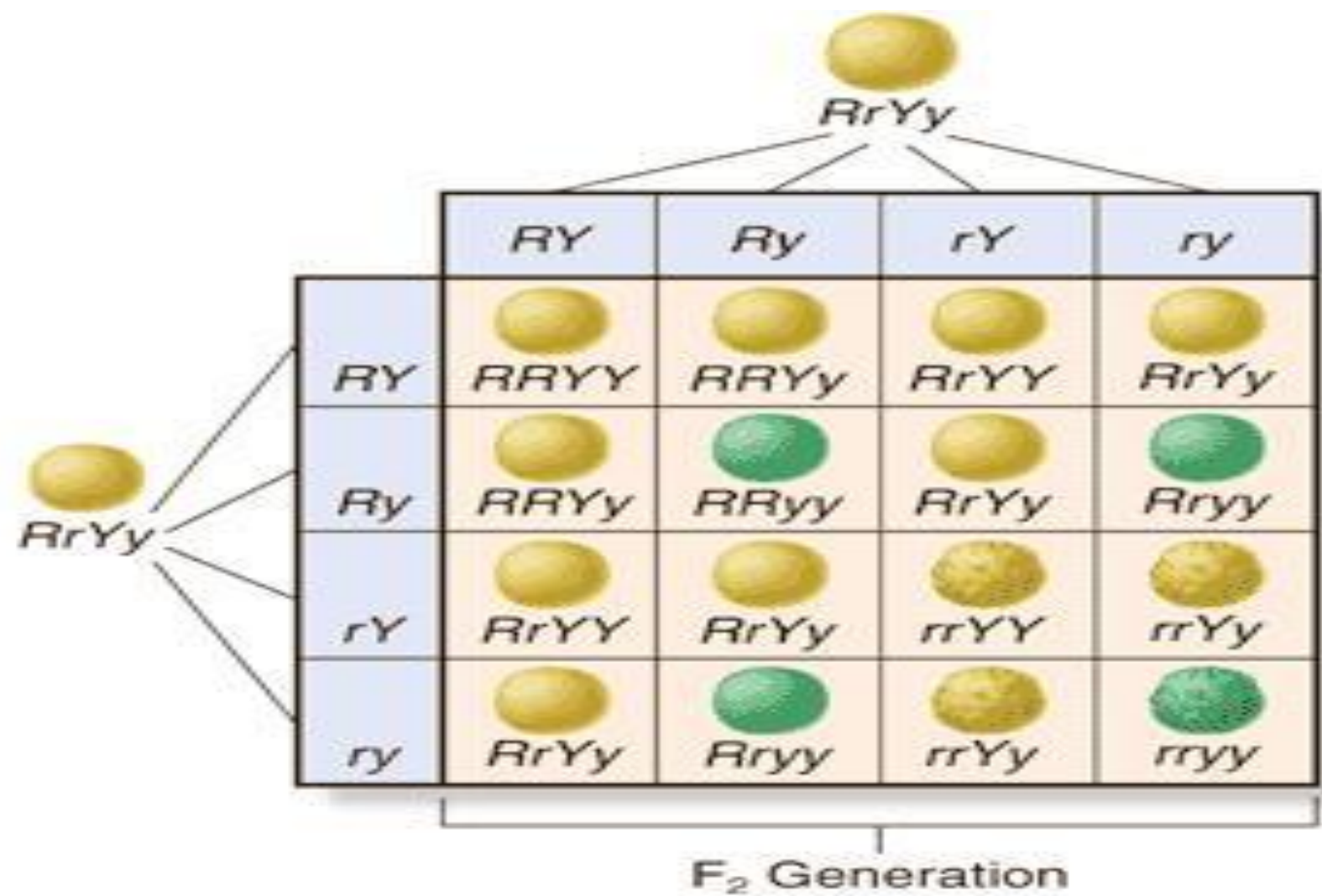
- If two different genes are examined are they linked or do they separate independently during meiosis?
 - Mendel's pea traits Assort Independently
 - Parent genotype: RrTt X RRTT
 - Gamete Alleles (top/side of punnett square)
 - (Top) RT, Rt, rT, rt (Side) RT, RT, RT, RT

Large Punnett Square (2 gene cross)

$AaPp \times AaPp$

AP Ap aP ap

AP	$AAPP$	$AAPp$	$AaPP$	$AaPp$
Ap	$AAPp$			
aP				
ap				

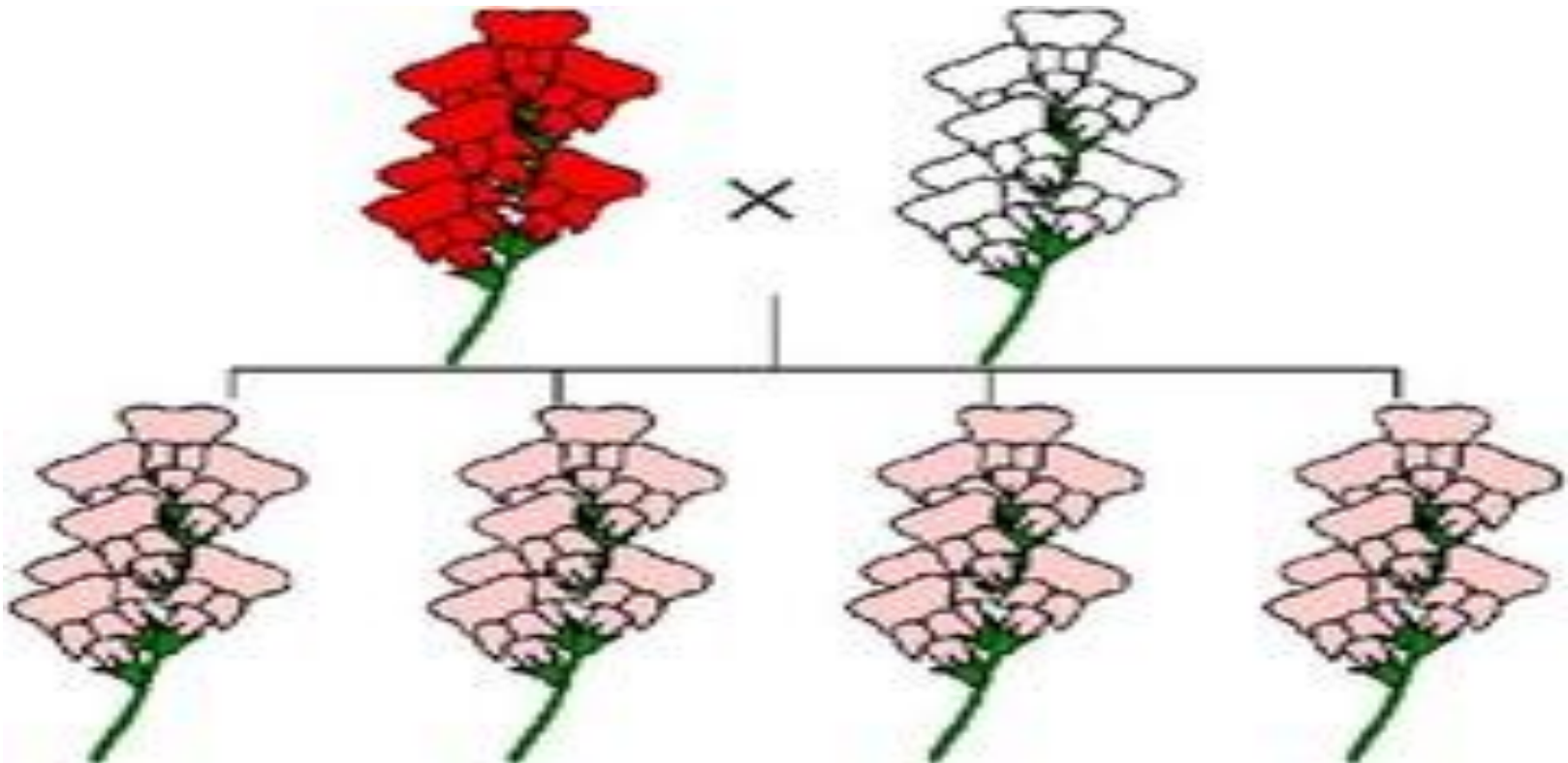


Practice: Set up the following PS

- Heterozygous Tall, heterozygous Round crossed with Homozygous Tall, wrinkled pea plant.
 1. Write out Parents (remember 2 genes = 4 alleles)
 2. Set up top and side of PS (4 top, 4 side)
 1. 2 alleles per box
 3. Fill in the boxes (16 boxes)
 1. 4 alleles per box

