

Symbols

Vocabulary terms you need to know: dominant, recessive, phenotype, genotype, homozygous, heterozygous, allele

Introduction: Like any language, the language of genetics consists of symbols and rules for using those symbols. For the purposes of this unit, a symbol for an allele consists of one letter. When a trait shows dominance, the capitalized first letter of the dominant form of the trait becomes its symbol. (In humans, for example, free ear lobes are the dominant form of earlobe shape. Attached ear lobes are recessive. Thus, F stands for free ear lobes.) For the recessive form of the same trait, the symbol remains the same but is not capitalized. (Thus f stands for attached ear lobes.)

The table below shows the forms of the traits Mendel studied in peas:

	stem height	coat color	pod color	seed color	seed shape	flower position
Dominant form	tall	colored	green	yellow	round	axial
Recessive form	short	white	yellow	green	wrinkled	terminal

1. Underline the first letter of each dominant form in the table above. Using the rules described above, complete the following chart of the traits Gregor Mendel studied in pea plants.

	stem height	coat color	pod color	seed color	seed shape	flower position
Dominant allele symbol	<u>T</u>			<u>C</u>		
Recessive allele symbol	t			c		

2. Using the symbols from the table above, write the genotypes that would be present in the following phenotypes if they were all homozygous. Next, indicate whether they are dominant or recessive:

phenotype	genotype	Dom. or Rec.?
tall stemmed plants	<u>TT</u>	
terminal flower position		
white seed coat	<u>cc</u>	
wrinkled seed shape		
yellow pod color		
yellow seed color		

heterozygous
Tt
Cc

T = tongue roller

t = non-roller

Hybrid female crossed with a non-roller

1. Write out parental genotypes and do Punnet square
2. Predict genotypic ratio of offspring
3. Predict phenotypic ratio of offspring

$Tt \times tt$
 genotypic ratio
 0:2:2
 phenotype ratio
 2:2

	T	t
t	Tt	tt
t	Tt	tt

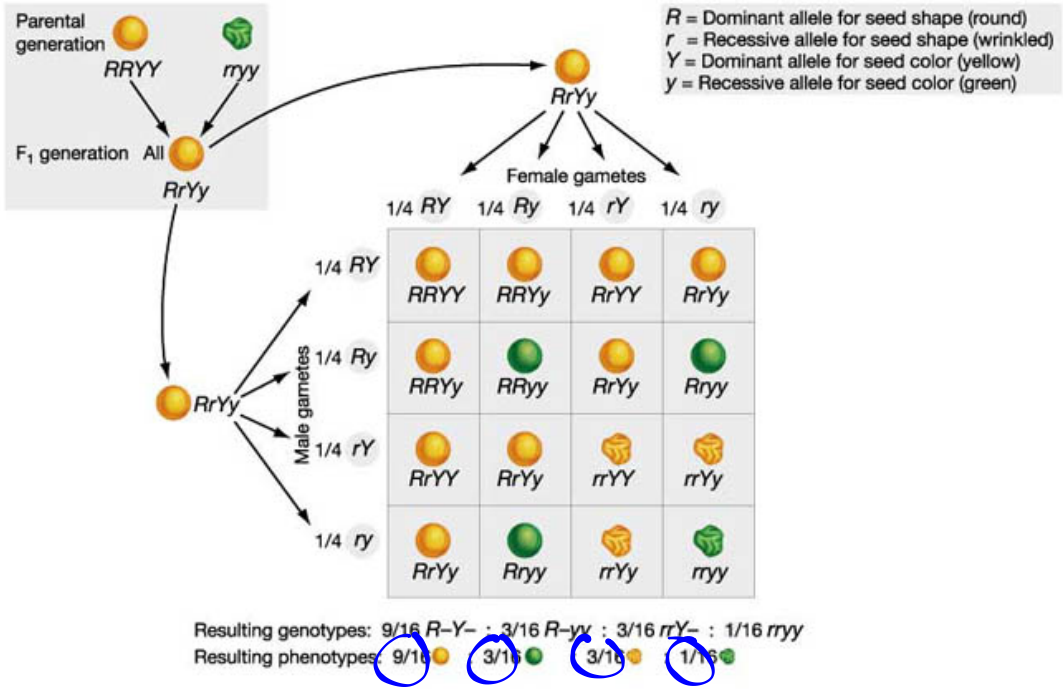
3. For a species of squash, assume white color is dominant to yellow color, and disk shape is dominant to spherical shape. If a squash plant that is heterozygous for white, disk squash ($WwDd$) is crossed with a plant that is also heterozygous for white and disk, how many different **phenotypes** are their offspring expected to show?

