

# Genetics Practice Review for Monohybrids (one trait):

KEY

1. For each of the genotypes (letters) listed write a phenotype (description).

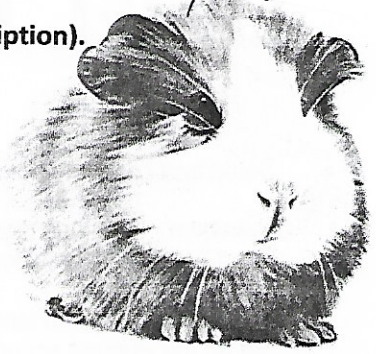
In guinea pigs, short hair is dominant to long hair:

HH = Short    Hh = Short    hh = Long

2. For each of the phenotype listed write a genotype.

In guinea pigs, black eyes are dominant to red eyes:

BB = Black eyes    Bb = Black eyes    bb = Red eyes



Complete the Punnett squares for each of the following crosses. Write your answer in PERCENTAGE.

3. Bb x bb

	B	b
b	Bb	bb
b	Bb	bb

How many guinea pigs will have black eyes

50%

red eyes

50%

4. bb x BB

	B	B
b	Bb	Bb
b	Bb	Bb

How many guinea pigs will have black eyes

100%

red eyes

0%

5. Bb x Bb

	B	b
B	BB	Bb
b	Bb	bb

How many guinea pigs will have black eyes

75%

red eyes

25%

LEVEL ONE: EASY

# LEVEL TWO: NORMAL

Setup and complete punnett squares for each of the crosses.

Reminder: In guinea pigs, black eyes (BB, Bb) are dominant to red eyes (bb)  
Short hair (HH, Hh) is dominant to long hair (hh)

6. A guinea pig with long hair (hh) is crossed with one that has short hair (H H).  
Set up the Punnett square below.

	h	h
H	Hh	Hh
h	Hh	Hh

What percentage of the offspring will have have short hair? 100%



7. A guinea pig with long hair (hh) is crossed with one that has short hair (H h).  
Set up the Punnett square below.

	h	h
H	Hh	Hh
h	hh	hh

What percentage of the offspring will have have short hair? 50%

8. A guinea pig with black eyes (B b) is crossed with one that also has black eyes (B b).  
Set up the Punnett square below.

	B	b
B	BB	Bb
b	Bb	bb

What percentage of the offspring will have have black eyes? 75% red eyes? 25%  
Bb, BB bb

Bb	Bb
bb	bb

# LEVEL THREE: YOU GOT THIS!

Heterozygous means that the individual has two different letters, for example Aa, Bb, Dd.  
 Homozygous means that the individual has two same letters, for example AA, bb, DD, eee

Cats can have a trait where their ear folds down, a breed called the "Scottish Fold," displays this phenotype in most breedings. The gene for folded ears is dominant (E) and the gene for straight ears (e) is recessive.

1. Write the three genotypes that are possible (choose your letters) and describe their phenotypes. Remember, genotypes have two letters and the phenotype describes what the cat looks like (folded or straight).

EE - Folded ears  
 Ee - Folded ears  
 ee - Straight ears

2. Show the cross of two heterozygous cats. What percentage of their offspring will have folded ears?

	E	e
E	EE	Ee
e	Ee	ee

EE or Ee

75% have folded ears

3. A heterozygous cat is crossed with a cat that has straight ears. What percentage of their offspring will have folded ears?

	E	e
e	Ee	ee
e	Ee	ee

50% have folded ears

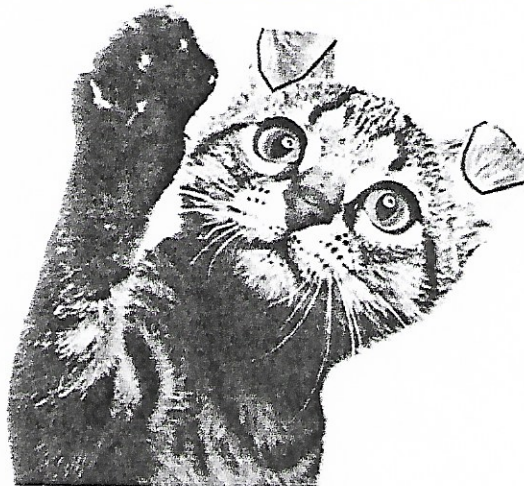
4. If both parents have straight ears, What percentage of the kittens will have straight ears also?