Beyond Mendel

- Incomplete Dominance: The Heterozygous shows a **blending** between both traits



Beyond Mendel

- Co-dominance: Heterozygous **show both** traits at the same time



Beyond Mendel

- **Multiple Alleles:** Having more than 2 alleles in a population. So there is a hierarchy of dominance: Full color > Chinchilla > Himalayan > albino (rabbits)

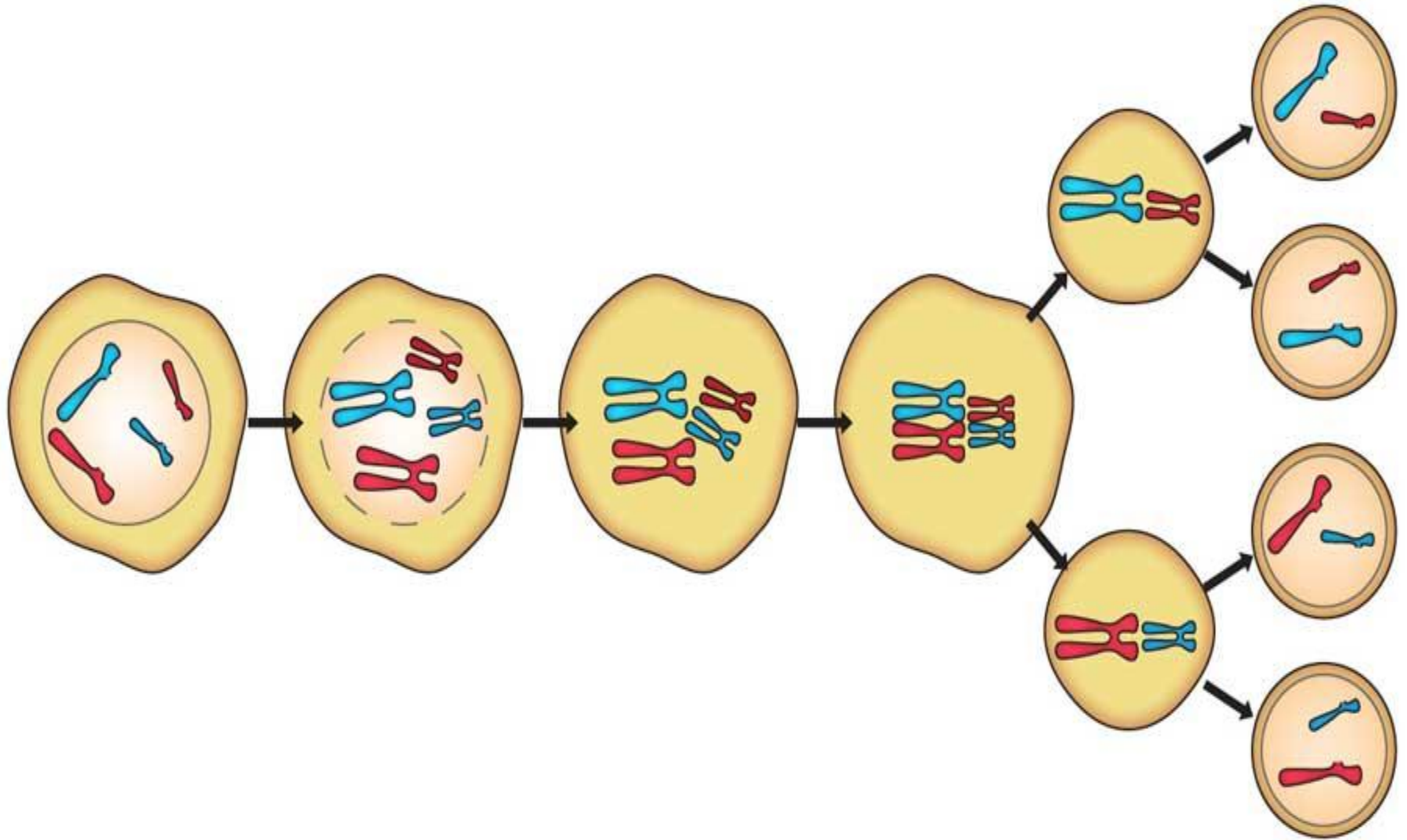


Beyond Mendel

- Polygenic Traits: Controlled by two or more genes.
 - Skin Color in humans has four different genes



