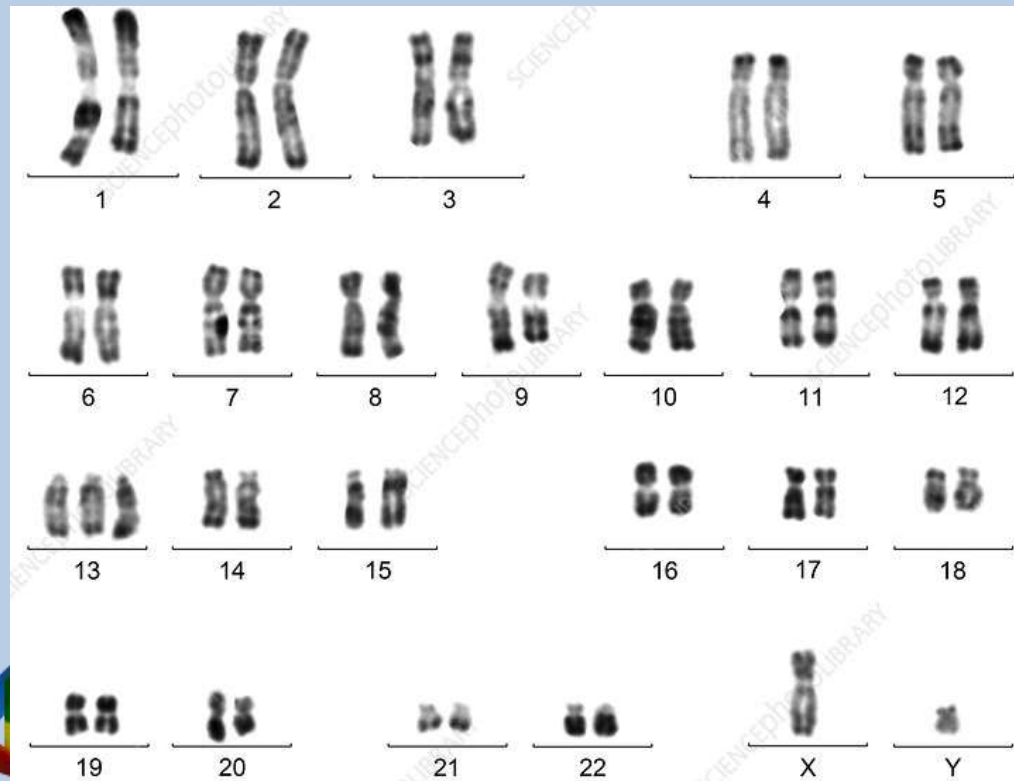
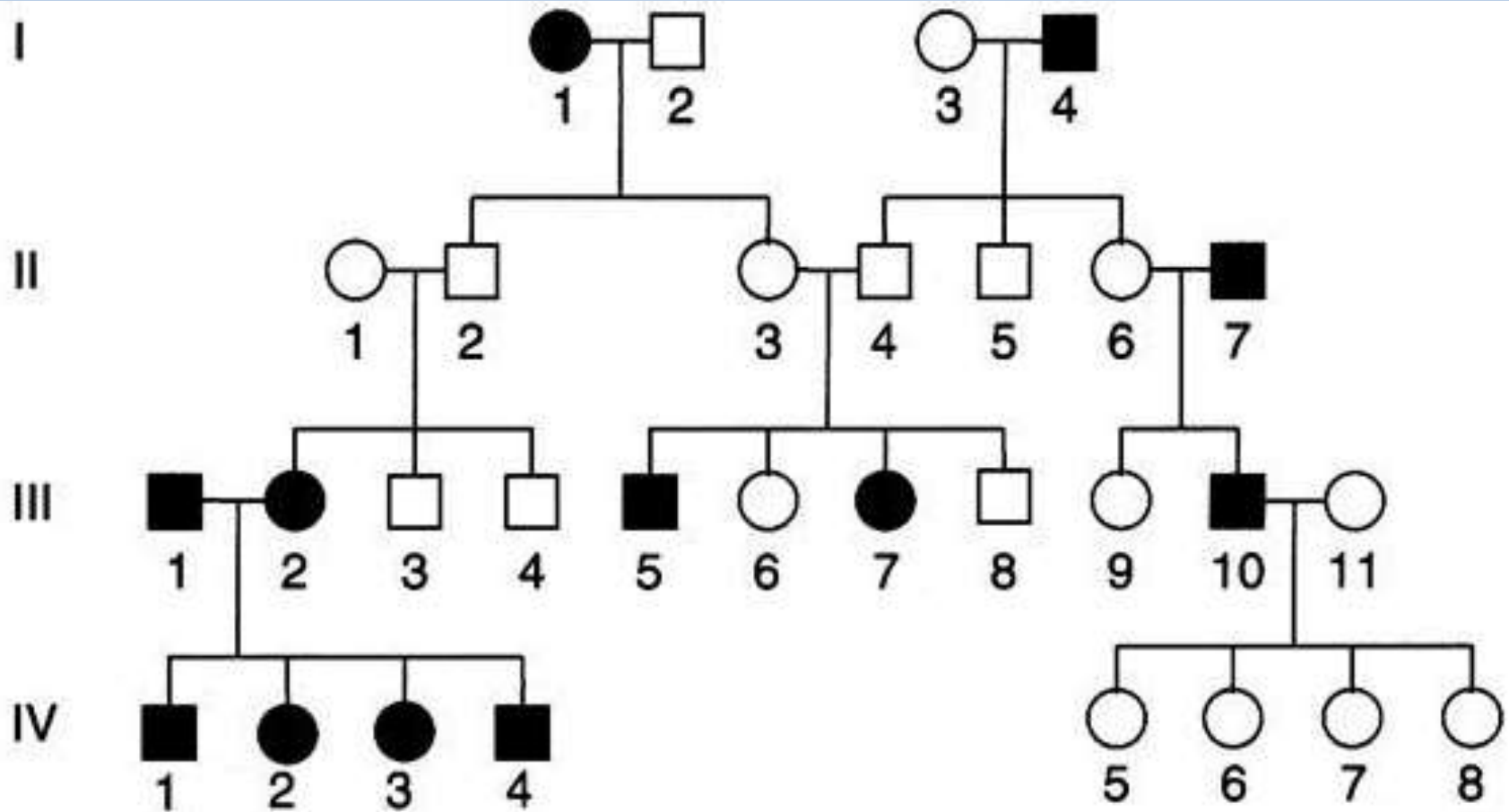


Tape “Diagnostics using Karyotypes on pg 63

- 1. What is nondisjunction?**
- 2. What pattern of inheritance does the pedigree show?**
- 3. Diagnose this patient:**



