

KEY

Genetics Review Sheet

Name: Ms. Davis

- Differentiate between:
 - Gene and allele -

Gene is a stretch of DNA that determines a trait
 Allele is a version of a gene

- Dominant allele vs. recessive allele -

When a dominant allele is present, it will show up over the recessive allele.

- Homozygous vs. heterozygous -

Hh = heterozygous HH or hh = homozygous

- Genotype vs. phenotype -

Genotype = DNA HH

Phenotype is what you see / what is expressed

Monohybrid Crosses:

Types of Inheritance

* Assume B allele is blue, b allele is red

Inheritance Pattern	Definition	Genotype	Phenotype
Complete Dominance	look it up	BB	Blue
		Bb	Blue
		bb	Red
Incomplete Dominance		BB	Blue
		Bb	Purple
		bb	Red
Codominance		BB	Blue
		Bb	Blue and Red
		bb	Red
Sex-Linked (complete dominance) X-linked		$X^B X^B$	Blue Bird
		$X^B X^b$	Blue Bird
		$X^b X^b$	Red Bird
		$X^B Y$	Blue Bird
		$X^b Y$	Red Bird

- If the ratio is 1:3, what is the percentage? $\frac{75\%}{25\%}$ The fraction? $\frac{1}{4}$
 $\frac{3}{4}$

2. Fill in the genotypes of the blood types in the table to the right.

Phenotypes (Blood Type)	Genotypes
A	AA
	AO
B	BB
	BO
AB	AB
O	OO

Dihybrid Crosses:

1. If a Aabb woman mates with an aaBB man, what is the probability their child will be aaBb?

Gametes ♀ $\begin{matrix} Ab \\ ab \end{matrix}$

Gametes ♂ $\begin{matrix} aB \end{matrix}$

50% or
1/2 or
1:1

	Ab	Ab	ab	ab
aB	Aabb	Aabb	aabb	aabb
aB	Aabb	Aabb	aabb	aabb
aB	Aabb	Aabb	aabb	aabb
aB	Aabb	Aabb	aabb	aabb

2. What are the gametes of a woman who is AaBb?

$\begin{matrix} AB \\ Ab \\ aB \\ ab \end{matrix}$

3. If AaBb is crossed with AaBb, what are the general phenotypic ratios of the offspring?

9:3:3:1

4. The majority of traits in humans are polygenic. What does this mean? Give an example.

look it up

Blood Type Problems

1. List all the possible genotypes for each of the 4 blood types:

Type O OO Type A AO, AA

Type B BO, BB Type AB AB

SHOW WORK! Punnett squares will be very helpful with these problems.

2. A man with AB blood has a baby with a woman with AB blood. What blood types will their children be and in what proportion?

	A	B
A	AA	AB
B	AB	BB

25% A
50% AB
25% B

3. A man who has type B blood (genotype: BB) has a baby with a woman with type O blood. What blood type will their children have?

	B	B	
O	Bo	Bo	Type B
O	Bo	Bo	

4. A woman with type A blood (genotype: AO) has a baby with a type B person (genotype: BO). What blood types will their children have?

	A	O	
B	AB	Bo	Types AB, B, A, O
O	AO	OO	

5. A woman with type A blood is claiming that a man with type AB blood is the father of her child, who is also type AB. Could this man be the father? Show the possible crosses; remember the woman can have AO or AA genotypes.

Yes

6. Why is a person with type O blood called a "universal donor"?

They can give to any blood type

7. Why is a person with type AB blood called a "universal acceptor"?

They can receive blood from any blood type

Practice Questions

1. A mutation caused a phenotypic change in an organism's offspring. The mutation most likely occurred in which type of cell from the parent? A. blood cell B. gamete C. neuron D. skin cell

gamete

2. In betta fish, alleles for color are incompletely dominant. Green fish have genotype CC, dark blue fish have genotype cc, and royal blue fish have genotype Cc. Two royal blue betta fish are crossed. What percentage of the offspring is expected to be green? A. 0% B. 25% C. 50% D. 75%

	C	c	
C	CC	Cc	25% green
c	Cc	cc	

3. A gene that affects hair length in dogs has two alleles. The allele for short hair (L) is dominant to the allele for long hair (l). A cross of two short-haired dogs produces six short-haired and two long-haired offspring. Which of the following best explains how the long-hair phenotype can appear in the offspring of two short-haired dogs?