Meiosis 11.4

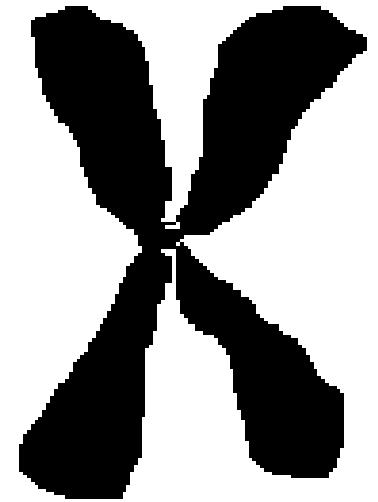


Chromosomes

- **Diploid(2N):** When you have both copies of the chromosome (1 from Mom and 1 from Dad)



haploid
chromosome

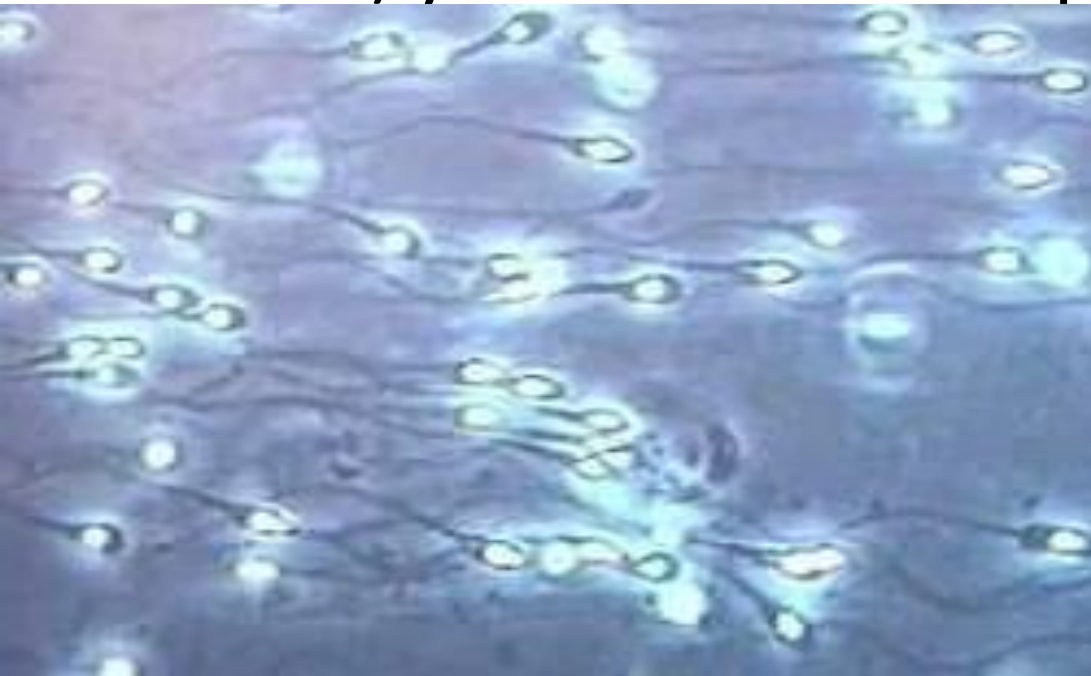


diploid
chromosome

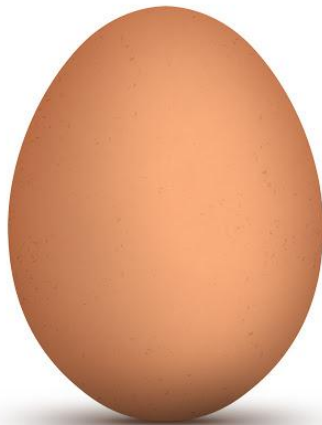
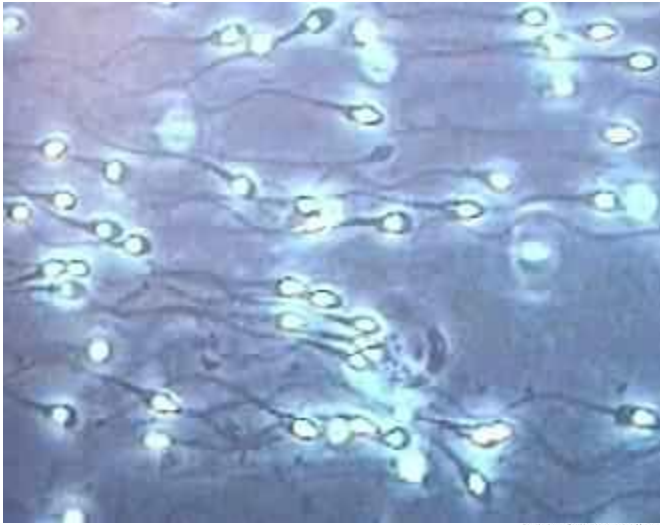
- **Haploid(N):** When you have one copy of the chromosome (occurs in gametes: sperm or egg)