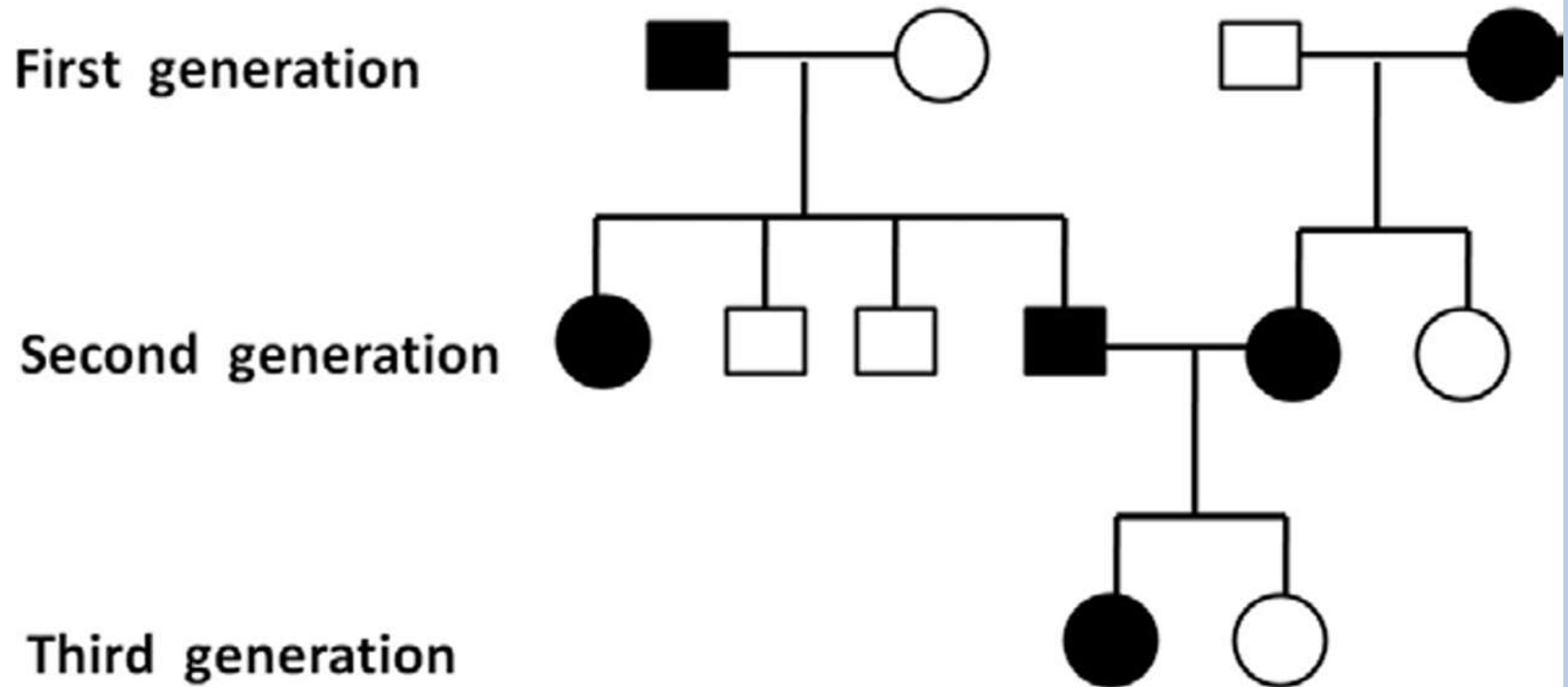
Deciphering Pedigrees



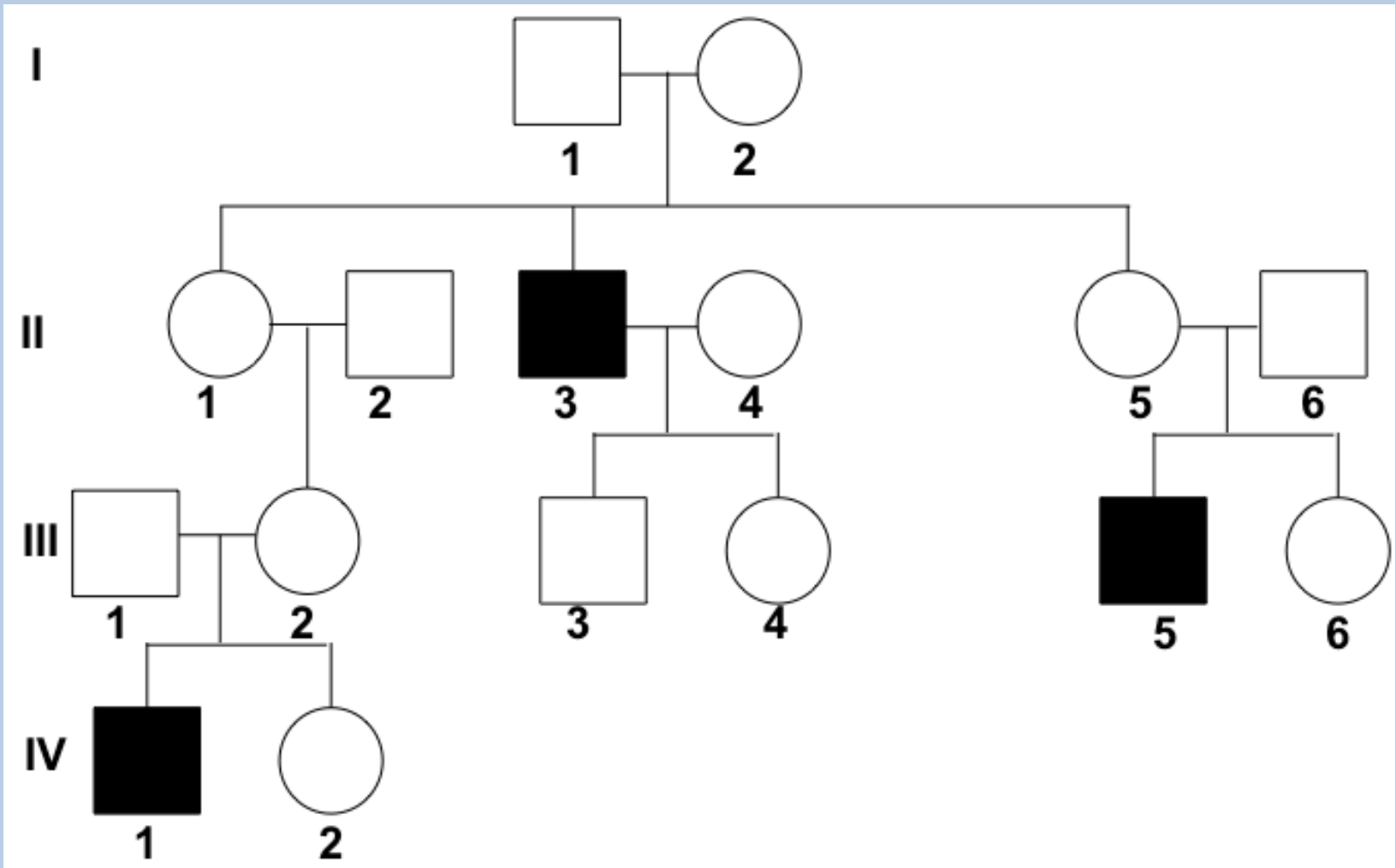
Deciphering Pedigrees

- **Two general hints:**
 - **If the trait SKIPS a generation it is recessive**
 - **If the trait is close to EQUAL in males and females it is autosomal**
 - **You can also look for an affected male and observe his daughters**