ee x ee

ee

	e	e
e	ee	ee
e	ee	ee

100% have straight



# KEY

**Incomplete dominance practice Problems**

4-6. Snapdragons are incompletely dominant for color; they have phenotypes red, pink, or white. The red flowers are homozygous dominant, the white flowers are homozygous recessive, and the pink flowers are heterozygous. Give the genotypes for each of the phenotypes, using the letters "R" and "r" for alleles:

a. Red snapdragon  
genotype: RR

b. Pink snapdragon  
genotype: Rr

c. White snapdragon  
genotype: rr

Show genetic crosses between the following snapdragon parents, using the punnett squares provided, and record the genotypic and phenotypic %s below:

a. pink x pink

	R	r
R	RR	Rr
r	Rr	rr

Genotypic  
%: 1:2:1  
Phenotypic  
%: 1:2:1

b. red x white

	R	R
r	Rr	Rr
r	Rr	Rr

Genotypic  
%: 4:0 = 1:0  
Phenotypic  
%: 4:0 = 1:0

c. pink x white

	R	r
r	Rr	rr
r	Rr	rr

Genotypic  
%: 1:1  
Phenotypic  
%: 1:1

7-9. In horses, some of the genes for hair color are incompletely dominant. Genotypes are as follows: brown horses are BB, white horses are bb and a Bb genotype creates a yellow-tannish colored horse with a white mane and tail, which is called "palomino". Show the genetic crosses between the following horses and record the genotypic and phenotypic percentages:

a. brown x white

	B	B
b	Bb	Bb
b	Bb	Bb

Genotypic  
%: 4:0 = 1:0  
Phenotypic  
%: 4:0 = 1:0

b. brown x palomino

	B	B
B	BB	BB
b	Bb	Bb

Genotypic  
%: 1:1  
Phenotypic  
%: 1:1

c. palomino x palomino

	B	b
B	BB	Bb
b	Bb	bb

Genotypic  
%: 1:2:1  
Phenotypic  
%: 1:2:1

10. Can palominos be considered a purebred line of horses? Why or why not?

*No - their alleles are different*

11. Which two colors of horse would you want to breed if you wanted to produce the maximum numbers of palominos in the shortest amount of time?

*Brown x white*

Name KEY

Period \_\_\_\_\_

# Worksheet: Dihybrid Crosses

## UNIT 3: GENETICS

**STEP 1:** Determine what kind of problem you are trying to solve.

**STEP 2:** Determine letters you will use to specify traits.

**STEP 3:** Determine parent's genotypes.

**STEP 4:** Make your Punnett square and make gametes

**STEP 5:** Complete cross and determine possible offspring.

**STEP 6:** Determine genotypic and phenotypic ratios.

### Two-Factor Crosses (Di-hybrid)

Ex) A tall green pea plant (TTGG) is crossed with a short white pea plant (ttgg).

TT or Tt = tall

tt = short

GG or Gg = green

gg = white

	TG	TG	TG	TG
tg	TtGg	TtGg	TtGg	TtGg
tg	TtGg	TtGg	TtGg	TtGg
tg	TtGg	TtGg	TtGg	TtGg
tg	TtGg	TtGg	TtGg	TtGg

16 Tall/Green : 0 Tall/White : 0 Short/Green : 0 Short/ White

Red seahorses are dominant over blue seahorses and a long dorsal fin is dominant to a short dorsal fin. Cross a hybrid (heterozygous) red, long finned (also heterozygous) seahorse with a blue heterozygous long finned seahorse. What is the phenotypic and genotypic ratio of the offspring?  $RrLl \times rRlL$

**Key**  
 R - red  
 rr - blue  
 L - Long  
 ll - short

	RL	RI	rl	rl
rL	RrLL	RrLl	rrLL	rrLl
rI	RrLl	Rrll	rrLl	rrll
rl	Rrll	Rrll	rrll	rrll
rl	Rrll	Rrll	rrll	rrll

3 Red, Long: 1 Red, Short: 3 Blue, Long: 1 Blue, Short  
 RL Rll rrL rrll

R - red L - Long  
 rr - blue l - short

B - five toes R - green skin  
 b - four toes r - blue skin

Try answering the following without making a Punnett Square?

