

1. In guinea pigs, black hair (B) is dominant to white hair (b).

	Genotype	Phenotype
Homozygous black guinea pig		
White guinea pig		
Heterozygous black guinea pig		

Why is there no heterozygous white guinea pig? _____

If you crossed a homozygous, black guinea pig with a white guinea pig, what would be the phenotype(s) and genotype(s) of the offspring?

genotypes _____

phenotypes _____

If two F₁ offspring were mated, what would be the genotype(s) and phenotype(s) of the F₂ generation and what would be the ratio of phenotypes?

genotypes _____

phenotypes _____

phenotypic ratio _____

2. In pea plants, tall plant size (G) is dominant to dwarf size (g). Starting with a cross between a pure-breeding tall plant and a pure-breeding dwarf plant, determine the following:

gametes of original parents: _____ and _____

F₁ genotype: _____; phenotype: _____

F₂ genotypes and ratios: _____

F₂ phenotypes and ratios: _____

3. Blue eye color is recessive to brown eye color. Marjorie and Henry both have brown eyes. Marjorie's mother has blue eyes and her father has brown eyes. Both of Henry's parents, all of his grandparents and his sisters and brothers have brown eyes.

a. What is the most likely genotype for Marjorie's eye color? _____

b. What is the most likely genotype for Henry's eye color? _____

c. What is the probability that Marjorie and Henry will have a child with blue eyes? _____

4. What kinds of gametes can be produced by organisms with the following genotypes?

- a. AAbb _____
- b. AABb _____
- c. AaBB _____
- d. Aabb _____
- e. aabb _____
- f. AaBb _____

5. Blue flower color (B) is dominant to white flower color (b). Straight-edged leaves (R) are dominant to curly-edged leaves (r).

- a. What is the genotype of a homozygous blue-flowered, straight-leafed plant? _____
- b. What is the genotype of a homozygous white-flowered, curly-leafed plant? _____
- c. What are two possible genotypes of a plant with blue flowers and curly leaves?

- d. What are the genotypes possible for a plant with white flowers and straight-edged leaves? _____
- e. If a homozygous plant with blue flowers and straight leaves is crossed with a homozygous plant with white flowers and curly leaves, what is the genotype of the F₁ generation?

- f. If two members of the F₁ generation are crossed, what are four phenotypes that can be produced and what is the expected phenotypic ratio?

6. In watermelons, the genes for green color (G) and round shape (R) are dominant over the alleles for striped color (g) and oval shape (r). Suppose a homozygous plant with striped, round fruit is crossed with a homozygous green, oval plant.

- a. What phenotype would this produce? _____
- b. What would be the genotype? _____

7. Plants called four o'clocks can have red, pink or white flowers. If two plants with pink flowers are crossed, the F₁ population contains 25% red, 50% pink and 25% white plants.

- a. What are the genotypes of the parent plants? _____
- b. What are the genotypes of the offspring plants? _____
- c. What conclusions can you draw about the inheritance of pigmentation in this plant?

- d. What is genotype of a red plant? _____
- e. What is the genotype of a white plant? _____

- f. What is the genotype of a pink plant? _____
- g. Red plants or white plants are always _____zygous
- h. Pink plants are always _____zygous.

8. An X-linked recessive gene (*r*) produces red/green color blindness. A normal woman (whose father was colorblind) marries a colorblind man:

- a. What is the genotype of the woman? _____
- b. What is the genotype of the man? _____
- c. What are the possible genotypes of the mother of the colorblind man?

