Name: ______________________________________ Date: ________

Non-Mendelian Genetics Practice Packet

Most genetic traits have a stronger, dominant allele and a weaker, recessive allele. In an individual with a heterozygous genotype, the dominant allele shows up in the offspring and the recessive allele gets covered up and doesn't show; we call this **complete dominance**.

However, some alleles don't completely dominate others. In fact, some heterozygous genotypes allow both alleles to partially show by blending together how they are expressed; this is called **incomplete dominance.** Other heterozygous genotypes allow both alleles to be completely expressed at the same time like spots or stripes; this is called **codominance**. Examples of each are listed below.

Part 1: Incomplete Dominance Practice Problems

#1-2. 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.

1. Give the genotypes for each of the phenotypes, using the letters "R" and " r " for alleles:
   a. Red snapdragon genotype: ______
   b. Pink snapdragon genotype: ______
   c. White snapdragon genotype: ______

2. 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

Genotypic %: ________________
Phenotypic %: ________________

b. red x white

Genotypic %: ________________
Phenotypic %: ________________

c. pink x white

Genotypic %: ________________
Phenotypic %: ________________

#3-4. 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".

3. Show the genetic crosses between the following horses and record the genotypic and phenotypic percentages:

a. brown x white

Genotypic %: ________________
Phenotypic %: ________________

b. brown x palomino

Genotypic %: ________________
Phenotypic %: ________________

c. palomino x palomino

Genotypic %: ________________
Phenotypic %: ________________

4. 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?

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5. In Smileys, eye shape can be starred (SS), circular (CC), or a circle with a star (CS). **Write the genotypes for the pictured phenotypes**



__________ __________ __________

6. Show the cross between a star-eyed and a circle eyed. (draw a punnett square to help)
What are the phenotypes of the offspring? ____________
What are the genotypes? __________

7. Show the cross between a circle-star eyed, and a circle eyed. (draw a punnett square to help)
How many of the offspring are circle-eyed? ____________
How many of the offspring are circle-star eyed? ____________

8. Show the cross between two circle-star eyed. (draw a punnett square to help)
How many of the offspring are circle-eyed? ____________
How many of the offspring are circle-star eyed? ____________
How many are star eyed? ____________

Part 2: Codominance Worksheet (Blood types)

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^AI^B **(AB)**	AB	A,B,AB and O (universal receiver)
A	I^AI^A or I^Ai **(AO)**	AB, A	O,A
B	I^BI^B or I^Bi **(BO)**	AB,B	O,B

9. Write the genotype for each person based on the description:
   a. Homozygous for the "B" allele __________
   b. Heterozygous for the "A" allele __________
   c. Type O __________
   d. Type "A" and had a type "O" parent __________
   e. Type "AB" __________

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In blood typing, the gene for type A and the gene for type B are codominant. The gene for type O is recessive. Using Punnett squares, determine the possible blood types of the offspring when:

10. Father is type O, Mother is type O

___________% O
___________% A
___________% B
___________% AB

11. Father is type A, homozygous; Mother is type B, homozygous

___________% O
___________% A
___________% B
___________% AB

12. Father is type A, heterozygous; Mother is type B, heterozygous

___________% O
___________% A
___________% B
___________% AB

13. Father is type O, Mother is type AB

___________% O
___________% A
___________% B
___________% AB

14. 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)*

15. 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?**

____

16. Mrs. Essy is type "A" and Mr. Essy 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. Essy must have the genotype ______
- Mrs. Essy must have the genotype ______ because ____________ has blood type _____
- Luke cannot be the child of these parents because neither parent has the allele _____.

Name: _______________________________________ Date: ________

17. 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: _______
- Father's genotype: _______
- Baby's genotype: ______ or ________
- Punnett square showing all possible genotypes for children produced by this couple.
- Was the baby switched? ________________________

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

a. Mother's genotype: _______ or ________

b. Father's genotype: _______ or ________

c. Baby's genotype: ______

d. Punnett square that shows the baby's genotype as a possibility

e. Could the baby actually be theirs? __________________________

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

*(hint… look at the baby's blood type only…)*_____________________________________
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

20. 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? *(hint… look at the baby's blood type only…)*____

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

Name: ______________________________________ Date: ________

Part 3: Genetics: X Linked Genes
In fruit flies, eye color is a sex linked trait. Red is dominant to white.

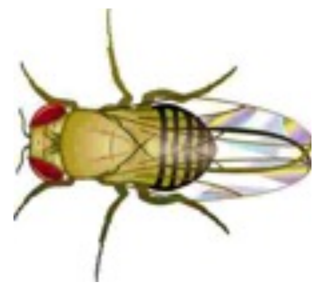
21. What are the sexes and eye colors of flies with the following genotypes:

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

22. What are the genotypes of these flies:

white eyed, male _____________ red eyed female (heterozygous) ________
white eyed, female ___________ red eyed, male ___________

23. Show the cross of a white eyed female $X^r X^r$ with a red-eyed male $X^R Y$.



24. Show a cross between a pure red eyed female and a white eyed male.
What are the genotypes of the parents:
___________& _______________

How many are:
white eyed, male___
white eyed, female ___
red eyed, male ____
red eyed, female ____

25. Show the cross of a red eyed female (heterozygous) and a red eyed male. What are the genotypes of the parents?
___________ & ________________

How many are:
white eyed, male___white eyed, female ___
red eyed, male ____ red eyed, female ____

26. Math: What if in the above cross, 100 males were produced and 200 females. (think about the percentage of the total #)
How many total red-eyed flies would there be?

Name: ______________________________________ Date: ________

27. In humans, hemophilia is a sex linked trait. Females can be normal, carriers, or have the disease. Males will either have the disease or not (but they won't ever be carriers)

$X^H X^H$ = female, normal

$X^H X^h$ = female, carrier

$X^h X^h$ = female, hemophiliac

$X^H Y$ = male, normal

$X^h Y$ = male, hemophiliac

Show the cross of a man who has hemophilia with a woman who is a carrier.

28. What is the probability that their children will have the disease? __________

29. A woman who is a carrier marries a normal man. Show the cross. What is the probability that their children will have hemophilia? What sex will a child in the family with hemophilia be?

30. A woman who has hemophilia marries a normal man. How many of their children will have hemophilia, and what is their sex?

Name: ___________________________________ Date: ________