A. Only recessive alleles are inherited from homozygous parents.




B. Dominant alleles grow weaker as they are passed from parents to offspring.

C. Only the parent with a dominant allele can pass that allele to offspring in sexual reproduction.

D. A heterozygous parent has an equal chance of passing either the dominant allele or the recessive allele to offspring.

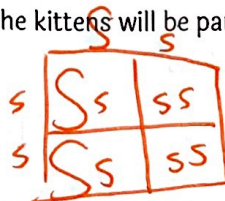
4. Human HLA genes have as many as 100 different alleles per gene. Which of the following terms best describes the inheritance pattern for each HLA gene? A. codominant B. linked gene C. multiple allele D. recessive

5. The table below gives information about the genetics of white spotting in cats.

Genotype	Phenotype
SS	 Mostly white
Ss	 Partially white
ss	 Black

If a partially white cat mates with a black cat, what are the expected phenotypes of the kittens?

- A. All the kittens will be black.
- B. Half the kittens will be black, and half will be partially white.
- C. Three-quarters of the kittens will be black, and one-quarter will be partially white.
- D. Three-quarters of the kittens will be partially white, and one-quarter will be mostly white.



6. Suppose a trait is controlled by a gene that has one dominant allele (G) and one recessive allele (g). Which of the following crosses would be expected to produce the greatest variety of genotypes among the offspring?

- A. GG x GG
- B. GG x gg
- C. Gg x Gg
- D. Gg x gg

7. A newly discovered gene has two alleles, A and a. Scientists hypothesize that the alleles show incomplete dominance. Which of the following statements provides evidence for incomplete dominance?

- A. Analysis of the DNA shows that only males have genotype AA.
- B. Individuals with genotype aa survive only a few days after birth.
- C. Individuals with genotype AA and individuals with genotype Aa both have the same phenotype.
- D. Crosses between two individuals with genotype Aa result in three different phenotypes among the offspring.

8. A single gene with two alleles codes for the fruit color (red and yellow) of tomato plants. Two tomato plants

Fruit Color	Number of Offspring Plants
red	157
yellow	52

heterozygous for fruit color are crossed. The table below shows the results of the cross. Based on the results, what is the most likely inheritance pattern of the alleles for fruit color?

- A. The alleles for red color and for yellow color are polygenic.
- B. The alleles for red color and for yellow color are codominant.
- C. The allele for red color is recessive to the allele for yellow color.
- D. The allele for red color is dominant to the allele for yellow color.

9. Crossing over is one event that can cause an offspring to have a phenotype that is different from its parents. Which of the following statements describes another event that can sometimes cause an offspring to have a phenotype that is different from its parents?

- A. The offspring is produced by asexual reproduction.
- B. Natural selection favors the offspring with specific genetic traits.
- C. Dominant alleles are passed from the parents and expressed in the offspring.
- D. A genetic mutation occurs in one of the parent gametes and is passed to the offspring.

10. In rabbits, a single gene with two alleles codes for ear shape. Two rabbits, each with a homozygous genotype, are mated. The female rabbit has straight ears and the male rabbit has floppy ears. All the offspring have straight ears. Which of the following conclusions about rabbit genetics is **best** supported by the results of the cross?

- A. Offspring rabbits receive alleles only from their mothers.
- B. The allele for straight ears is dominant to the allele for floppy ears.
- C. Alleles in female rabbits are always more dominant than alleles in male rabbits.
- D. The allele for straight ears and the allele for floppy ears are on different chromosomes.

11. In a plant called jimsonweed, flowers can be white or purple. A jimsonweed plant with white flowers is crossed with a jimsonweed plant with purple flowers. All of the offspring have purple flowers. Based on the results of the cross, which of the following statements most likely describes the alleles for flower color in jimsonweed?

- A. The allele for purple flowers is recessive to the allele for white flowers.
- B. The allele for purple flowers is dominant to the allele for white flowers.
- C. The allele for purple flowers has mutated more times than the allele for white flowers.
- D. The allele for purple flowers is on a different chromosome than the allele for white flowers.

12. A particular genetic disorder leads to very high levels of blood cholesterol. The gene linked to this trait has two alleles, **N** and **n**. The table below shows how the three different combinations of these alleles are expressed.

Genotype	Expressed Phenotype
NN	normal cholesterol levels
Nn	slightly elevated cholesterol levels
nn	greatly elevated cholesterol levels

Which of the following statements describes the interaction of the **N** and **n** alleles for the gene?

- A. The **N** allele is recessive to the **n** allele.
- B. The **N** allele is incompletely dominant to the **n** allele.
- C. The **N** allele assort independently from the **n** allele.