Goal of Meiosis

- Take a Diploid cell and make 4 unique haploid gametes
- So that during fertilization (sperm and egg meet) you make one unique diploid individual.



Haploid/Diploid, Gamete or Organism



Chromosome

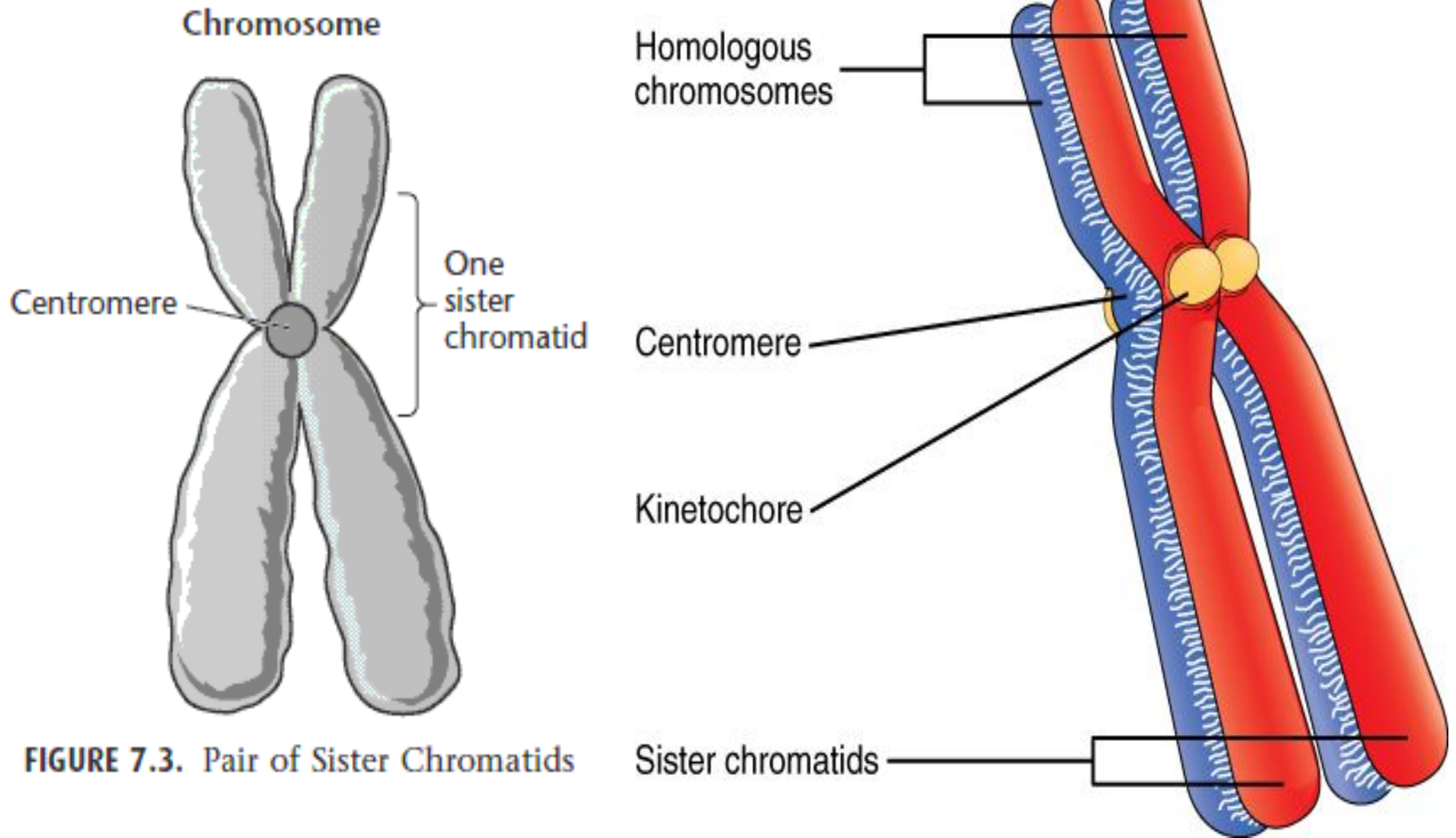
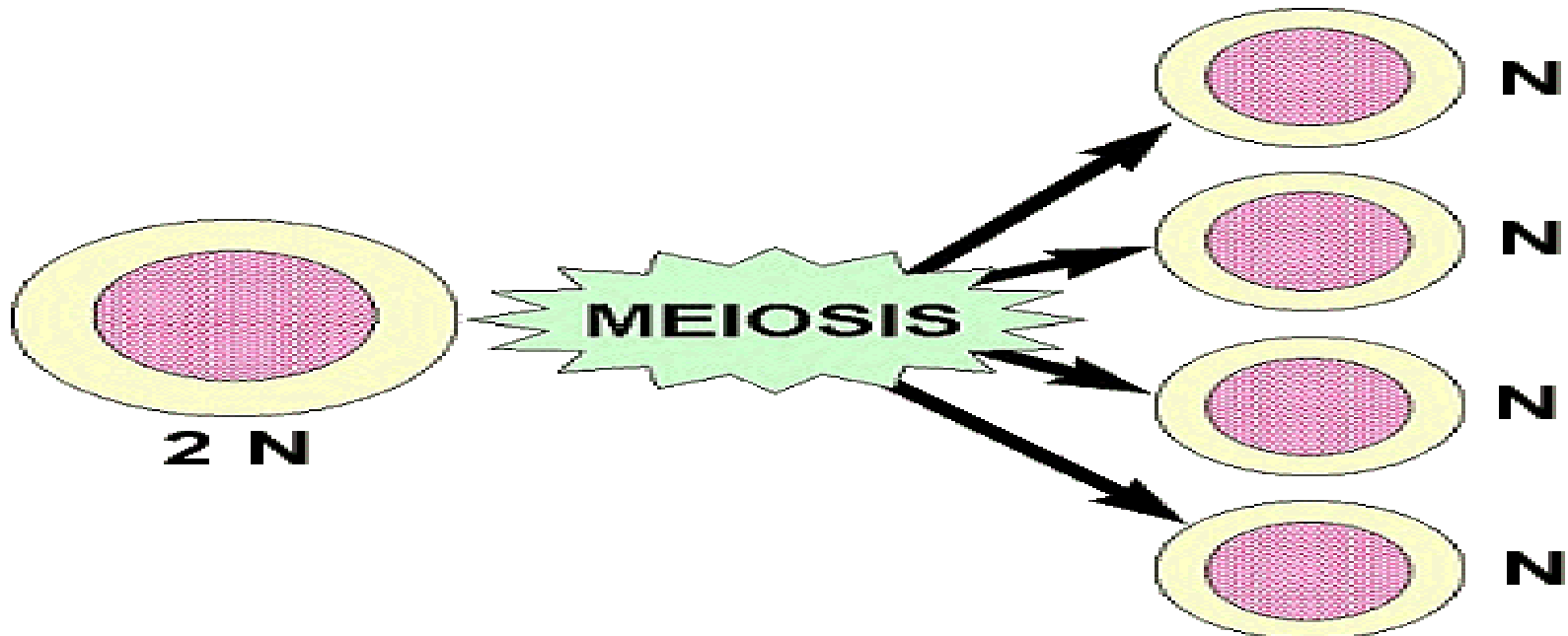


FIGURE 7.3. Pair of Sister Chromatids

2 stages of Meiosis

- Meiosis 1 – homologous chromosome separate
- Meiosis 2 – Chromatids separate
 - End result = 4 unique cells



Crossing Over

- During Prophase 1 the homologous chromosomes share “legs” and exchange genes.
 - This leads to more variation within a population
 - When the Homologous chromosomes are paired up this is called a tetrad

Crossing Over