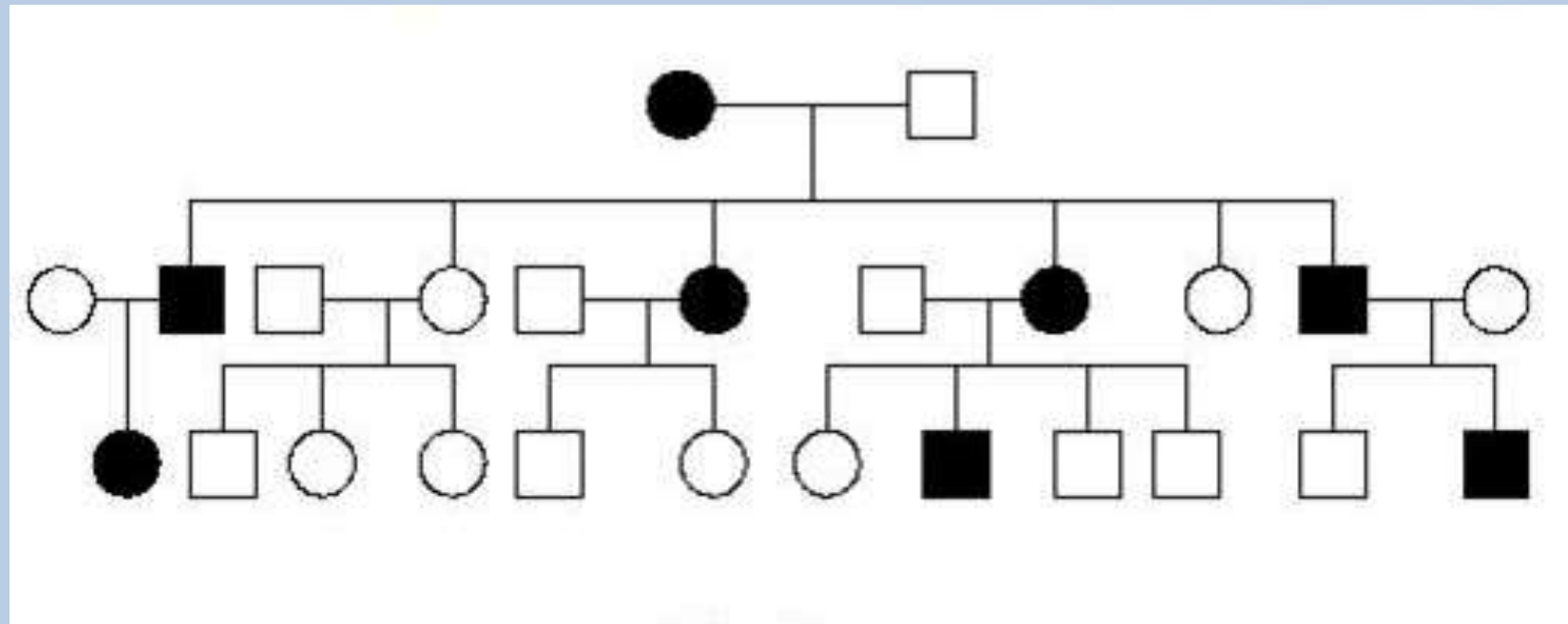
Deciphering Pedigrees



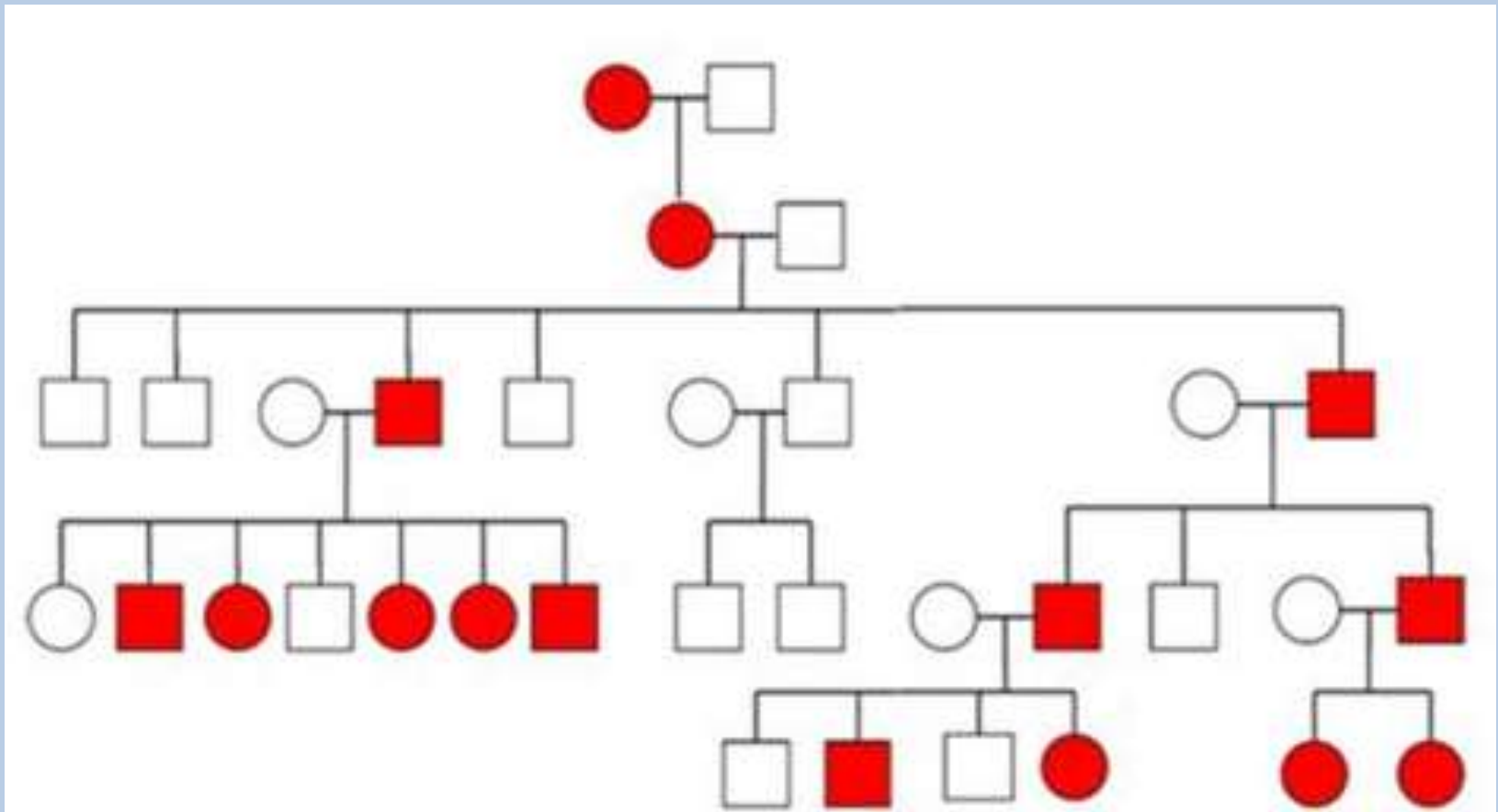
Deciphering Pedigrees



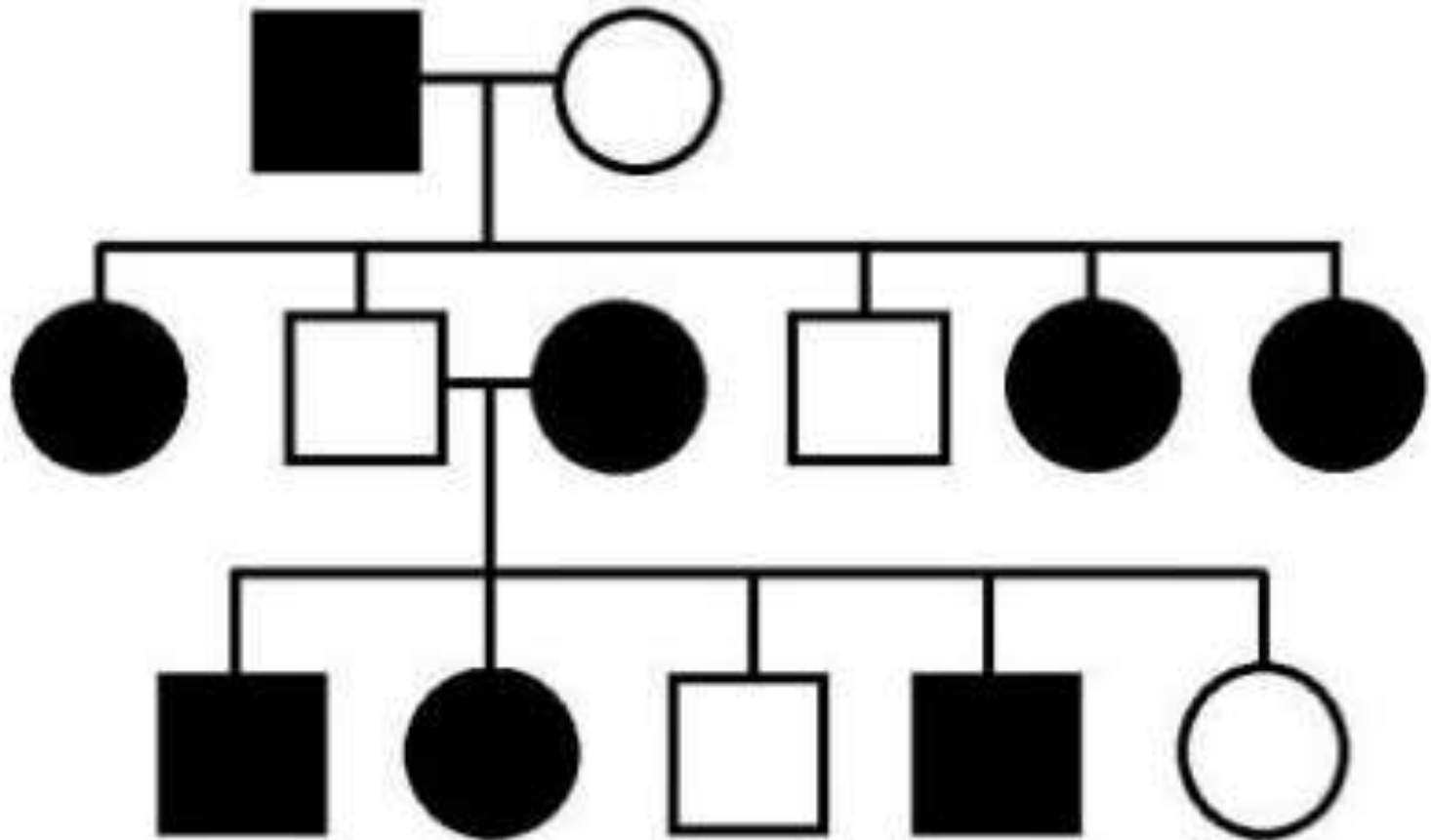
Deciphering Pedigrees



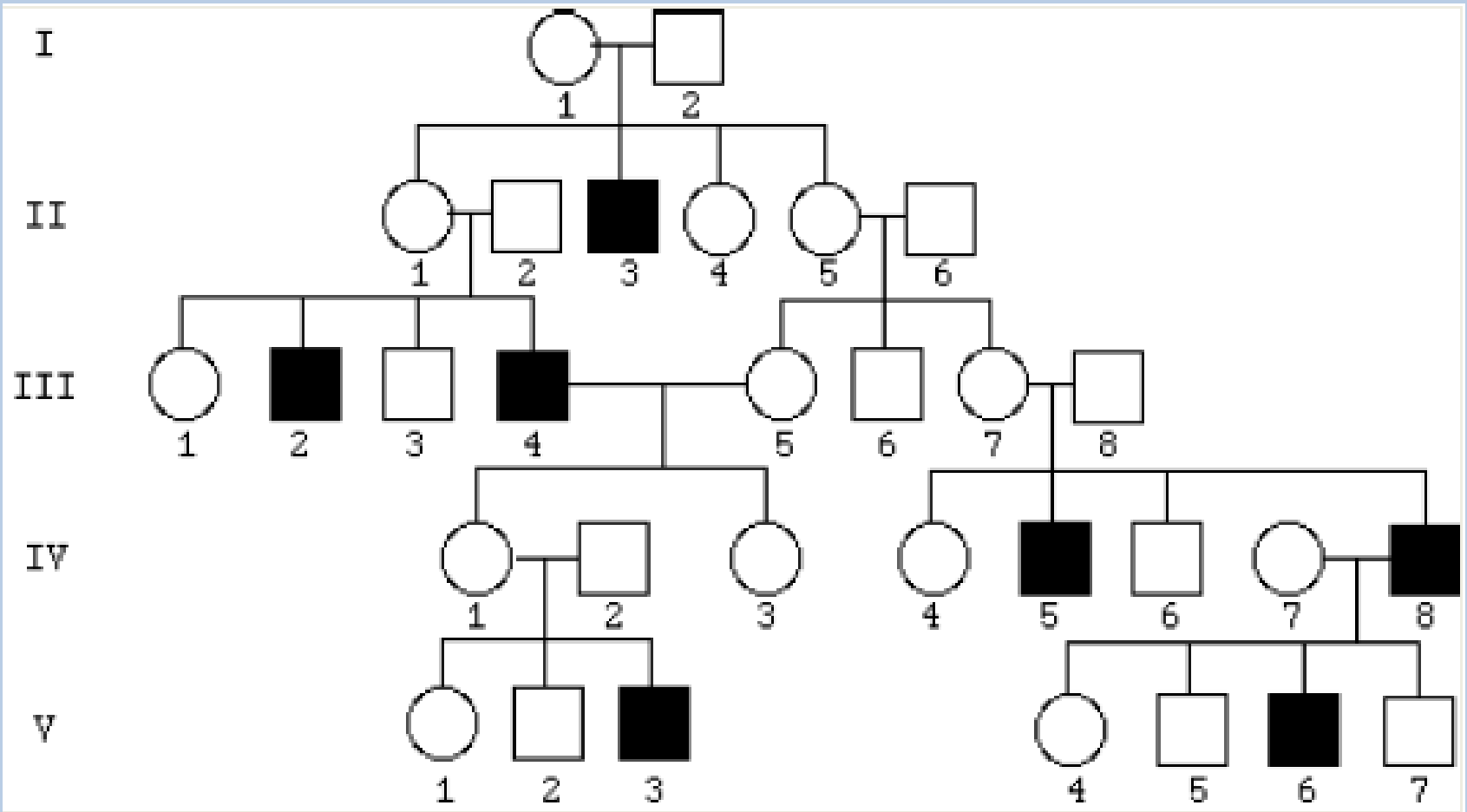
Deciphering Pedigrees



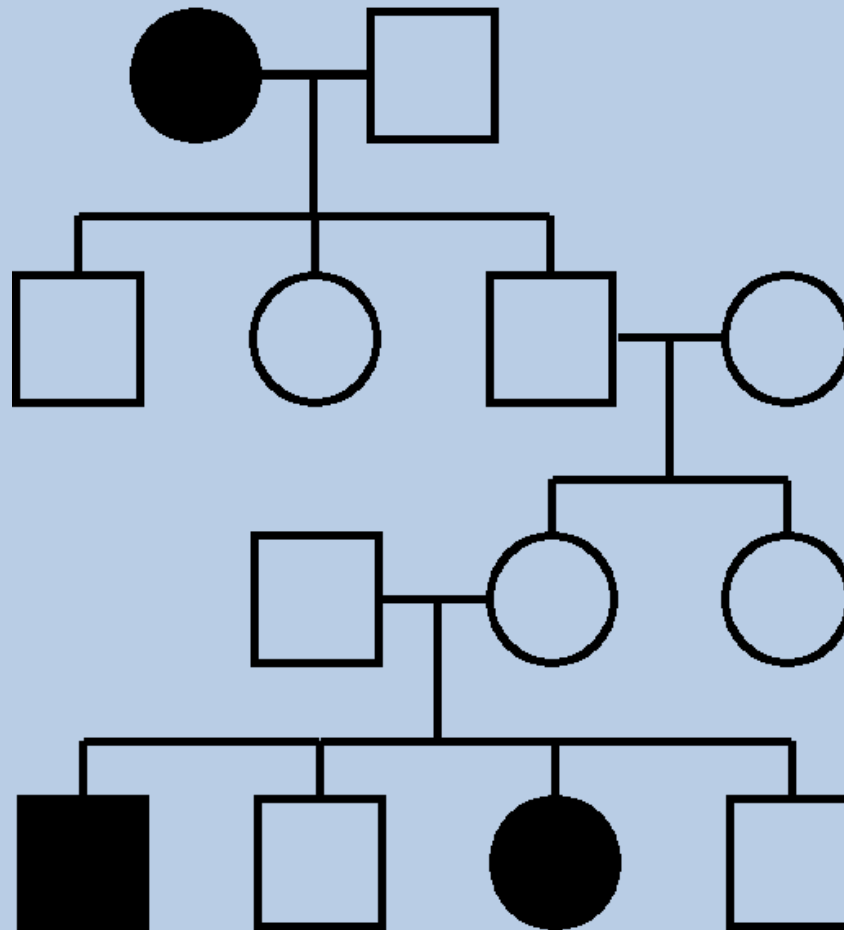
What is the pattern of inheritance?



