

Key

Non - Mendelian Inheritance
Practice Problems

1. A gardener knows that he can get orange flowers by crossing a red-flowered plant (RR) with a yellow-flowered plant (YY).

A. What type of genetic inheritance does this show?

incomplete dominance

- B. What would be the phenotypic ratios for a cross between a red-flowered plant and an orange-flowered plant? Show the Punnett Square.

	R	R
R	RR	RR
Y	RY	RY

red : orange
1 : 1

- C. What would be the genotypes of the parents if the offspring produced were 25% red-flowered, 50% orange-flowered, and 25% yellow-flowered? Show Punnett Squares.

	R	Y
R	RR	RY
Y	RY	YY

2. The roan horse is an example of codominance. Explain what codominance means in terms of which alleles are expressed in the horses. Describe the phenotype of a roan horse.

Both alleles are expressed at same time

phenotype = red hairs + white hairs

- A. What will be the phenotypic ratios of a cross between two roan horses? Show the Punnett square.

	R	W
R	RR	RW
W	RW	WW

red : roan : white
1 : 2 : 1
25% : 50% : 25%

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A. What will be the phenotypic ratios of a cross between two roan horses? Show the Punnett square.

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red : roan : white
1 : 2 : 1
25% : 50% : 25%

B. A horse breeder wants to produce only roan horses because they sell very well. Explain which horses she should always cross to produce the most roan offspring.

	R	R	
W	RW	RW	RR x WW
W	RW	RW	

3. How many phenotypes are possible when a trait is incompletely dominant? How many for a codominant trait? How many for a dominant/recessive trait?

3 = incomplete

2 = dom/ra.

3 = codominant

4. When yellow guinea pigs (YY) are crossed with white guinea pigs (WW), cream-colored offspring (YW) are produced. What type of inheritance is this?

incomplete dominance

A. Can a pet store owner mate a cream-colored male and a white female to obtain yellow guinea pigs? Explain your answer.

	Y	W	
W	WY	WW	NO - no yellow produced
W	WY	WW	

B. Would a test cross be necessary for guinea pig coat color? Explain.

NO - each phenotype has a specific

genotype

White = WW

Cream = YW

Yellow = YY

5. In a radish breeding experiment, the results were as follows:

25 long radishes : 52 oval radishes : 26 round radishes

- A. What type of inheritance is this?

incomplete dominance

- B. Determine the probable genotypes of the parent radishes. Show your work. L = long, R = round

	L	R	
L	BL	LR	LR x LR
R	LR	RR	

6. How are traits which have multiple alleles different from traits which do not. Explain using blood types and plant height.

Plant height = dom./rec = $T = \text{tall}$ } 2 alleles
 $t = \text{short}$

Blood type = mult. all. = $I^A = \text{A blood}$ } 3 alleles
 $I^B = \text{B blood}$
 $i = \text{O blood}$

7. A woman homozygous for type B blood marries a man who is heterozygous for type A. What will be the possible genotypes and phenotypes of their children? Show your work.

	I^B	I^B
I^A	$I^A I^B$	$I^A I^B$
i	$I^B i$	$I^B i$

$I^A I^B : I^B i$
 1 : 1

AB blood : B blood

1 : 1

8. A woman with type AB blood marries a man with type A blood. His mother had type O blood. What blood type is not likely to occur among the children? Explain.

	I^A	I^B
I^A	$I^A I^A$	$I^A I^B$
i	$I^A i$	$I^B i$

~~I^A~~

O blood will
not occur

9. A couple have four children. Their first child had type A blood, the second has type O, the third has type AB, and the fourth has type B. What are the genotypes of their parents? Show your work.

	I^B	i
I^A	$I^A I^B$	$I^A i$
i	$I^B i$	ii

10. Explain why men get sex-linked recessive traits more frequently than women.

Men have 1 chance to get normal allele
(XY)

women have 2 chances to get normal allele
(XX)

- since trait is on X-chrom.

11. In fruit flies, red eye color (X^R) is dominant over white eye color (X^r) and the trait is sex-linked. What genotypes and phenotypes will result from a cross between a red-eyed male and a heterozygous red-eyed female? Show your work.

	X^R	Y
X^R	$X^R X^R$	$X^R Y$
X^r	$X^R X^r$	$X^r Y$

12. Two parents with normal vision have a color-blind son. What is the probability that their next child will be a color-blind daughter? Show your work.