- a. Use the FOIL method to show the different possible gametes that each parent can produce.



- b. Make a Punnett square showing the possible genotypes of offspring of this 2-factor cross.

	WD	Wd	wD	wd	
WD	$WWDD$	$WwDd$	$WwDd$	$WwDd$	white, disk
Wd	$WwDd$	$WWdd$	$WwDd$	$Wwdd$	white, sphere
wD	$WwDd$	$WwDd$	$wwDD$	$wwDd$	yellow, disk
wd	$WwDd$	$WwDd$	$wwDd$	$wwdd$	yellow, sphere



1. Hemophilia, a blood clotting disorder, is caused by an X-linked recessive allele (h). What are the chances that the daughter of a normal man and a heterozygous woman will have hemophilia?

a. Write the allele symbols and indicate what trait they code for.

X^h = hemophilia X^H = normal

b. Write the P₁ cross.

$X^H X^h \times X^H Y$

c. Write the Punnett square.

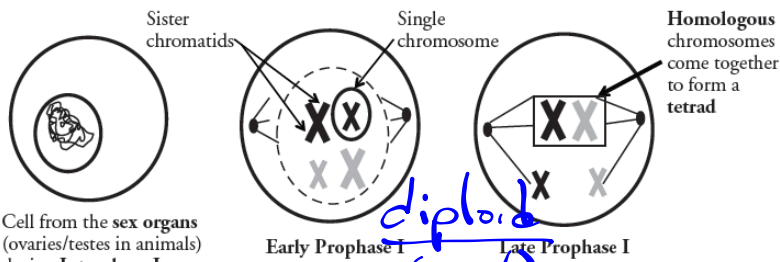
	X^H	X^h
X^H	$X^H X^H$	$X^H X^h$
Y	$X^H Y$	$X^h Y$

0% chance of
♀ offspring
w/ hemophilia

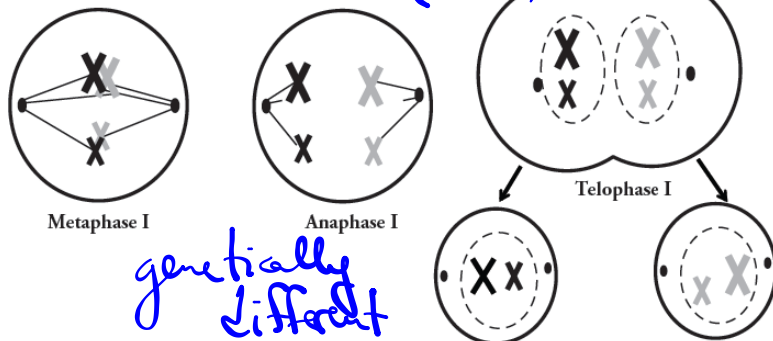
d. Answer to the question:

2. A recessive allele on the X chromosome causes colorblindness. A woman with normal vision (whose father is colorblind) marries a colorblind man. What fraction of their children is expected to be colorblind boys? Show your work and circle your answer below.

Model 1 – Meiosis I



diploid (2 sets)



genetically different

haploid (1 set)