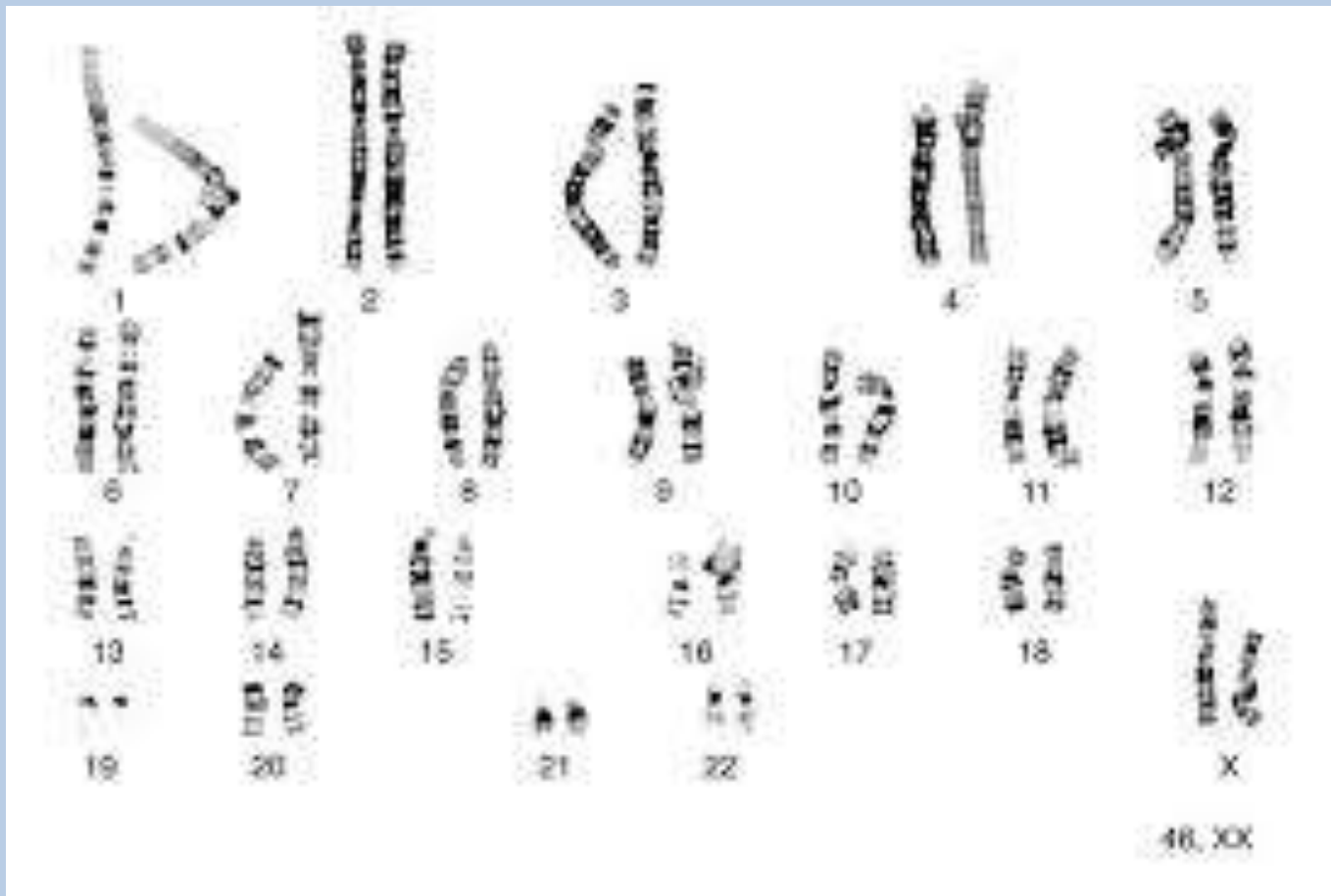
What is the pattern of inheritance?



What is the pattern of inheritance?



Get out Diagnostics Using Karyotypes (pg 63)



Diagnosics Using Karyotypes

<https://www.youtube.com/watch?v=5bAuUHVNvv4>

Complex Inheritance – pg. 64



Environmental Effects



Environmental Effects



Multiple Alleles

Genotype

CC

$c^{ch}c^{ch}$

c^hc^h

cc

Phenotype

BLACK

CHINCHILLA

HIMALAYAN

ALBINO



Polygenic Traits








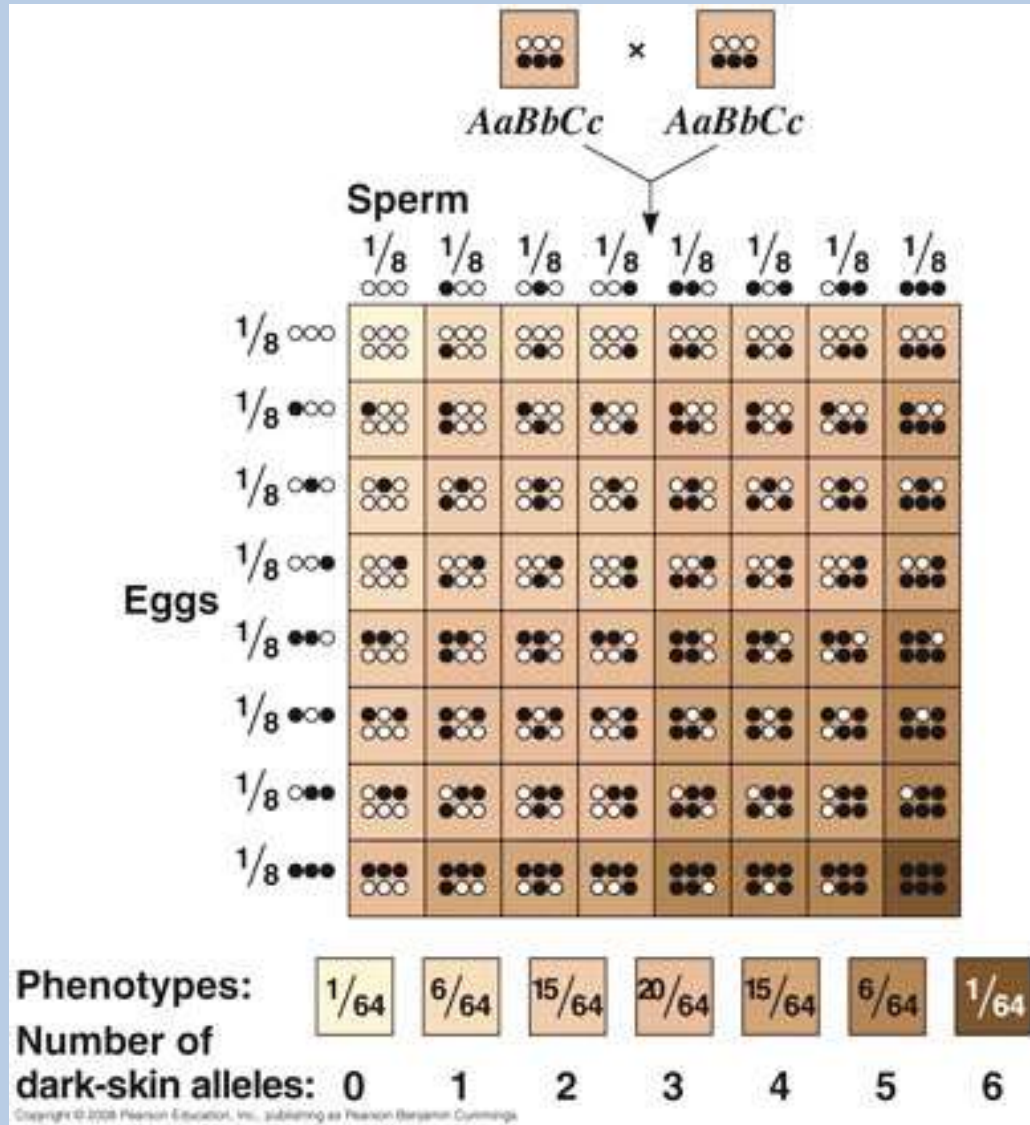
Gene 1	d^1d^1	d^1D^1	d^1D^1	D^1D^1	D^1d^1	D^1d^1	D^1D^1
Gene 2	d^2d^2	d^2d^2	d^2D^2	D^2d^2	D^2d^2	D^2D^2	D^2D^2
Gene 3	d^3d^3	d^3d^3	d^3d^3	d^3d^3	D^3D^3	D^3D^3	D^3D^3
Total number of dark-skin genes	0	1	2	3	4	5	6
							
	Very light			Medium			Very dark
# of light "d" alleles	6	5	4	3	2	1	0
# of dark "D" alleles	0	1	2	3	4	5	6

FIGURE 10.7 Polygenic Inheritance

Skin color in humans is an example of polygenic inheritance. The dark "D" alleles are found in several different genes and have an additive effect on skin color. The top portion of the figure shows examples of genotypes that can produce the different skin colors. The number of dark "D" alleles is more important than how the "D" alleles are distributed in the different genes.

