

Name key!

Incomplete Dominance and Codominance Practice Worksheet

1. Explain the difference between incomplete and codominance.

Incomplete dominance - heterozygous shows blending  
codominance - heterozygous shows BOTH

Co-Dominance Problems

2. In some chickens, the gene for feather color is controlled by codominance. The allele for black is B and the allele for white is W. The heterozygous phenotype is known as erminette (black and white spotted).

- a. What is the genotype for black chickens? BB
- b. What is the genotype for white chickens? WW
- c. What is the genotype for erminette chickens? BW

3. If two erminette chickens were crossed, what is the probability that:

- a. They would have a black chick? 25%
- b. They would have a white chick? 25%

Parents: BW x BW

B	B	BW	BW
W	BW	BW	WW

4. A black chicken and a white chicken are crossed. What is the probability that they will have erminette chicks? 0%

Parents: BB x WW

B	B
BW	BW
BW	BW

5. What offspring are expected from mating a roan bull and a roan cow? Roan = Red & White (RW)

1: Red 2: Roan 1: White

6. What phenotypes would you expect from a cross between a red bull and a white cow?

All Roan

7. Two birds with blue and white feathers are bred together. They produce three birds with blue feathers, five blue and white feathers, and two with white feathers. From these results, how do you think tail length in these cats are inherited (Codominance or Incomplete dominance)? Show the genotypes for all of the phenotypes.

Codominance

Blue + white (BW)

Blue (BB)

White (WW)

Incomplete Dominance Problems

8. In snapdragons, flower color is controlled by incomplete dominance. The two alleles are red (R) and white (r). The heterozygous genotype is expressed as pink (Rr).

- a. What is the phenotype of a plant with the genotype RR? red
- b. What is the phenotype of a plant with the genotype rr? white
- c. What is the phenotype of a plant with the genotype Rr? pink

9. A pink-flowered plant is crossed with a white-flowered plant. What is the probability of producing a pink-flowered plant? 50%

Parents: Rr x rr

R	r
Rr	Rr
Rr	rr

10. What cross will produce the most pink-flowered plants? Show a Punnett square to support your answer.

Parents: Rr x Rr

R	r
Rr	Rr
Rr	rr

All pink!

11. In Andalusian fowls, black individuals (BB) and white individuals (bb) are homozygous.

A homozygous black bird is crossed with a homozygous white bird. The offspring are all bluish-gray (Bb). Show the cross as well as the genotypes and phenotypes of the parents and offspring.

B	B
Bb	Bb
Bb	Bb

12. What results if a black individual is crossed with a bluish-gray individual? (SHOW YOUR WORK)

♀: Black B B

♂: Bluish-gray b B

B	B
Bb	Bb
Bb	Bb

13. If two bluish-gray individuals were crossed, what would be the ratios for both phenotype and genotype of the offspring?

P: 1: Black B B

2: bluish-gray B b

1: white b b

B	b
Bb	Bb
Bb	bb

G: 1: BB

2: Bb

1: bb

### Codominance and Multiple Alleles

Human Blood type is determined by three alleles -- A, B, and O. Both A and B alleles are dominant, while O is recessive. Complete the following table for blood types and alleles.

Blood Types	Genotypes
A	AA, AO
B	BB, BO
AB	AB
O	OO

Show the results of the following crosses:

3. Father type AB blood X Mother with type O blood  
 cross: AB X OO

	O	O	genotypes <u>2: AO 2: BO</u>
A	AO	AO	phenotypes <u>2: Type A 2: Type B</u>
B	BO	BO	g. ratio <u>2/4 AO 2/4 BO</u>
			p. ratio <u>2/4 Type A 2/4 Type B</u>

4. Both parents have type AB blood

cross: AB X AB

	A	B	genotypes <u>1: AA 2: AB 1: BB</u>
A	AA	AB	phenotypes <u>1: Type A 2: Type AB 1: Type B</u>
B	AB	BB	g. ratio _____
			p. ratio _____

5.