If BBrr and Bbrr are crossed, how many toes will all their offspring have? 5 How can you tell?

BBrr MUST pass B to all offspring

If Bbrr and Bbrr are crossed will all the offspring have blue skin? yes How can you tell?

Only "r" passed on so all (rr)

In dihybrids, if both parents have all heterozygous traits (BbRr X BbRr), what will the phenotypic ratio of the offspring ALWAYS be?

9:3:3:1

# Codominance Worksheet (Blood types)

Key

Human blood types are determined by genes that follow the **CODOMINANCE** pattern of inheritance. There are two dominant alleles (A & B) and one recessive allele (O).

Blood Type (Phenotype)	Genotype	Can donate blood to:	Can receive blood from:
O	ii (OO)	A, B, AB and O (universal donor)	O
AB	I <sup>A</sup> I <sup>B</sup>	AB	A, B, AB and O (universal receiver)
A	I <sup>A</sup> I <sup>A</sup> or I <sup>A</sup> i (I <sup>A</sup> O)	AB, A	O, A
B	I <sup>B</sup> I <sup>B</sup> or I <sup>B</sup> i (I <sup>B</sup> O)	AB, B	O, B

1. Write the genotype for each person based on the description:

- Homozygous for the "B" allele
- Heterozygous for the "A" allele
- Type O
- Type "A" and had a type "O" parent
- Type "AB"
- Blood can be donated to anybody
- Can only get blood from a type "O" donor

BB  
AO  
OO  
AO  
AB  
O  
AB

2. Pretend that Brad Pitt is homozygous for the type B allele, and Angelina Jolie is type "O." What are all the possible blood types of their baby? (Do the punnett square)

BO, type B, only

	B	B
O	BO	BO
O	BO	BO

3. Complete the punnett square showing all the possible blood types for the offspring produced by a type "O" mother and an a Type "AB" father. What are percentages of each offspring?

50% AO, 50% BO

	A	O
A	AO	AO
B	BO	BO

4. Mrs. Brown is type "A" and Mr. Brown is type "O." They have three children named Matthew, Mark, and Luke. Mark is type "O," Matthew is type "A," and Luke is type "AB." Based on this information:

- Mr. Brown must have the genotype OO
- Mrs. Brown must have the genotype AO because Mark has blood type OO
- Luke cannot be the child of these parents because neither parent has the allele B.

	A	
O	AO	
O	AO	OO

5. Two parents think their baby was switched at the hospital. Its 1968, so DNA fingerprinting technology does not exist yet. The mother has blood type "O," the father has blood type "AB," and the baby has blood type "B."

- a. Mother's genotype: OO  
 b. Father's genotype: AB  
 c. Baby's genotype: BB or BO  
 d. Punnett square showing all possible genotypes for children produced by this couple.  
 e. Was the baby switched? No - BO possible

	O	O
A	AO	AO
B	BO	BO

6. Two other parents think their baby was switched at the hospital. Amy the mother has blood type "A," Steven the father has blood type "B," and Priscilla the baby has blood type "AB."

- a. Mother's genotype: AA or AO  
 b. Father's genotype: BB or BO  
 c. Baby's genotype: AB  
 d. Punnett square that shows the baby's genotype as a possibility  
 e. Could the baby actually be theirs? Yes - AB possible

	A	
B	AB	B
A		

7. Based on the information in this table, which men could not be the father of the baby?

You can use the Punnett square if you need help figuring it out.

Name	Blood Type
Mother	Type A
Baby	Type B
The mailman	Type O
The butcher	Type AB
The waiter	Type A
The cable guy	Type B


8. The sister of the mom above also had issues with finding out who the father of her baby was. She had the state take a blood test of potential fathers. Based on the information in this table, why was the baby taken away by the state after the test?

Name	Blood Type
Mother	Type O
Baby	Type AB
Bartender	Type O
Guy at the club	Type AB
Cabdriver	Type A
Flight attendant	Type B

OO mom  
 can't have  
 an AB baby!