Model 2 – Meiosis II



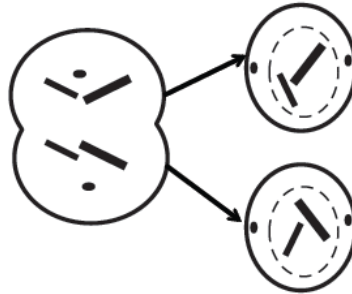
Two cells from
Meiosis I in
Prophase II



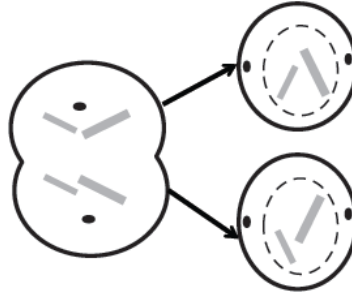
Metaphase II



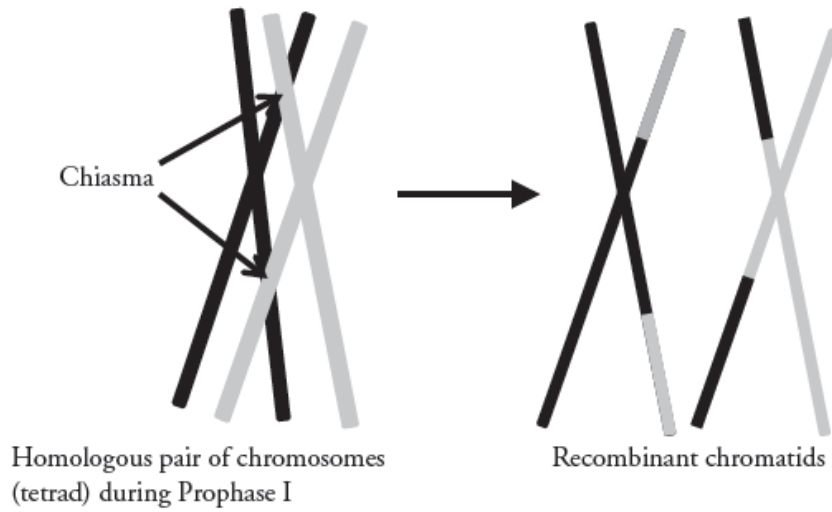
Anaphase II



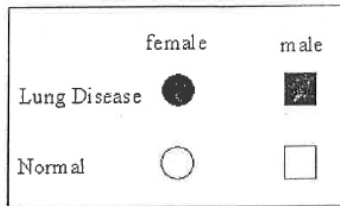
Telophase II



Model 4 – Crossover of DNA in Chromosomes

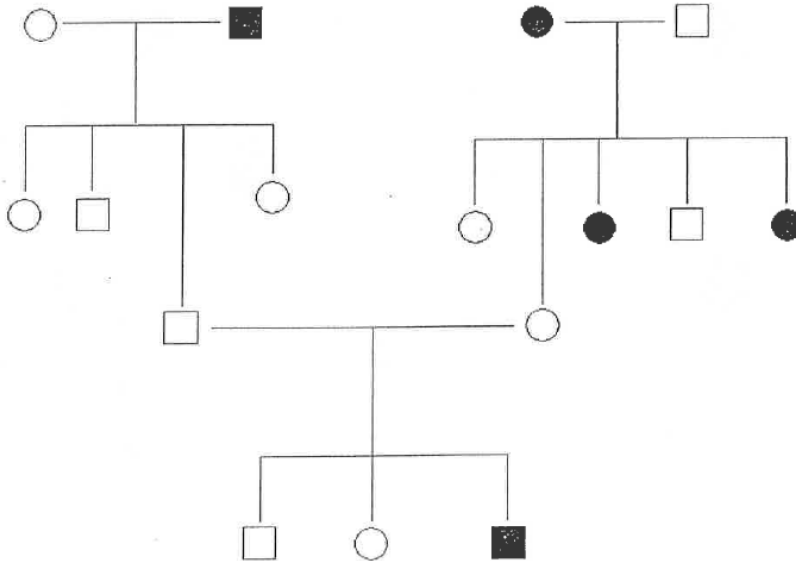


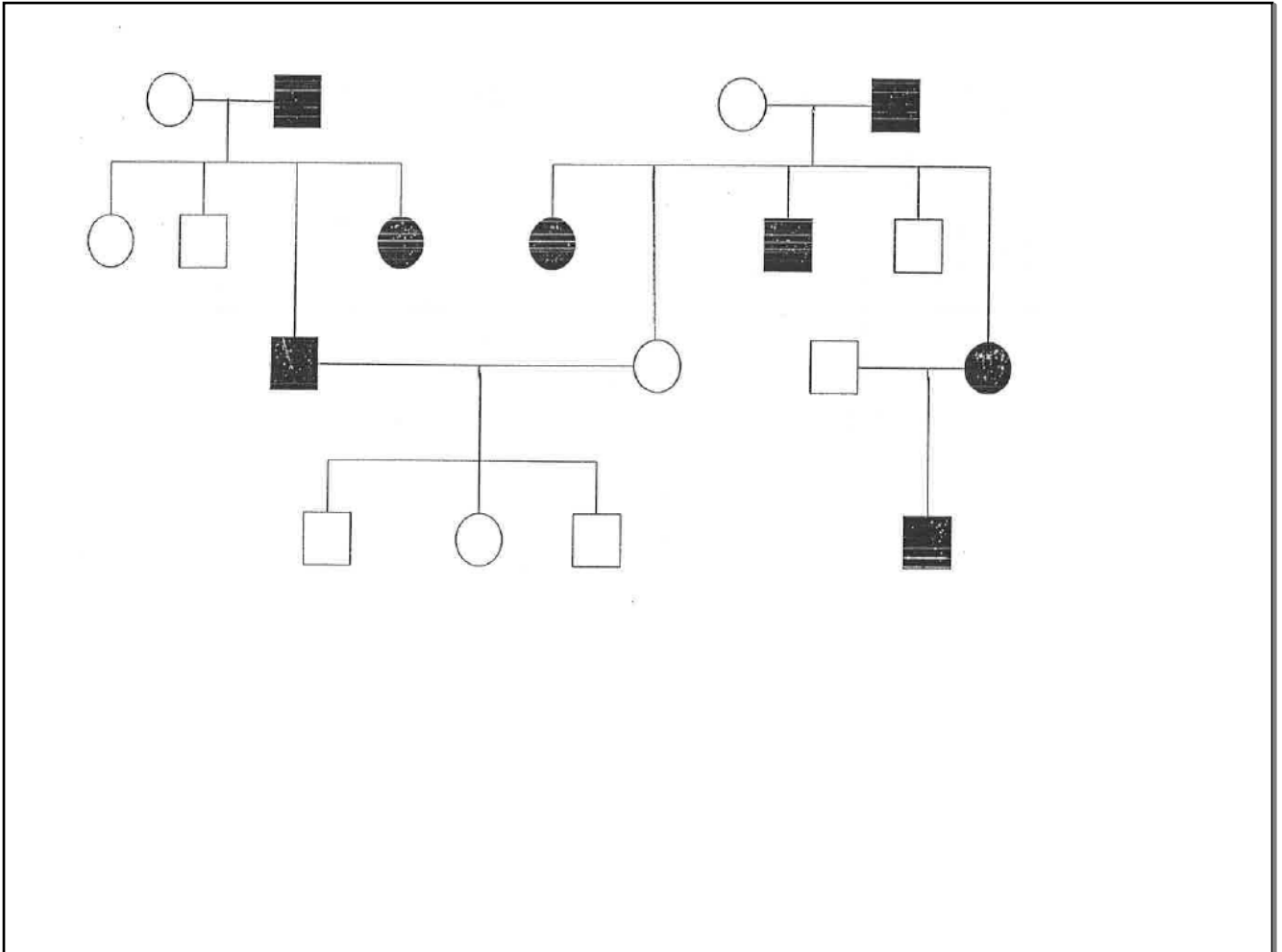
Key:



A = normal
a = disease

choose: $\left\{ \begin{array}{l} AA \\ Aa \\ aa \\ A? \end{array} \right.$





Blood Type Genetics

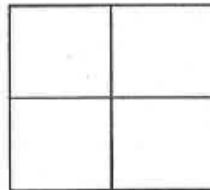
I_A , I_B , and i code for different proteins on the surface of red blood cells. The i allele is recessive. I_A and I_B are dominant to O . I_A and I_B are codominant to each other.

Fill in the table below and then answer the questions that follow

Blood Type (Phenotype)	Genotype
Homozygous for type A	$I_A I_A$
Heterozygous for type A	$I_A i$
Homozygous for type B	$I_B I_B$
Heterozygous for type B	$I_B i$
Type AB	$I_A I_B$
Type O	ii

1. Nadine's mom has type AB blood and her dad is heterozygous for type B blood. What is the probability that Nadine has

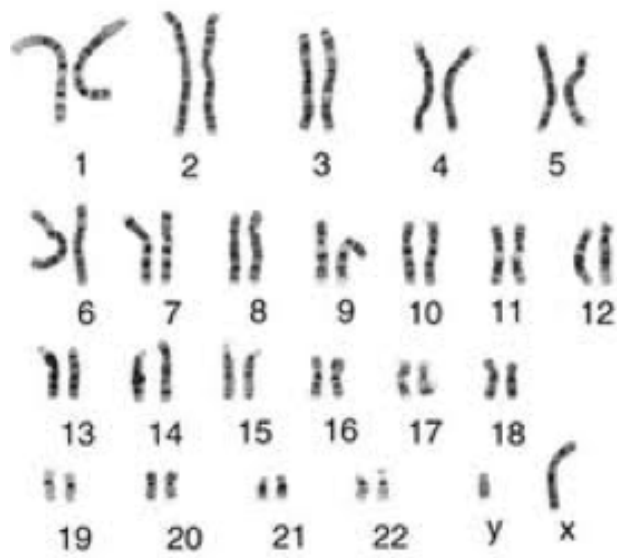
- a. type A blood _____
- b. type B blood _____
- c. type AB blood _____
- d. type O blood _____