- d. What are the possible genotypes of the father of the colorblind man? _____
- e. What are the chances that the son of the woman and man in this problem will be colorblind? _____
- f. What are the chances that their daughter will be colorblind? _____

9. Three alleles control the ABO blood types. Any individual has only two alleles, but may have any selection from these three alleles. In addition, although A and B are dominant to O, they are not dominant to each other. There are four possible blood types. They are: type A (genotypes $I^A I^A$ or $I^A i$), type B (genotypes $I^B I^B$ or $I^B i$) type O (genotype ii) and type AB (genotype $I^A I^B$). Which of the following parents could produce the given children?

parents	child	yes or no	child's genotype
A + AB	B	_____	_____
A + O	A	_____	_____
A + B	O	_____	_____
A + AB	O	_____	_____
A + AB	B	_____	_____
B + B	O	_____	_____
AB + AB	A	_____	_____

10. A man with blood group A marries a woman with blood group B. They have a child with blood group O.

- a. What are the genotypes of the mother? _____
- b. What are the genotypes of the father? _____
- c. What are the genotypes of the child? _____

1. In guinea pigs, black hair (B) is dominant to white hair (b).

	Genotype	Phenotype
Homozygous black guinea pig	BB	black
White guinea pig	bb	white
Heterozygous black guinea pig	Bb	black

Why is there no heterozygous white guinea pig? need both b genes

If you crossed a homozygous, black guinea pig with a white guinea pig, what would be the phenotype(s) and genotype(s) of the offspring?

genotypes F₂ Bb BB × bb

B	B
b	b

phenotypes all black

If two F₁ offspring were mated, what would be the genotype(s) and phenotype(s) of the F₂ generation and what would be the ratio of phenotypes?

genotypes 1 BB 2 Bb 1 bb Bb × Bb
phenotypes Black Black white

B	B	b
B	BB	Bb
b	Bb	bb

phenotypic ratio 3:1

2. In pea plants, tall plant size (G) is dominant to dwarf size (g). Starting with a cross between a pure-breeding tall plant and a pure-breeding dwarf plant, determine the following:

gametes of original parents: G, G and g, g GG × gg
F₁ genotype: Gg; phenotype: Tall Gg × Gg
F₂ genotypes and ratios: GG, Gg, gg 1:2:1

G	G	g
G	GG	Gg
g	Gg	gg

F₂ phenotypes and ratios: 3 tall: 1 short

3. Blue eye color is recessive to brown eye color. Marjorie and Henry both have brown eyes. Marjorie's mother has blue eyes and her father has brown eyes. Both of Henry's parents, all of his grandparents and his sisters and brothers have brown eyes.

- What is the most likely genotype for Marjorie's eye color? Bb
- What is the most likely genotype for Henry's eye color? BB or Bb
- What is the probability that Marjorie and Henry will have a child with blue eyes? 0% or 25%

b - blue
B - brown

b - blue
B - brown

$\begin{matrix} \text{♂ } B\text{---} \times \text{♀ } bb \\ \text{♀ } Bb \end{matrix}$

 $\begin{matrix} B\text{---} \times B\text{---} \\ \text{♂ } B\text{---} \end{matrix}$

$\begin{matrix} B\text{---} \times b.b \\ \text{♀ } B\text{---} \end{matrix}$

 $\begin{matrix} \text{♂ } B\text{---} \\ \text{♀ } B\text{---} \end{matrix}$

B	B
b	Bb

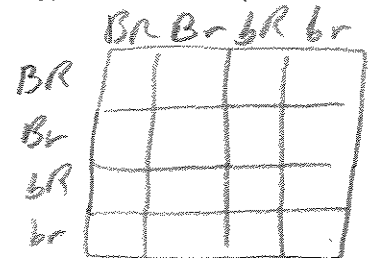
4. What kinds of gametes can be produced by organisms with the following genotypes?

- a. AAbb Ab
- b. AABb AB, Ab
- c. AaBB AB, aB
- d. Aabb Ab, ab
- e. aabb ab
- f. AaBb AB, Ab, aB, ab

5. Blue flower color (B) is dominant to white flower color (b). Straight-edged leaves (R) are dominant to curly-edged leaves (r).

- a. What is the genotype of a homozygous blue-flowered, straight-leafed plant? BBRR
- b. What is the genotype of a homozygous white-flowered, curly-leafed plant? bbrr
- c. What are two possible genotypes of a plant with blue flowers and curly leaves? Bbrr, bbRr
- d. What are the genotypes possible for a plant with white flowers and straight-edged leaves? bbRr, bbRR
- e. If a homozygous plant with blue flowers and straight leaves is crossed with a homozygous plant with white flowers and curly leaves, what is the genotype of the F₁ generation? BbRr
- f. If two members of the F₁ generation are crossed, what are four phenotypes that can be produced and what is the expected phenotypic ratio?

