Crosses Involving One Trait Practice

1. Use a Punnett square to predict the genotypic and phenotypic outcome (offspring) of a cross between two heterozygous/hybrid tall (Tt) pea plants.

Key: T - \_\_\_\_\_\_\_\_\_\_ Parents: \_\_\_ \_\_\_ x \_\_\_ \_\_\_

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| --- | --- |
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|  |  |

 t - \_\_\_\_\_\_\_\_\_\_ Genotypes:

 Phenotypes:

2. In pea plants, green peas are dominant over yellow peas. Use a Punnett square to predict the phenotypic and genotypic outcome of a cross between a plant heterozygous/hybrid for green (Gg) and a plant homozygous/purebred for yellow (gg) peas.

3. In pea plants green peas are dominant over yellow peas. Use a Punnett square to predict the phenotypic and genotypic outcome of a cross between two plants heterozygous for green peas.

4. In pea plants, round peas are dominant over wrinkled peas. Use a Punnett square to predict the phenotypic and genotypic outcome of a cross between a plant homozygous for round peas and a plant homozygous for wrinkled peas.

5. In pea plants, round peas are dominant over wrinkled peas. Use a Punnett square to predict the phenotypic and genotypic outcome of a cross between homozygous dominant pea plants.

Genetics Cross Packet

Monohybrid Cross Problems

Directions: For EACH problem, complete the following.

1. Determine the dominant and recessive alleles and make a KEY
2. Write the genotypes of each parent
3. Construct a punnett square
4. Determine the genotype and phenotypes of the offspring

1. In garden peas, round seed coats are recessive to wrinkled seed coats. What will the results be of a cross between a homozygous dominant male and a recessive female?

2. In humans, straight toes are dominant to curled toes. What would be the result of a cross between a recessive male and a heterozygous female?

3. In dogs, erect ears is dominant over droopy ears. What are the results if two heterozygous dogs have a litter of puppies?

4. The ability to roll the tongue is determined by a dominant gene, while the recessive gene results in the inability to roll the tongue. A man and his wife can both roll their tongues and are surprised to find that their son cannot! Explain this by showing the genotypes of all three persons. (Note: You don’t need to do a Punnett square for this problem but you can if it helps you.)

5. In cats, Tabby stripes are dominant over stripeless cats, What would the kittens be with one heterozygous tabby and the other stripeless cat

6. In cats, short hair is dominant over long hair. Cross a Homozygous short-hair X Heterozygous short-hair.

Complex Inheritance Problems

7. In humans straight hair (cc) and curly hair (CC) are incompletely dominant, that result in hybrids who have wavy hair (Cc). Cross a curly hair female with a wavy haired male.

8. In snapdragons, RR=red, Rr=pink, rr=white. What would the results be of a cross if one parent was a homozygous red snapdragon and the other was a homozygous white snapdragon?

9. In iris flowers, purple (P) is incompletely dominant over white (p). What would the results be of a cross if both parents were pale lavender?

10. In crocus flowers, white and purple are co-dominant, and result in a purple and white striped flower when both genes are present. What are the possible results from the cross-pollination of a striped crocus with a white crocus?

1. In cattle, red is incompletely dominant over white hides. Roan is the name of the color that results from incomplete dominance. What are the possible results if a white male mates with a roan female?

12. In Chickens, feathers can be black (BB), CHECKERED (Bb) or white (bb). A black rooster is crossed with a checkered hen. What is the phenotype and genotype of their offspring?

The following Punnett squares show the results of four different crosses Gregor Mendel made with pea plants. In this case, Mendel was looking at flower color with red being dominant over white. For each of the results listed below, write down which cross (Punnett square) applies.

13. He crossed a red flowered plant with a white flowered plant. His results were 126 red flowered plants and 122 white flowered plants. Which Punnett square applies? \_\_\_\_\_\_\_\_\_\_\_

14. He crossed a red flowered plant with a white flowered plant. His results were 307 red flowered plants and 0 white flowered plants. Which Punnett square applies? \_\_\_\_\_\_\_\_\_\_\_

15. He crossed a red flowered plant with a red flowered plant. His results were 306 red flowered plants and 110 white flowered plants. Which Punnett square applies? \_\_\_\_\_\_\_\_\_\_\_

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| A.

|  |  |  |
| --- | --- | --- |
|  | R | R |
| r | Rr | Rr |
| r | Rr | Rr |

 | B.

|  |  |  |
| --- | --- | --- |
|  | R | R |
| R | RR | RR |
| r | Rr | Rr |

 |
| C.

|  |  |  |
| --- | --- | --- |
|  | R | r |
| R | RR | Rr |
| r | Rr | rr |

 | D.

|  |  |  |
| --- | --- | --- |
|  | R | r |
| r | Rr | rr |
| r | Rr | rr |

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Multiple alleles and Codominance

This is the phenomenon that occurs when 2 or more alleles influence the phenotype. BOTH alleles show up with certain genotypes. Example: Human blood type:

16. You are blood type O and you marry a person with blood type AB. List the possible blood types (phenotypes) and genotypes of your offspring.

17. Suppose two newborn babies were accidentally mixed up in the hospital. In an effort to determine the parents of each baby, the blood types of the babies and the parents were determined.

* 1. Baby 1 had type O Mrs. Templet had type AB and Mr. Templet had type B
	2. Baby 2 had type AB Mrs. Klumpp had type A Mr. Klumpp had type O

Who are the parents for Baby #1 and 2? Draw punnett squares to show the 2 couples’ offspring

Sex-Linked Traits

* A sex-linked trait is a trait that is carried on the X sex chromosome. Moms can be carriers because they have the sex chromosomes XX. Examples of traits which are sex-linked are: color blindness, hemophilia, muscular dystrophy
* Possible genotypes for Mom and Dad- Mom: Dad:

 XNXN XNXn XnXn XNYXnY

Normal, Carrier, has the trait Normal, has the trait

* The problems are completed in the same way as a monohybrid cross, but the X and Y chromosomes are included. For example, if the Mom is a carrier for color blindness and Dad is color blind the results of the Punnett square are below:

|  |  |  |
| --- | --- | --- |
|  | Xn | Y |
|  XN | XNXn | XNY |
| Xn | XnXn | XnY |

Genotypes: 25%XNXn, 25%XnXn, 25%XNY, 25%XnY

Phenotypes: 25%carrier female, 25%colorblind female, 25%normal male, 25%colorblind male

18. Hemophilia is a sex-linked trait. A person with hemophilia is lacking certain proteins that are necessary for normal blood clotting. Hemophilia is caused by a recessive allele so use “N” for normal and “n” for hemophilia. Since hemophilia is sex- linked, remember a woman will have two alleles (XNXN or XNXn or XnXn) but a man will have only one allele (XNY or XnY).

Complete the cross if a woman who is heterozygous (a carrier) for hemophilia marries a normal man.

19. Color blindness is caused by a sex-linked recessive allele. Can a color blind female have a son that has normal vision? Do the Punnett square. \**use N = normal vision and n = color blind*

Dihybrid Problems: Use the key below to complete the following problems.



20. Cross one Pure short hair and colorpoint cat with a Long hair and pure normal cat.

21. Hybrid short hair and hybrid normal X Heterozygous short hair and hybrid normal

22. Heterozygous Tabby and Hybrid normal X Stripeless and colorpoint