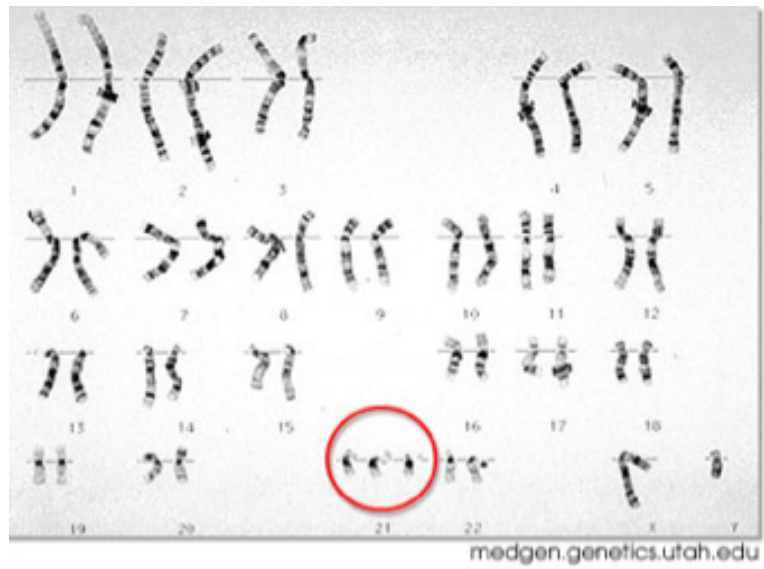


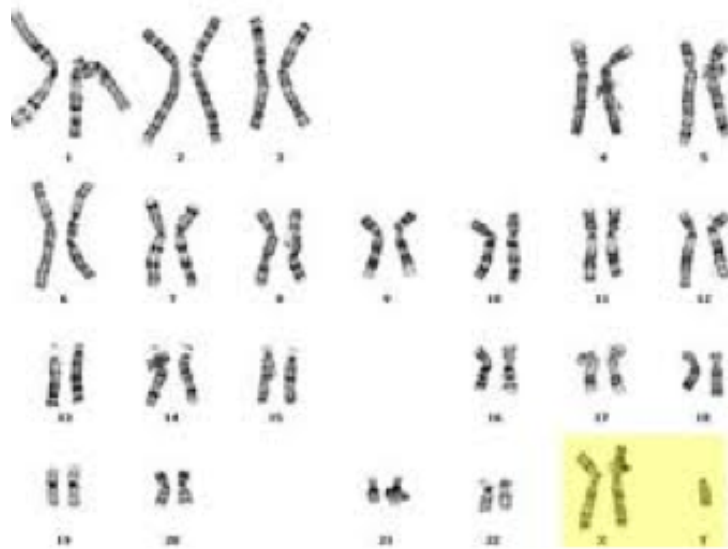
2. Tricia's mom has type AB blood and her dad has type O blood. What is the probability that Tricia has

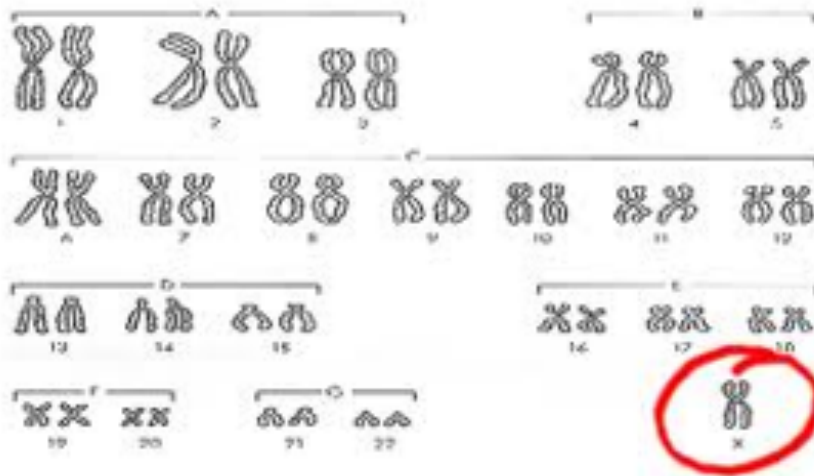
- a. type A blood _____
- b. type B blood _____
- c. type AB blood _____
- d. type O blood _____











P: tall TT × short tt

F₁: Tt all tall
 $Tt \times Tt$

F₂

	T	t
T	TT	Tt
t	Tt	tt

pheno ratio
3:1

Incompl. dom

hybrid pheno =
blend

Codom = hybrid pheno. =
both expressed