Polygenic Traits



Polygenic Traits

		sperm							
Gametes		ABC	ABC	AbC	Abc	aBC	aBC	abC	abc
eggs	ABC	6	5	5	4	5	4	4	3
	ABC	5	4	4	3	4	3	3	2
	AbC	5	4	4	3	4	3	3	2
	Abc	4	3	3	2	3	2	2	1
	aBC	5	4	4	3	4	3	3	2
	aBC	4	3	3	2	3	2	2	1
	abC	4	3	3	2	3	2	2	1
	abc	3	2	2	1	2	1	1	0

Polygenic Traits

	ABC	ABc	AbC	Abc	aBC	aBc	abC	abc
ABC	AABBCC	AABBcC	AABbCC	AABbCc	AaBBCC	AaBBcC	AaBbCC	AaBbCc
ABc	AABBcC	AABBcc	AABbCc	AABbcc	AaBBcC	AaBBcc	AaBbCc	AaBbcc
AbC	AABbCC	AABbCc	AAbbCC	AAbbCc	AaBbCC	AaBbCc	AabbCC	AabbCc
Abc	AABbCc	AABbcc	AAbbCc	AAbbcc	AaBbCc	AaBbcc	AabbCc	Aabbcc
aBC	AaBBCC	AaBBcC	AaBbCC	AaBbCc	aaBBCC	aaBBcC	aaBbCC	aaBbCc
aBc	AaBBcC	AaBBcc	AaBbCc	AaBbcc	aaBBcC	aaBBcc	aaBbCc	aaBbcc
abC	AaBbCC	AaBbCc	AabbCC	AabbCc	aaBbCC	aaBbCc	aabbCC	aabbCc
abc	AaBbCc	AaBbcc	AabbCc	Aabbcc	aaBbCc	aaBbcc	aabbCc	aabbcc

1 : 6 : 15 : 20 : 15 : 6 : 1

Polygenic Traits

	<i>Sable</i> aw+aw	<i>Sable</i> aw+as	<i>Sable</i> aw+at	<i>Sable</i> aw+a	<i>Blk&Tan</i> as+as	<i>Blk&Tan</i> as+at	<i>Blk&Tan</i> as+a	<i>Bi-Color</i> at+at	<i>Bi-Color</i> at+a	<i>Black</i> a+a
<i>Sable</i> aw+aw	100% aw+aw	50% aw+aw 50% aw+as	50% aw+aw 50% aw+at	50% aw+aw 50% aw+a	100% aw+as	50% aw+as 50% aw+at	50% aw+as 50% aw+a	100% aw+at	50% aw+at 50% aw+a	100% aw+a
<i>Sable</i> aw+as	50% aw+aw 50% aw+as	50% aw+as 25% aw+aw 25% [as+as]	25% aw+aw 25% aw+as 25% aw+at	25% aw+aw 25% aw+as 25% aw+a	50% aw+as 50% as+at	25% aw+as 25% aw+at 25% as+at	25% aw+as 25% aw+a 25% as+a	50% aw+at 50% [as+at]	25% aw+at 25% aw+a 25% [as+at] 25% [as+a]	50% aw+a 50% [as+a]
<i>Sable</i> aw+at	50% aw+aw 50% aw+at	25% aw+aw 25% aw+as 25% [as+at]	50% aw+at 25% aw+aw 25% [at+at]	25% aw+aw 25% aw+at 25% [at+a]	50% aw+as 50% as+at	25% aw+as 25% aw+at 25% as+at	25% aw+as 25% aw+a 25% as+a	50% aw+at 50% [at+at]	25% aw+at 25% aw+a 25% [at+at] 25% [at+a]	50% aw+a 50% [at+a]
<i>Sable</i> aw+a	50% aw+aw 50% aw+a	25% aw+aw 25% aw+as 25% [as+a]	25% aw+aw 25% aw+at 25% [at+a]	50% aw+a 25% as+aw	50% aw+as 50% as+at	25% aw+as 25% aw+at 25% as+a	25% aw+as 25% aw+a 25% as+a	50% aw+at 50% [at+a]	25% aw+at 25% aw+a 25% [at+a] 25% [a+a]	50% aw+a 50% [a+a]
<i>Blk&Tan</i> as+as	100% aw+as	50% aw+as 50% as+as	50% aw+as 50% as+at	50% aw+as 50% as+a	100% as+as	50% as+as 50% as+at	50% as+as 50% as+a	100% as+at	50% as+at 50% as+a	100% as+a
<i>Blk&Tan</i> as+at	50% aw+as 50% aw+at	25% aw+as 25% aw+at 25% as+at	25% aw+as 25% aw+at 25% as+at	25% aw+as 25% aw+at 25% as+a	50% as+as 50% as+at	50% as+at 25% [at+at]	25% as+at 25% as+a 25% [at+a]	50% as+at 50% [at+at]	25% as+at 25% as+a 25% [at+at] 25% [at+a]	50% as+a 50% [at+a]
<i>Blk&Tan</i> as+a	50% aw+as 50% aw+a	25% aw+as 25% aw+a 25% as+a	25% aw+as 25% aw+a 25% [at+a]	25% aw+as 25% aw+a 25% [a+a]	50% as+as 50% as+at	25% as+at 25% as+a 25% [at+a]	50% as+at 25% [a+a]	50% as+at 50% [at+a]	25% as+at 25% as+a 25% [at+a] 25% [a+a]	50% as+a 50% [a+a]
<i>Bi-Color</i> at+at	100% aw+at	50% aw+at 50% [as+at]	50% aw+at 50% [at+at]	50% aw+at 50% [at+a]	100% as+at	50% as+at 50% [at+at]	50% as+at 50% [at+a]	100% at+at	50% at+at 50% [at+a]	100% at+a
<i>Bi-Color</i> at+a	50% aw+at 50% aw+a	25% aw+at 25% aw+a 25% [as+at] 25% [as+a]	25% aw+at 25% aw+a 25% [at+at] 25% [at+a]	25% aw+at 25% aw+a 25% [at+a] 25% [a+a]	50% as+at 50% as+a	25% as+at 25% as+a 25% [at+at] 25% [at+a]	25% as+at 25% as+a 25% [at+a] 25% [a+a]	50% at+at 50% [at+a]	50% at+at 25% [at+at] 25% [at+a] 25% [a+a]	50% at+a 50% [a+a]
<i>Black</i> a+a	100% aw+a	50% aw+a 50% [as+a]	50% aw+a 50% [at+a]	50% aw+a 50% [a+a]	100% as+a	50% as+a 50% [at+a]	50% as+a 50% [a+a]	100% at+a	50% at+a 50% [a+a]	100% a+a

Polygenic Traits



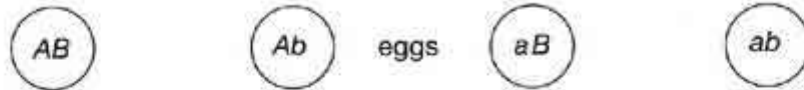
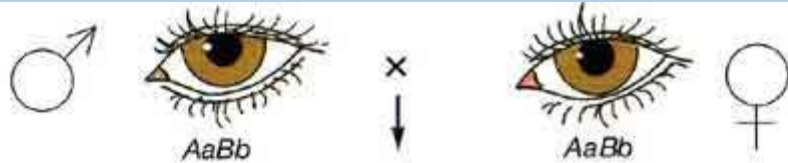
Polygenic Traits



Polygenic Traits

<i>HERC2</i>	<i>Gey</i>	Eye Color
BB	GG	Brown
BB	Gb	Brown
BB	bb	Brown
Bb	GG	Brown
Bb	Gb	Brown
Bb	bb	Brown
bb	GG	Green
bb	Gb	Green
bb	bb	Blue

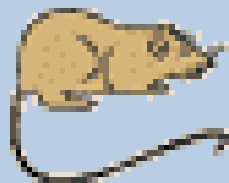
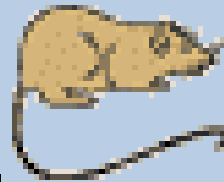
	B/G	B/g	b/G	b/g
B/G	■ BB/GG	■ BB/Gg	■ Bb/GG	■ Bb/Gg
B/g	■ BB/Gg	■ BB/gg	■ Bb/Gg	■ Bb/gg
b/G	■ Bb/GG	■ Bb/Gg	■ bb/GG	■ bb/Gg
b/g	■ Bb/Gg	■ Bb/gg	■ bb/Gg	■ bb/gg



















sperm	AB	 $AABB$	 $AABb$	 $AaBB$	 $AaBb$	 light blue
	Ab	 $AABb$	 $AAbb$	 $AaBb$	 $Aabb$	 deep blue or green
	aB	 $AaBB$	 $AaBb$	 $aaBB$	 $aaBb$	 light brown
	ab	 $AaBb$	 $Aabb$	 $aaBb$	 $aabb$	 medium brown
		 dark brown/black				

Epistasis

AaBb X AaBb



	AB	Ab	aB	ab	
AB	AABB 	AABb 	AaBB 	AaBb 	9 agouti
Ab	AABb 	AAbb 	AaBb 	Aabb 	
aB	AaBB 	AaBb 	aaBB 	aaBb 	4 albino
ab	AaBb 	Aabb 	aaBb 	aabb 	

