

Punnett Square Test Prep

Inheritance (Unit 4) – Biology

Name: _____

Block: _____ Date: _____

Completed Example

Trait: Green Leaves vs Purple Leaves

Parent 1

Genotype: Gg

Genotype description: heterozygous

Phenotype: green leaves

Parent 2

Genotype: GG

Genotype description: homozygous dominant

Phenotype: purple leaves

| | | |
|---|----|----|
| | G | G |
| G | GG | GG |
| g | Gg | Gg |

Offspring Possibilities

| Genotypes | Genotype descriptions | Phenotypes |
|-----------|----------------------------|---------------------|
| <u>GG</u> | <u>homozygous dominant</u> | <u>green leaves</u> |
| <u>Gg</u> | <u>heterozygous</u> | <u>green leaves</u> |
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(The last line is blank because "gg" isn't a possible result of this cross.)

Genotypic ratio: 0 : 4 : 0 (0 homozygous dominant, 4 heterozygous, and 0 homozygous recessive)

Phenotypic ratio: 4 : 0 (4 with the dominant trait of green leaves, and 0 with the recessive trait of purple leaves)

What is the likelihood that a plant produced from this cross will **have** green leaves? 100%

What is the likelihood that a plant produced from this cross will be a **carrier** for purple leaves? 50%

Instructions

In each of the Punnett Squares that follows, you'll be given **partial information**. Use the information you're given to fill in all of the blanks, complete the Punnett Square, and answer the questions!

1. Trait: **Tay-Sachs Disease** (a recessive disorder) – The homozygous dominant genotype is HH (H for healthy).

Parent 1

Genotype: Hh

Genotype description: _____

Phenotype: _____

Parent 2

Genotype: _____

Genotype description: **Heterozygous**

Phenotype: _____

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Offspring Possibilities

| Genotypes | Genotype descriptions | Phenotypes |
|-----------|-----------------------|------------|
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What is the likelihood that this couple will have a child who **has** Tay-Sachs Disease? 0%

What is the likelihood that this couple will have a child who is a **carrier** for Tay-Sachs Disease? 50%

2. Trait: **Tay-Sachs Disease** (a recessive disorder) – The homozygous dominant genotype is HH (H for healthy).

Parent 1

Genotype: _____

Genotype description: **Heterozygous**

Phenotype: _____

Parent 2

Genotype: _____

Genotype description: **Homozygous** _____

(Hint: Look at the offspring)

Phenotype: _____

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Offspring Possibilities

Genotypes Genotype descriptions Phenotypes

hh _____

_____ _____

_____ _____

What is the likelihood that this couple will have a child who **has** Tay-Sachs Disease? _____ %

What is the likelihood that this couple will have a child who is a **carrier** for Tay-Sachs Disease? _____ %

3. Trait: **Black Fur (B) vs White Fur (B') vs Gray Fur**

Parent 1

Genotype: **B'B'**

Phenotype: _____

Parent 2

Genotype: _____

Phenotype: **Gray Fur**

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Offspring Possibilities

Genotypes Genotype Descriptions Phenotypes

_____ _____

_____ _____

_____ _____

What is the likelihood that this cross will result in an offspring with gray fur? _____ %

4. Trait: **Black Fur (B) vs White Fur (B') vs Gray Fur**

Parent 1

Genotype: _____

Phenotype: **Black Fur**

Parent 2

Genotype: **BB'**

Phenotype: _____

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Offspring Possibilities

Genotypes Genotype Descriptions Phenotypes

_____ _____

_____ _____

_____ _____

What is the likelihood that this cross will result in an offspring with gray fur? _____ %

5. Trait: Black Fur (B) vs White Fur (W) vs Black & White Stripes

Parent 1

Genotype: BB

Phenotype: _____

Parent 2

Genotype: _____

Phenotype: Black & White Stripes

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Offspring Possibilities

Genotypes

Phenotypes

What is the likelihood that this cross will result in an offspring with black & white stripes? _____ %

6. Trait: Black Fur (B) vs White Fur (W) vs Black & White Stripes

Parent 1

Genotype: BB

Phenotype: _____

Parent 2

Genotype: _____

Phenotype: White Fur

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Offspring Possibilities

Genotypes

Phenotypes

What is the likelihood that this cross will result in an offspring with black & white stripes? _____ %