	X^c	X^c	
X^c	$X^c X^c$	$X^c X^c$	0%
Y	$X^c Y$	$X^c Y$	

13. A phenotypically normal woman has phenotypically normal parents. However, she has a color-blind brother.

A. What are her chances of being a carrier?

50%

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

B. If she is a carrier, does that mean she will definitely have a color-blind son? Explain.

no - 50% chance of having
a colorblind son

Name: _____

Period: _____

Non-Mendelian Genetics Quiz
25 points

Match the type of inheritance or technique to the descriptions below. Choices may be used more than once. (6 pts.)

- A. Testcross
- B. Codominance
- C. Incomplete Dominance
- D. Sex-linked

- C 1. When a black chicken is crossed with a white chicken the offspring are grey.
- D 2. A trait found on the X chromosome.
- A 3. Crossing an organism with an unknown genotype with an organism that is homozygous recessive for the trait
- B 4. In cattle, possible coat colors include red, white, and roan.
- D 5. Trait which shows up mostly in men.
- C 6. In our meiosis babies hair texture could be straight, curly or kinky.

Multiple Choice: Record your answer on the space provided. Draw Punnett squares if necessary to help you determine the correct answer. (1 pt. each)

A pet store owner has green lizards and brown lizards. The green lizards sell the best. She knows that brown is dominant to green in lizards. She would like to get rid of the brown lizards who cannot produce any green offspring.

- D 7. Which of the following could be genotypes for the brown lizards?
 - A. BB
 - B. Bb
 - C. bb
 - D. both A and B

B 8. What technique should she employ to determine which brown lizards she will keep and which ones she will get rid of?

- A. Punnett Square
- B. testcross
- C. codominance
- D. monohybrid cross

C 9. What should she cross each brown lizard with in this technique?

- A. a homozygous brown lizard
- B. a heterozygous brown lizard
- C. a green lizard
- D. a blue lizard

B 10. If she performs the cross and the baby lizards are all brown, she should ...

- A. keep the brown lizard that was crossed
- B. get rid of the brown lizard that was crossed

In roses, RR = red, RW = pink and WW = white for flower color.

C 11. If a plant breeder wanted to get the most variety in color each time she crossed 2 flowers, what parental genotypes would she use?

- A. RR x RR
- B. RR x RW
- C. RW x RW
- D. WW x WW

A 12. What type of inheritance would this be?

- A. incomplete dominance
- B. codominance
- C. sex linked trait
- D. testcross

C 13. How many phenotypes are possible with this type of inheritance?

- A. 1
- B. 2
- C. 3
- D. 4

B 14. If you were a plant breeder and you had red roses, would there be any reason to do a testcross?

- A. yes
- B. no

A 15. When a tall radish plant is crossed with a short radish plant, all the offspring were medium height. The medium height plants were then crossed with each other. Out of 100 offspring of the medium height plants, how many would be expected to be tall?

TT = tall
SS = short

- A. 25
- B. 50
- C. 100
- D. 0

In horses, B stands for black coat color and W stands for white coat color and the coat color trait is codominant.

C 16. What would be the genotype for a heterozygous horse?

- A. BB
- B. WW
- C. BW
- D. none of the above

D 17. What would be the phenotype for a heterozygous horse?

- A. black
- B. white
- C. grey
- D. black and white

A 18. What is the chance a black horse and a black and white horse would produce a white horse?

- A. 0%
- B. 25%
- C. 50%
- D. 100%

Michelle wants to have a child, but she is afraid of having a child with hemophilia. Her doctor asks her about her family history and she tells him that only her father has hemophilia in her family and her husband has no hemophilia in his family. X^H = normal, X^h = hemophilic

B 19. What is Michelle's genotype?

- A. $X^H X^H$ B. $X^H X^h$ C. $X^h X^h$ D. $X^H Y$

A 20. What is her husband's genotype?

- A. $X^H Y$
 B. $X^h Y$
 C. $X^H Y^h$
 D. $X^H X^h$

B 21. What are the chances that Michelle and her husband will have a child with hemophilia?

- A. 0%
 B. 25%
 C. 50%
 D. 100%

	X^H	X^h
X^H	$X^H X^H$	$X^H X^h$
X^h	$X^H X^h$	$X^h X^h$
Y	$X^H Y$	$X^h Y$

A 22. Will the child with hemophilia be a boy or a girl?

- A. boy
 B. girl

B 23. What are the chances Michelle and her husband will have a girl who will not pass on the allele for hemophilia?

- A. 0%
 B. 25%
 C. 50%
 D. 100%

B 24. Sex linked traits are carried on ...

- A. the Y chromosome
 B. the X chromosome
 C. the Z chromosome
 D. both A and B

B 25. T or F: Females can never get a sex linked trait or disease.
 A. true B. false