Epistasis



Epistasis



B_E_



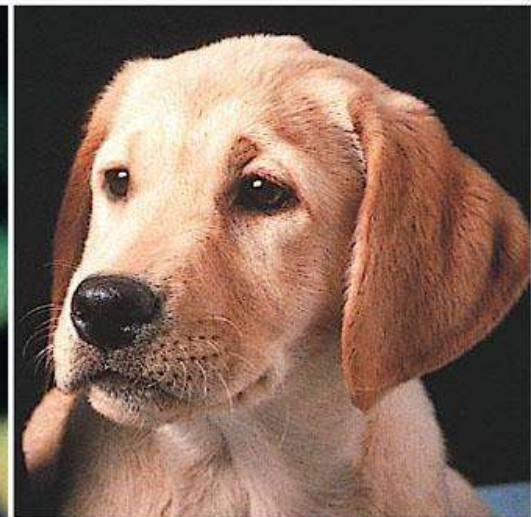
bb_E_



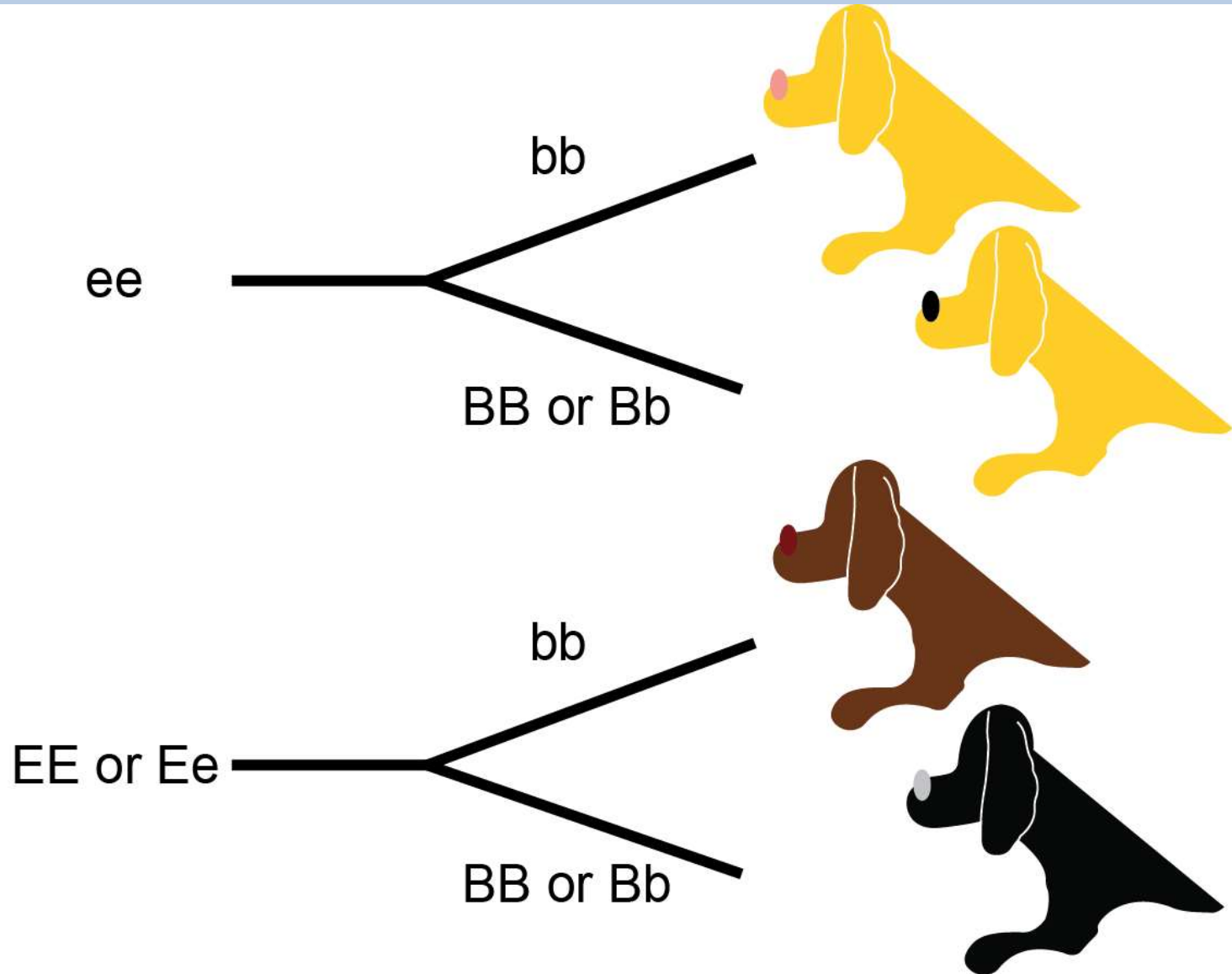
__ ee

Epistasis

	(EB)	(Eb)	(eB)	(eb)
(EB)	EEBB black	EEBb black	EeBB black	EeBb black
(Eb)	EEBb black	EEbb chocolate	EeBb black	Eebb chocolate
(eB)	EeBB black	EeBb black	eeBB yellow	eeBb yellow
(eb)	EeBb black	Eebb chocolate	eeBb yellow	eebb yellow



Epistasis



Epistasis

- <https://www.youtube.com/watch?v=M5IveTJRYyI>

Epistasis




- 30 seconds; in your table groups *compare and contrast polygenic traits and epistasis.*

Demonstration

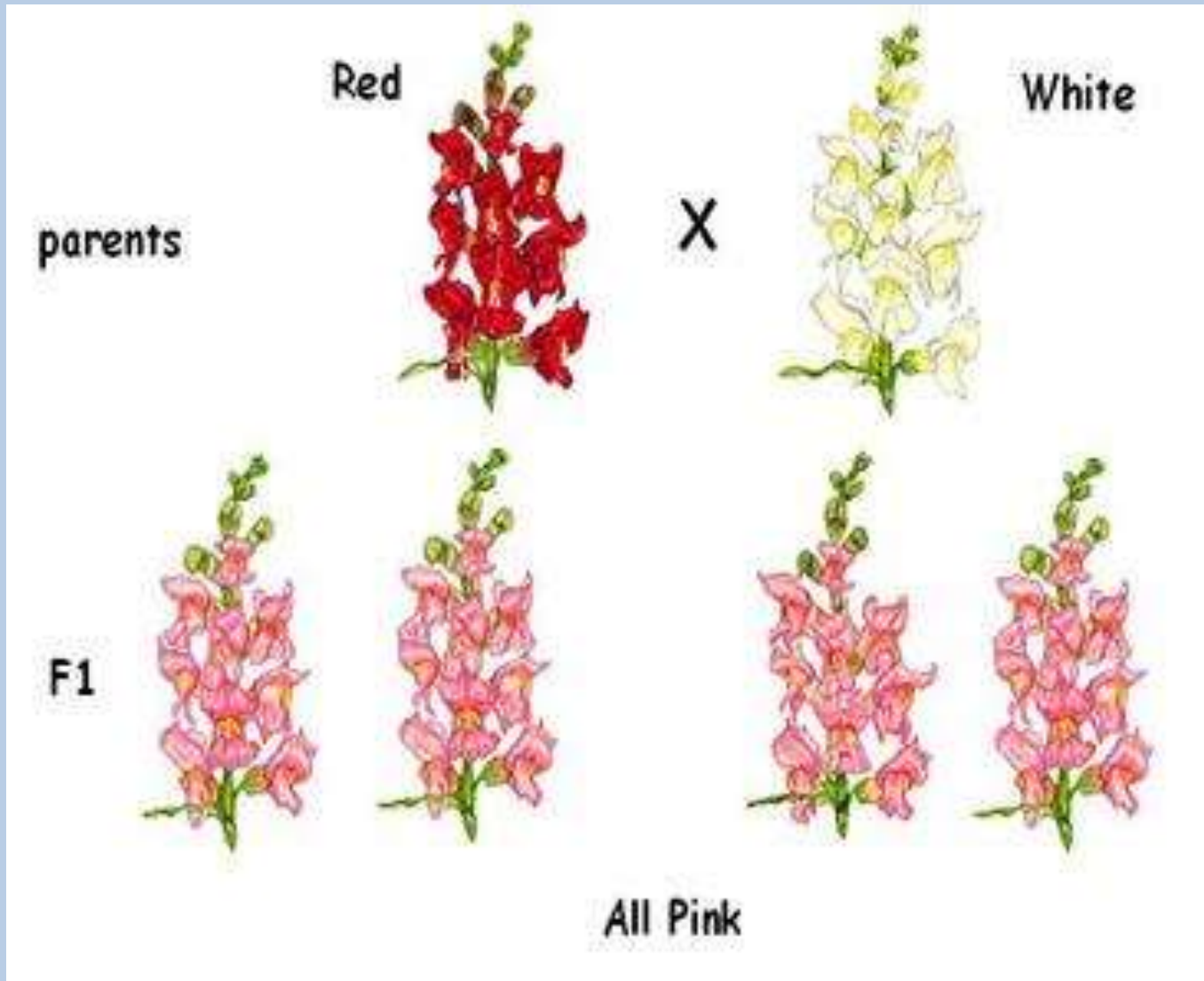
- Please watch the demonstration; predict what you think will happen... and think about *WHY*?

Incomplete Dominance

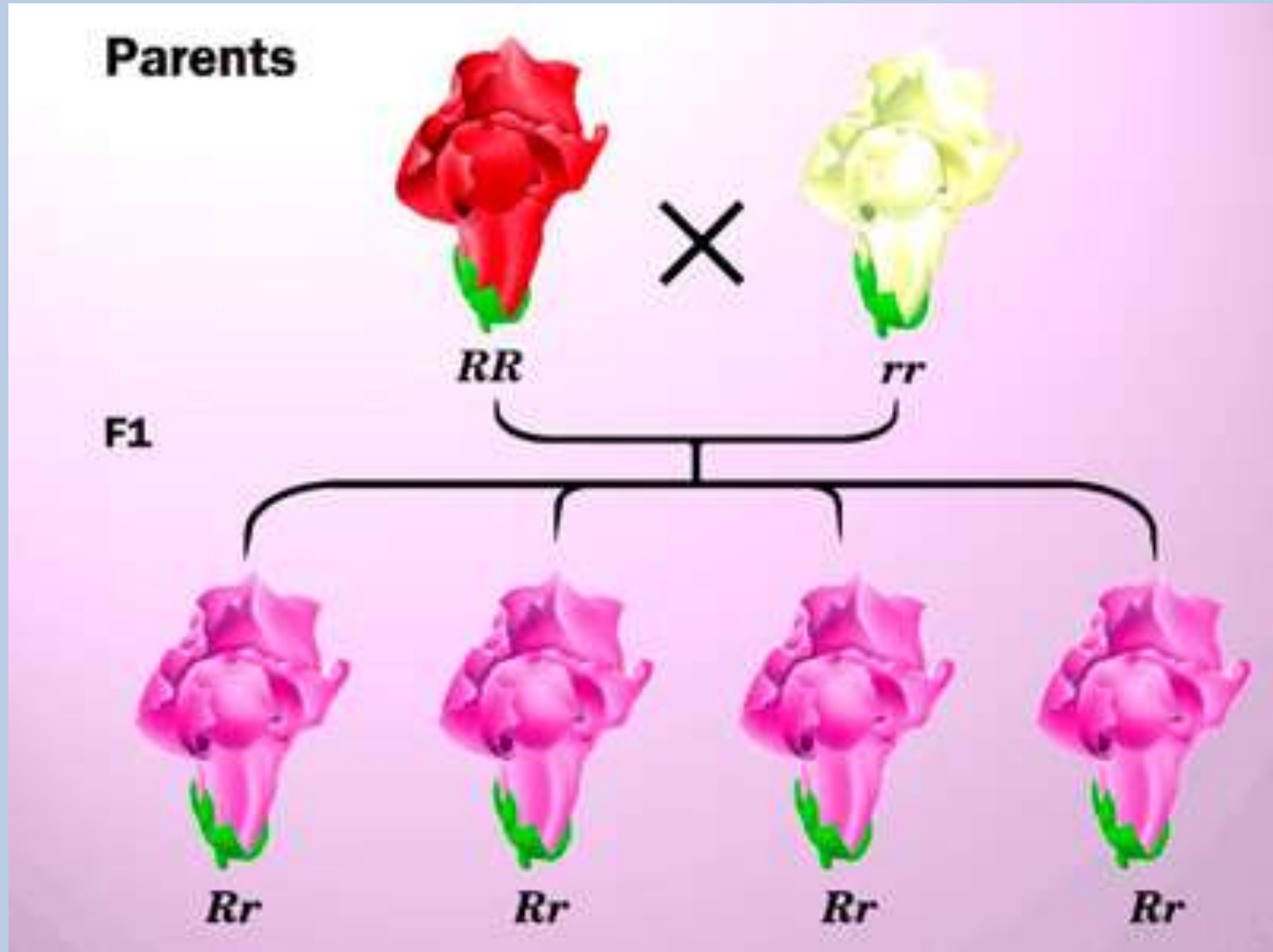
FIGURE 7.5 Incomplete Dominance

PHENOTYPE	GENOTYPE	PHENOTYPE	GENOTYPE	PHENOTYPE	GENOTYPE
green	B_1B_1	steel blue	B_2B_2	royal blue	B_1B_2
					
The green betta fish is homozygous for the green color allele.		The steel blue betta fish is homozygous for the blue color allele.		The royal blue betta fish is heterozygous for the two color alleles.	