7. Trait: Blood Type (a real-life example of codominance)

Parent 1

Genotype: ii

Phenotype: Type _____

Parent 2

Genotype: i^Ai

Phenotype: Type _____

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Offspring Possibilities

Genotypes

Phenotypes

Type _____

Type _____

Type _____

| Genotype | Phenotype |
|---|---------------|
| I ^A I ^A (Homozygous dom.) | Blood Type A |
| I ^A i (Heterozygous) | Blood Type A |
| I ^B I ^B (Homozygous dom.) | Blood Type B |
| I ^B i (Heterozygous) | Blood Type B |
| I ^A I ^B (Heterozygous) | Blood Type AB |
| ii (Homozygous rec.) | Blood Type O |

What is the likelihood that their offspring will be Type A? _____ / 4

8. Trait: **Blood Type** (a real-life example of **codominance**)

Parent 1

Genotype: $I^A I^B$

Phenotype: Type

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Parent 2

Genotype:

Phenotype: **Type O**

Offspring Possibilities

| <i>Genotypes</i> | <i>Phenotypes</i> |
|------------------|-------------------|
| <u> </u> | Type <u> </u> |
| <u> </u> | Type <u> </u> |
| <u> </u> | Type <u> </u> |

| Genotype | Phenotype |
|-----------------------------|----------------------|
| $I^A I^A$ (Homozygous dom.) | Blood Type A |
| $I^A i$ (Heterozygous) | Blood Type A |
| $I^B I^B$ (Homozygous dom.) | Blood Type B |
| $I^B i$ (Heterozygous) | Blood Type B |
| $I^A I^B$ (Heterozygous) | Blood Type AB |
| $i i$ (Homozygous rec.) | Blood Type O |

What is the likelihood that their offspring will be Type B? %

9. Trait 1: **Leaf shape**. Alleles: **Broad leaves (B) vs thin leaves (b)**

Trait 2: **Flower color**. Alleles: **Red flowers (R) vs yellow flowers (R')** (Heterozygous = orange flowers)

Parent 1

Genotype: $BbR'R'$

Phenotypes: &

Parent 2

Genotype: $bbRR$

Phenotypes: &

FOIL for $BbR'R'$:

FOIL for $bbRR$:

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Offspring Possibilities

| <i>Genotypes</i> | <i>Phenotypes</i> | <u> </u> & <u> </u> |
|------------------|-------------------|-----------------------|
| <u> </u> | <u> </u> | <u> </u> & <u> </u> |
| <u> </u> | <u> </u> | <u> </u> & <u> </u> |
| <u> </u> | <u> </u> | <u> </u> & <u> </u> |
| <u> </u> | <u> </u> | <u> </u> & <u> </u> |
| <u> </u> | <u> </u> | <u> </u> & <u> </u> |
| <u> </u> | <u> </u> | <u> </u> & <u> </u> |

What is the likelihood that a flower produced by this cross will have thin leaves **and** orange flowers? / 16

What is the likelihood that a flower produced by this cross will be heterozygous for **both** traits? / 16

10. Trait 1: Leaf shape. Alleles: Broad leaves (B) vs thin leaves (b)

Trait 2: Flower color. Alleles: Red flowers (R) vs yellow flowers (R') (Heterozygous = orange flowers)

Parent 1

Genotype: _____

Phenotypes: Thin leaves with orange flowers

Parent 2

Genotype: _____

Phenotypes: Broad leaves (homozygous) with yellow flowers

FOIL for Parent 1: _____

FOIL for Parent 2: _____

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Offspring Possibilities

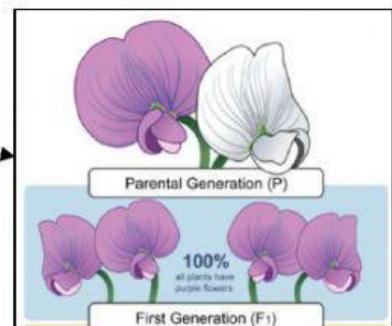
Genotypes *Phenotypes*

_____ & _____
_____ & _____
_____ & _____
_____ & _____
_____ & _____
_____ & _____
_____ & _____
_____ & _____

What is the likelihood that a flower produced by this cross will have broad leaves **and** yellow flowers? _____ / 16

What is the likelihood that a flower produced by this cross will be heterozygous for **both** traits? _____ / 16

11. If we cross a plant with the same genotype as the white flower in the P generation with a plant that has an F1 genotype, what is the likelihood that they'll produce offspring that are white? _____ %



12. The incomplete Punnett Square below is for a cross between two cows. One is brown. The other is white.

What is the likelihood that an offspring of theirs will be brown? _____ %

What is the likelihood that an offspring of theirs will be white? _____ %

One more phenotype is possible. Describe how cows with that phenotype would look: _____

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| | |
| | BW |