<u>B_R_</u>	<u>9</u>
<u>B_rr</u>	<u>3</u>
<u>bbR_</u>	<u>3</u>
<u>bbrr</u>	<u>1</u>



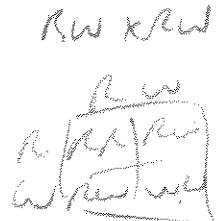
6. In watermelons, the genes for green color (G) and round shape (R) are dominant over the alleles for striped color (g) and oval shape (r). Suppose a homozygous plant with striped, round fruit is crossed with a homozygous green, oval plant.

- a. What phenotype would this produce? Green Round
- b. What would be the genotype? GgRr

ggRR x GGrr

7. Plants called four o'clocks can have red, pink or white flowers. If two plants with pink flowers are crossed, the F₁ population contains 25% red, 50% pink and 25% white plants.

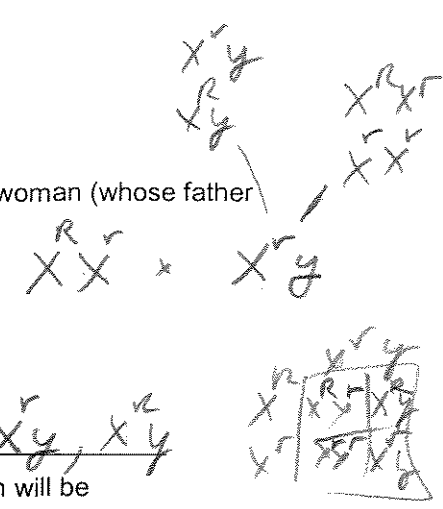
- a. What are the genotypes of the parent plants? RW
- b. What are the genotypes of the offspring plants? RR, Rr, rr
- c. What conclusions can you draw about the inheritance of pigmentation in this plant? Incomplete dominance
- d. What is genotype of a red plant? RR
- e. What is the genotype of a white plant? rr



- f. What is the genotype of a pink plant? RW
- g. Red plants or white plants are always homo zygous
- h. Pink plants are always hetero zygous.

8. An X-linked recessive gene (r) produces red/green color blindness. A normal woman (whose father was colorblind) marries a colorblind man:

- a. What is the genotype of the woman? $X^R X^r$
- b. What is the genotype of the man? $X^r y$
- c. What are the possible genotypes of the mother of the colorblind man? $X^R X^r, X^r X^r$
- d. What are the possible genotypes of the father of the colorblind man? $X^r y, X^R y$
- e. What are the chances that the son of the woman and man in this problem will be colorblind? 50%
- f. What are the chances that their daughter will be colorblind? 50%



9. Three alleles control the ABO blood types. Any individual has only two alleles, but may have any selection from these three alleles. In addition, although A and B are dominant to O, they are not dominant to each other. There are four possible blood types. They are: type A (genotypes $I^A I^A$ or $I^A i$), type B (genotypes $I^B I^B$ or $I^B i$), type O (genotype ii) and type AB (genotype $I^A I^B$). Which of the following parents could produce the given children?

parents	child	yes or no	child's genotype
<u>AA AO</u> A + AB	B	<u>YES</u>	<u>BO</u>
<u>AA AO</u> A + O	A	<u>YES</u>	<u>AO</u>
<u>AA AO BB</u> A + B	O	<u>YES</u>	<u>OO</u>
<u>AA AO AB</u> A + AB	O	<u>NO</u>	
<u>AA AO AB</u> A + AB	B	<u>YES</u>	<u>BO</u>
<u>AA AO AB</u> B + B	O	<u>YES</u>	<u>OO</u>
<u>AA AO AB</u> AB + AB	A	<u>YES</u>	<u>AA</u>

10. A man with blood group A marries a woman with blood group B. They have a child with blood group O.

- a. What are the genotypes of the mother? BO
- b. What are the genotypes of the father? AO
- c. What are the genotypes of the child? OO