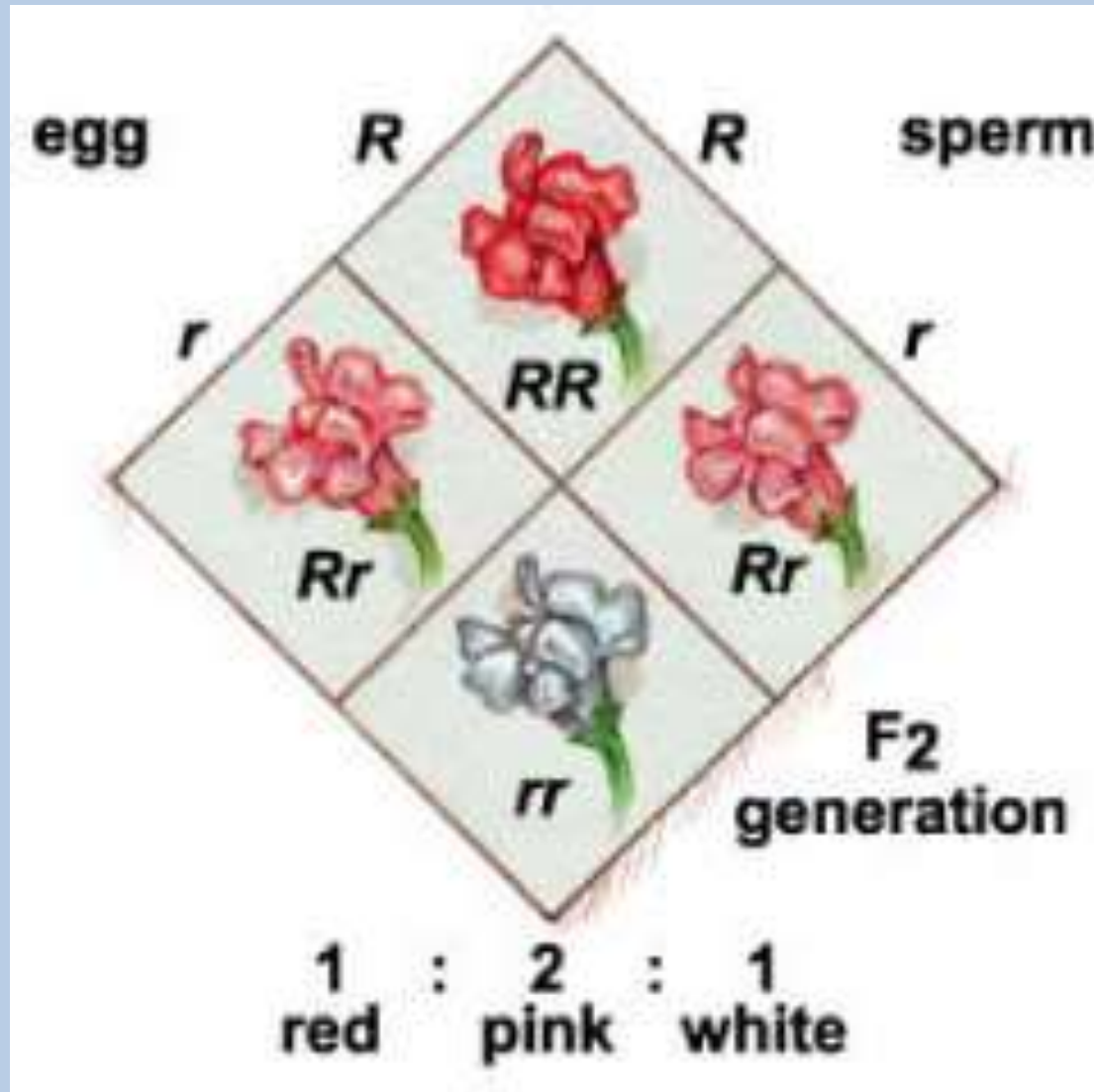
Incomplete Dominance



Incomplete Dominance



Incomplete Dominance



Incomplete Dominance

- 1 min; make a sketch in your notes to help you remember what incomplete dominance looks like
- 1 min; when everyone at your table group is done:
 - Share your sketch
 - Explain *WHY* it is incomplete dominance

Codominance

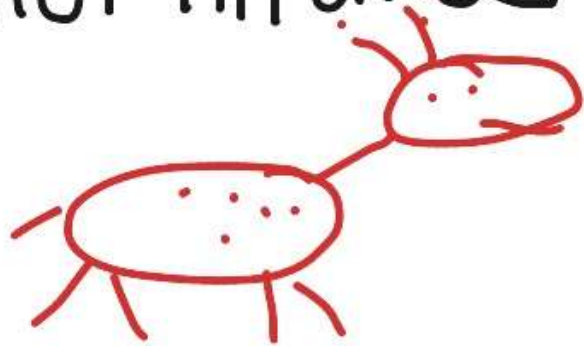


both equally present



mixing

Codominance - two traits
show



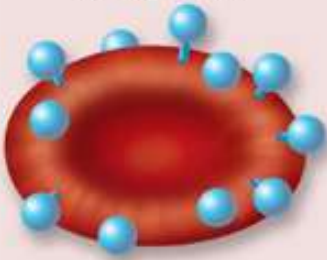

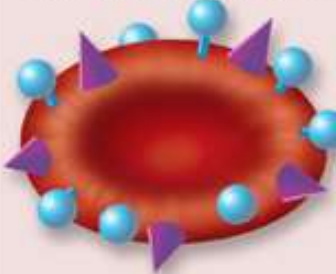




Incomplete Dominance -
two traits
blend



Blood Type

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ABO Blood Types

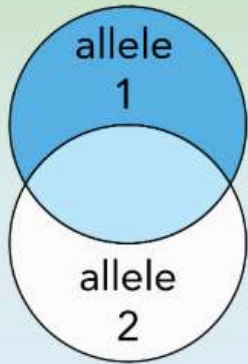
	Antigen A	Antigen B	Antigens A and B	Neither antigen A nor B
Erythrocytes				
Plasma	Anti-B antibodies 	Anti-A antibodies 	Neither anti-A nor anti-B antibodies	Both anti-A and anti-B antibodies 
Blood type	Type A Erythrocytes with type A surface antigens and plasma with anti-B antibodies	Type B Erythrocytes with type B surface antigens and plasma with anti-A antibodies	Type AB Erythrocytes with both type A and type B surface antigens, and plasma with neither anti-A nor anti-B antibodies	Type O Erythrocytes with neither type A nor type B surface antigens, but plasma with both anti-A and anti-B antibodies

Blood Type

Phenotype (Blood type)	Genotype
Type A	$I^A I^A$ or $I^A i$
Type B	$I^B I^B$ or $I^B i$
Type AB	$I^A I^B$
Type O	$i i$

