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Punnett Square Practice Worksheet Questions and Answers PDF

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Part 1: Foundational Knowledge

What is the term for different versions of a gene?

Hint: Think about the variations of genes.

○ Chromosomes
○ **Alleles ✓**
○ Genotypes
○ Phenotypes

The correct term for different versions of a gene is alleles.

Which of the following are true about dominant alleles?

Hint: Consider the characteristics of dominant alleles.

☐ **They can mask the effect of recessiv alleles. ✓**
☐ They are always more common in a population.
☐ **They determine the phenotype in a heterozygous genotype. ✓**
☐ They are represented by lowercase letters.

Dominant alleles can mask recessives and determine phenotypes in heterozygous genotypes.

Explain the difference between homozygous and heterozygous genotypes.

Hint: Consider the allele combinations in each genotype.

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> **Homozygous genotypes have identical alleles, while heterozygous genotypes have different alleles.**

List two examples of a homozygous genotype and two examples of a heterozygous genotype.

Hint: Think about common traits in organisms.

1. Homozygous examples:

> AA, aa

2. Heterozygous examples:

> Aa, Bb

> Examples of homozygous genotypes include AA and aa; examples of heterozygous genotypes include Aa and Bb.

Part 2: Understanding Genetic Concepts

What does a Punnett square help predict?

Hint: Consider what information is derived from a Punnett square.

○ The physical appearance of an organism
○ **The probability of an offspring having a particular genotype ✓**
○ The number of chromosomes in a cell
○ The mutation rate of a gene

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A Punnett square helps predict the probability of offspring genotypes.

Which statements are true about phenotypes?

Hint: Think about the relationship between genotypes and phenotypes.

☐ **They are determined by genotypes. ✓**
☐ **They can be influenced by the environment. ