

Biology A

Name _____ Per _____

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	T	C	G	Y	R	A
Recessive allele symbol	t	c	g	y	r	a

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	TT	dom.
terminal flower position	aa	rec.
white seed coat	cc	rec.
wrinkled seed shape	rr	rec.
yellow pod color	gg	rec.
yellow seed color	yy	dom.

3. Write the genotype of the following hybrids (also called heterozygotes).

phenotype	genotype
yellow seeded peas	Yy
axial flowers	Aa
green podded peas	Gg
colored seed coats	Cc
round seeds	Rr
tall stemmed seeds	Tt

4. Use Punnett squares to predict the genotypic and phenotypic ratios of the following parental cross.

$Tt \times Tt$

	T	t
T	TT tall	Tt tall
t	Tt tall	tt short

Genotypic ratio:

$1:2:1$

Phenotypic ratio:

$3:1$

5. Use Punnett squares to predict the genotypic and phenotypic ratios of the following parental cross.

homozygous wrinkled seeds x heterozygous round seeds

$rr \times Rr$

	R	r
r	Rr	rr
r	Rr	rr

Genotypic ratio:

$0:2:2$

Phenotypic ratio:

$2:2$

1. $Tt \times tt$

	T	t
t	Tt	tt
t	Tt	tt

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

0:2:2

2:2

2-FACTOR CROSSES/SEX-LINKED TRAITS 11/3

ESSENTIAL Qs:

- WHAT ARE THE POSSIBLE OUTCOMES OF 2-FACTOR CROSSES?
- WHY ARE SOME TRAITS SEX-LINKED?

2-FACTOR CROSSES:

SEED SHAPE: $R = \text{ROUND}$
 $r = \text{WRINKLED}$

SEED COLOR: $Y = \text{YELLOW}$
 $y = \text{GREEN}$

P₁: RRYY ♂ × rryy ♀

F₁: RrYy - all dihybrid
 ROUND, yellow

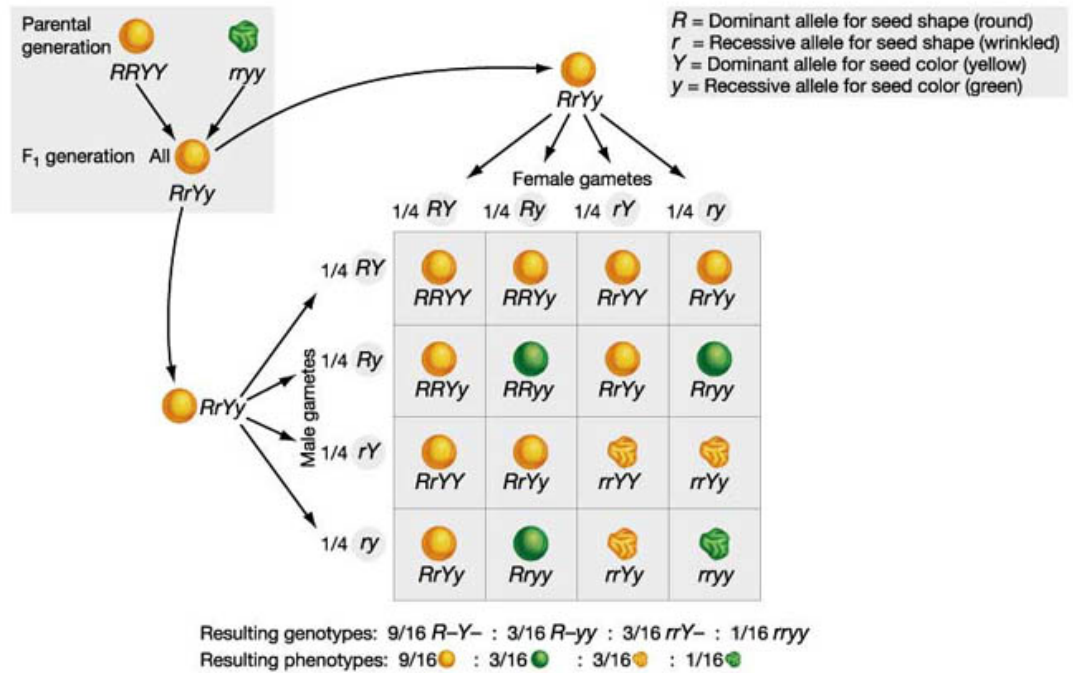
F₁ cross: $RrYy \times RrYy$

$$\overset{\sigma}{RrYy} \times \overset{\text{♀}}{RrYy}$$

Gametes:
"FOIL"

- F: 1. \underline{RY}
 O: 2. \underline{Ry}
 I: 3. \underline{rY}
 L: 4. \underline{ry}

	RY	Ry	rY	ry
RY	$RRYY$	$RRYy$	$RrYY$	$RrYy$
Ry	$RRYy$	$RRyy$	$RrYy$	$Rryy$
rY	$RrYY$	$RrYy$	$rrYY$	$rrYy$
ry	$RrYy$	$Rryy$	$rrYy$	$rryy$



SEX-LINKED TRAITS:

HUMANS: 46 chromosomes

From Mom: 23 "

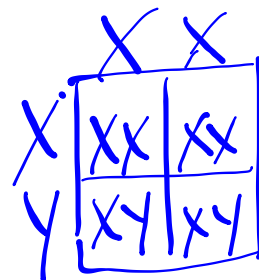
From DAD: 23 "

#23 - SEX chromosomes

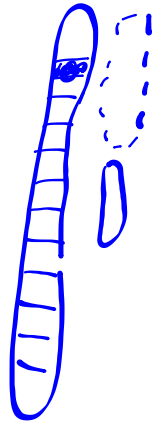
X + Y

XX - female

XY - male



X-linked trait - on X-chromosome



♂ MORE LIKELY to
show X-LINKED
REC. traits

Color-blind:

X^N = normal color vision
 X^n = colorblind

male-normal vision: $X^N Y$

male-colorblind: $X^n Y$

female-colorblind: $X^n X^n$

$X^N Y \times X^N X^n$

	X^N	Y
X^N	$X^N X^N$	$X^N Y$
X^n	$X^N X^n$	$X^n Y$

Normal vision ♀:

$X^N X^N$

$X^N X^n$ - carrier