Picture Quiz

INCOMPLETE DOMINANCE



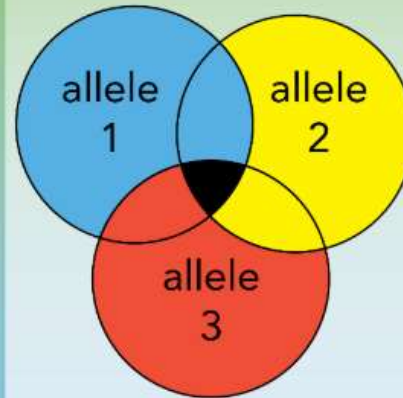
Neither allele is dominant or recessive

CODOMINANCE



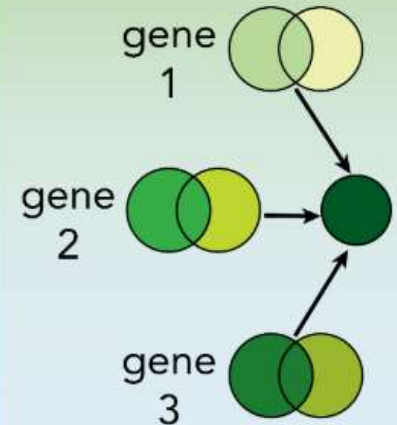
Both alleles are clearly expressed

MULTIPLE ALLELES



One gene has more than two alleles

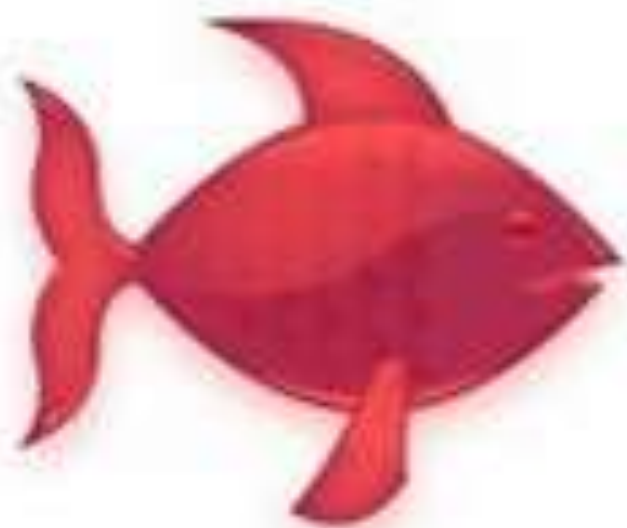
POLYGENIC TRAITS



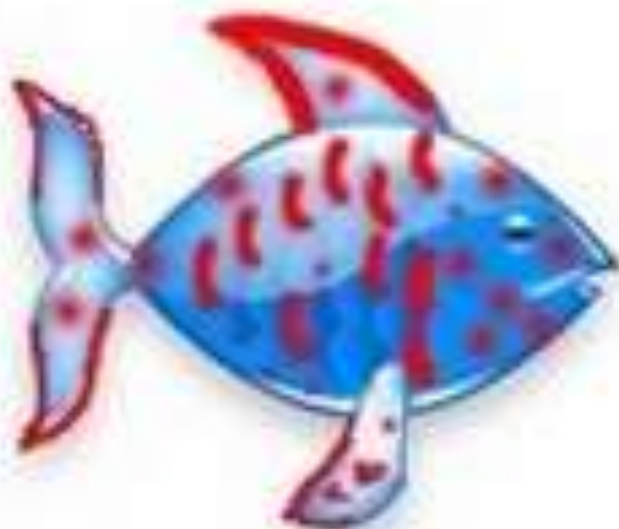
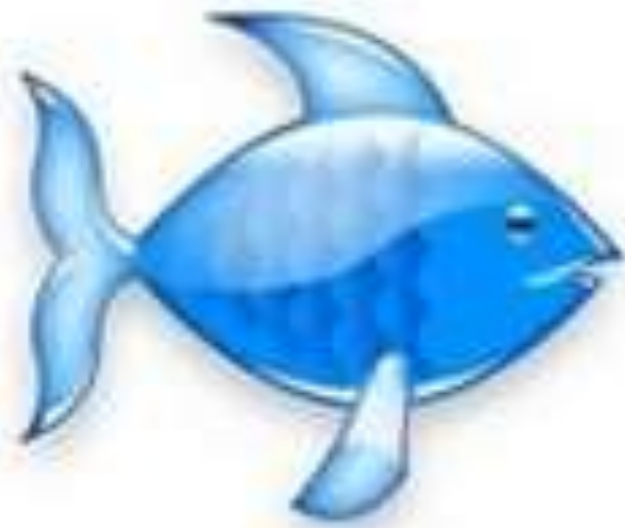
More than one gene controls a trait

**Identify the following pictures
using these words:**

- Polygenic trait**
- Incomplete dominance**
- Codominance**
- Epistasis**
- Multiple alleles**



X





Genotype

CC

$c^{ch}c^{ch}$

c^hc^h

cc

Phenotype

BLACK

CHINCHILLA

HIMALAYAN

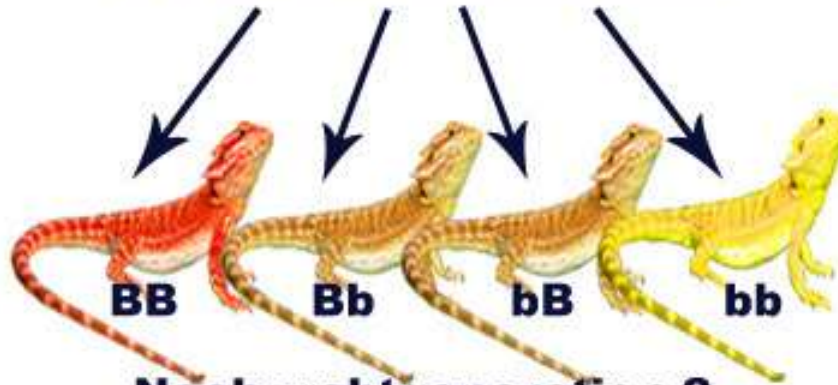
ALBINO







Nachzuchtgeneration 1
alle Tiere Orange (rot & gelb gemischt)



Nachzuchtgeneration 2

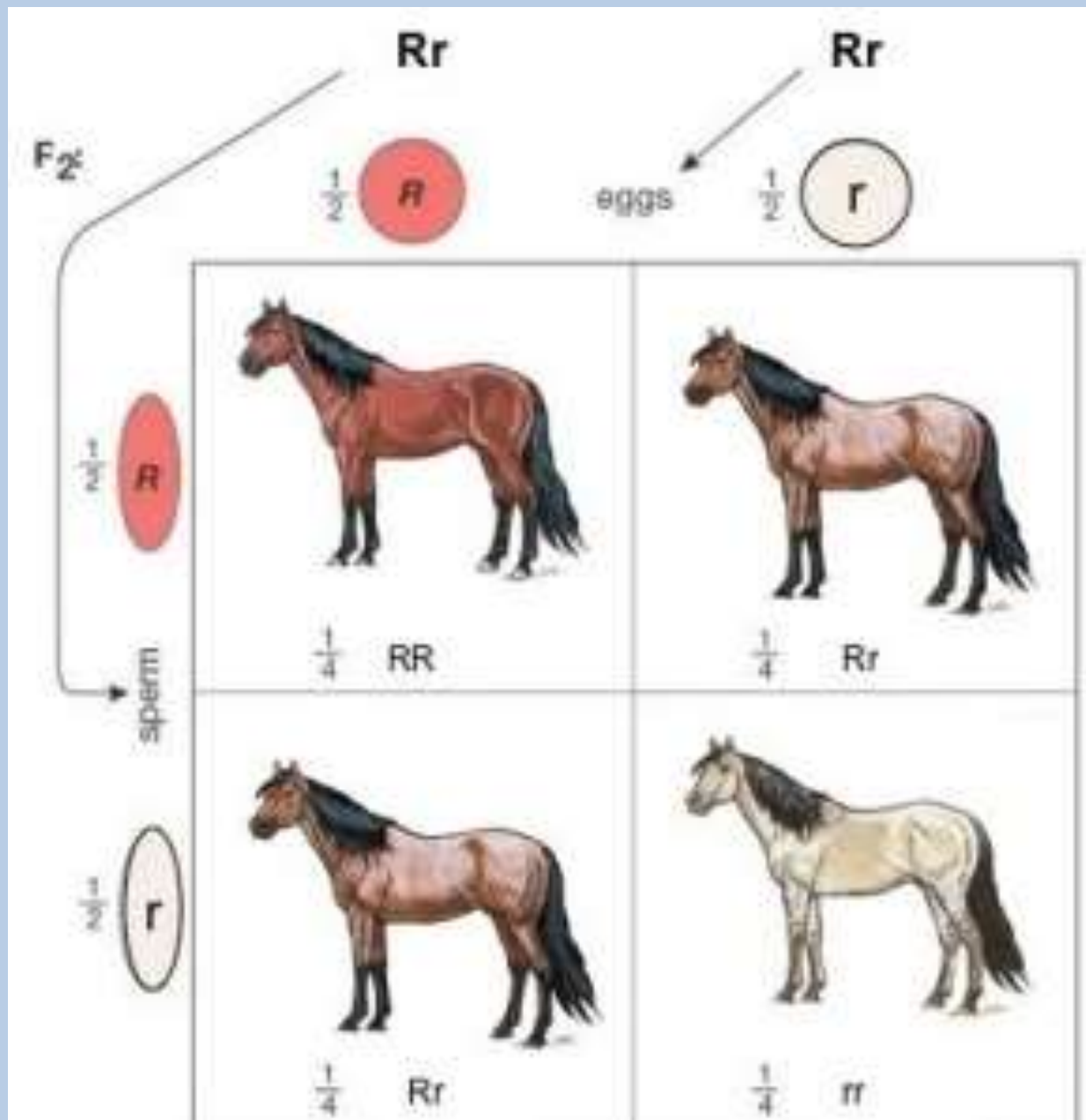
25% rot

50% Orange

25% gelb

© Parag.chandgadkar









Blood Types

- **30 sec; in your groups discuss *WHY* it is important that people do not get the wrong blood type during a transfusion**

(IF YOU DON'T KNOW MAKE YOUR BEST EDUCATED GUESS)

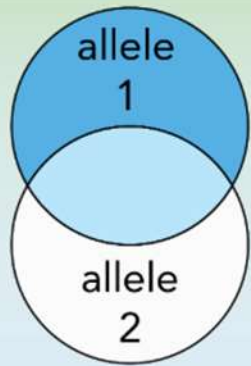
***a transfusion is when extra blood is given to a patient**

Complex Inheritance

- Use a computer to complete the interactivity portion
- TAKE YOUR TIME
- Answer the questions carefully
- Be THOROUGH in your explanations

Complex Inheritance

INCOMPLETE DOMINANCE



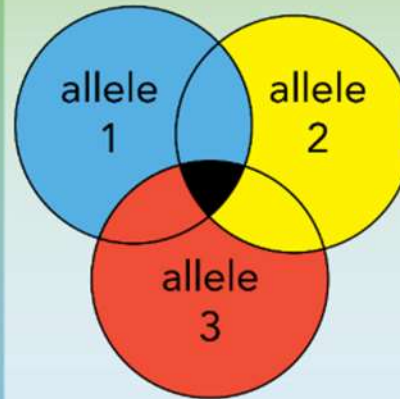
Neither allele is dominant or recessive

CODOMINANCE



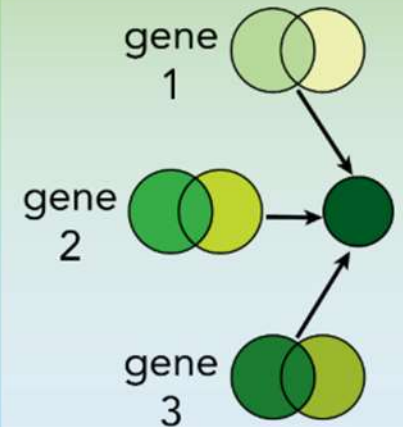
Both alleles are clearly expressed

MULTIPLE ALLELES



One gene has more than two alleles

POLYGENIC TRAITS



More than one gene controls a trait

Blood Type

Phenotype (Blood type)	Genotype
Type A	$I^A I^A$ or $I^A i$
Type B	$I^B I^B$ or $I^B i$
Type AB	$I^A I^B$
Type O	$i i$

Blood Type

- <http://www.redcrossblood.org/donating-blood/donor-zone/games/blood-type>
- <http://www.nobelprize.org/educational/medicine/bloodtypinggame/gamev2/index.html>
- <http://www.nobelprize.org/educational/medicine/landsteiner/landsteiner.html>