A. Could a couple have a child with type O blood if the mother is type B and the father is type A? Yes

B. What would the genotypes of the parents have to be?

Mom: BO Dad: AO → Baby: OO

C. What is the probability of their having a child with type O blood?

25%

D. What other genotypes could their children have?

AB, AO, BO

Name \_\_\_\_\_

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#### Co-Dominance Problems

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- a. What is the genotype for black chickens? \_\_\_\_\_  
b. What is the genotype for white chickens? \_\_\_\_\_  
c. What is the genotype for erminette chickens? \_\_\_\_\_

3. If two erminette chickens were crossed, what is the probability that:

- a. They would have a black chick? \_\_\_\_\_ %  
b. They would have a white chick? \_\_\_\_\_ %

Parents: \_\_\_\_\_ X \_\_\_\_\_

4. A black chicken and a white chicken are crossed. What is the probability that they will have erminette chicks? \_\_\_\_\_ %

Parents: \_\_\_\_\_ X \_\_\_\_\_

5. What offspring are expected from mating a roan bull and a roan cow?

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#### Incomplete Dominance Problems

8. In snapdragons, flower color is controlled by incomplete dominance. The two alleles are red (R) and white (r). The heterozygous genotype is expressed as pink (Rr).

- a. What is the phenotype of a plant with the genotype RR? \_\_\_\_\_  
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c. What is the phenotype of a plant with the genotype Rr? \_\_\_\_\_

9. A pink-flowered plant is crossed with a white-flowered plant. What is the probability of producing a pink-flowered plant? \_\_\_\_\_ %

Parents: \_\_\_\_\_ X \_\_\_\_\_

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Parents: \_\_\_\_\_ X \_\_\_\_\_

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**Codominance (Blood types)**

Human blood types are determined by genes that follow the CODOMINANCE pattern of inheritance. There are two dominant alleles ( $I^A$  and  $I^B$ ) and one recessive allele ( $i$ ).

Blood Type (Phenotype)	Genotype	Can donate blood to:	Can receive blood from:
O	$ii$	A, B, AB and O (universal donor)	O
AB	$I^A I^B$	AB	A, B, AB and O (universal receiver)
A	$I^A I^A$ or $I^A i$	AB, A	O, A
B	$I^B I^B$ or $I^B i$	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

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? (show your work)

Brad:  $I^B I^B$  All kids will be:  $I^B i$   
 Angie:  $ii$

3. Draw a Punnett square showing all the possible blood types for the offspring produced by a type "O" mother and an a Type "AB" father



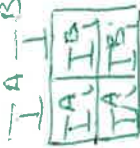
4. Mrs. Clink is type "A" and Mr. Clink is type "O." They have three children named Matthew, Mark, and Luke. Mark is type "O," Matthew is type "A," and Luke is type "AB." Based on this information:

- Mr. Clink must have the genotype  $ii$
- Mrs. Clink must have the genotype  $I^A i$  because MATTHEW has blood type "O"
- Luke cannot be the child of these parents because neither parent has the allele  $I^B$

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."

- Mother's genotype:  $ii$
- Father's genotype:  $I^A I^B$
- Baby's genotype:  $I^B i$
- Punnett square showing all possible genotypes for children produced by this couple
- Was the baby switched?

NO



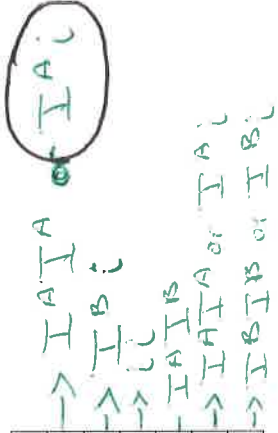
6. Two other parents think their baby was switched at the hospital. The mother has blood type "A," the father has blood type "B," and the baby has blood type "AB."

- Mother's genotype:  $I^A i$  or  $I^A I^A$
- Father's genotype:  $I^B i$  or  $I^B I^B$
- Baby's genotype:  $I^A I^B$
- Was the baby switched?

NO

7. Based on the information in this table, which man could not be the father of the baby? Justify your answer with a Punnett square.

Name	Blood Type
Mother	Type A
Baby	Type B
Sammy	Type O
George	Type AB
Billy	Type A
Tommy	Type B



8. Explain why blood type data cannot prove who the father of a baby is, and can only prove who the father is not.

Because there are only 84 blood types but many individuals.

DNA is only true test.