D. The **N** allele completely masks the phenotype of the **n** allele.

13. In red-green colorblindness, individuals cannot perceive the colors red and green in the same way as individuals with full color vision. Full color vision is coded by a dominant allele (**B**) on the X chromosome. Red-green colorblindness is caused by a recessive allele (**b**) on the X chromosome.

- Identify the phenotype of a female with the genotype $X^B X^b$. *full color*
- Identify the phenotype of a male with the genotype $X^B Y$. *full color*

Draw a Punnett square for the cross, and identify the following:

- the percentage of offspring expected to be male and colorblind *25%*.
- the percentage of offspring expected to be female and colorblind *0%*.

	X^B	Y
X^B	$X^B X^B$	$X^B Y$
X^b	$X^B X^b$	$X^b Y$

Explain why red-green colorblindness occurs more frequently in males than in females.

males must receive an X chromosome from mom. If they receive the b they will be color blind. Females get 2 copies

14. Height is a polygenic trait in humans. Which of the following statements **best** explains the genetics of this trait?

- A. Height is controlled by more than one gene.
- B. Height is controlled by a single dominant gene.
- C. The gene for height is located on the X chromosome.
- D. The gene for height is located on the Y chromosome.

15. A pea plant is Pp. What alleles will be in its gametes? What percentage of gametes will have P? What percentage will have p?

50% P 50% p

16. A cow is WW. What fraction of its gametes will be W?

100% or $\frac{1}{1}$

Oompa Loompa Genetics

<p>1. Oompahs generally have blue faces which is caused by a dominant gene. The recessive condition results in an orange face. Develop a "key" to show the genotypes and phenotypes possible for Oompa Loompas.</p>	<p>Genotype Phenotype $BB =$ Blue Face $Bb =$ Blue Face $bb =$ orange face</p>											
<p>2. Two heterozygous Oompahs are crossed. What proportion of the offspring will have orange faces?</p>	<p>$Bb \times Bb$</p> <p>orange = 25%</p>											
<p>3. A blue faced Oompah (homozygous) is married to an orange faced Oompah. They have 8 children. How many children will have blue faces?</p>	<p>$BB \times bb$</p> <p>8 will have orange faces</p>											
<p>4. Otis Oompah has an orange face and is married to Ona Oompah who has a blue face. They have 60 children, 31 of them have orange faces. What are the genotypes of the parents?</p> <p>31/60 is approx 1/2 based on this, you know that 50% must be bb.</p>	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td></td> <td>b</td> <td>b</td> <td></td> </tr> <tr> <td>B</td> <td>Bb</td> <td>Bb</td> <td rowspan="2">50% blue</td> </tr> <tr> <td>b</td> <td>bb</td> <td>bb</td> </tr> </table> <p>50% orange</p>		b	b		B	Bb	Bb	50% blue	b	bb	bb
	b	b										
B	Bb	Bb	50% blue									
b	bb	bb										

Use this info to build your Punnett Sq.

6. Ona Oompah (from #4) divorces Otis and marries Otto. Otto has an orange face. What is the probability that Ona and Otto's children will have orange faces?

5 or 50%

	b	b	andi
ona	B	Bb	Bb
	b	bb	bb

7. Oompahs have some sex linked traits. Females have two X chromosomes, and males have one X and one Y chromosome. So males have just one X chromosome. Thus, all X-linked alleles are expressed in males, even if they are recessive.

If C equals colorblindness, how many offspring will be colorblind if mom is a carrier, and the father is not colorblind?

$X^C X^c$ $X^C Y$

	X^C	X^c	
X^C	$X^C X^C$	$X^C X^c$	1/4 will likely be color blind
Y	$X^C Y$	$X^c Y$	

8. Oompahs can have red, blue or purple hair. Purple hair results from the heterozygous condition. Make a "key" showing the genotypes and phenotypes for hair color. Is this an example of codominance or incomplete dominance?

Incomplete Dominance

R = red B = Blue

RR = red BB Blue

RB = Purple

9. Orville Oompah has purple hair and is married to Opal Oompah who brags that she has the bluest hair in the valley. How many of Opal's children will be able to brag about their blue hair also?

	R	B	orville
opal	B	BR	BB
	B	BR	BB

2/4 will have blue hair

11. Olga Oompah has red hair and marries Oliver Oompah who has blue hair. They have 32 children. What color is their children's hair?

all Purple b/c all children are heterozygous

	R	R	olga
oliver	B	BR	BR
	B	BR	BR

12. Olivia Oompah is married to Odo Oompah and they both have purple hair. What color hair and in what proportion would you expect their children to have?

25% red

50% purple

25% blue

1:2:1

	R	B
R	RR	RB
B	RB	BB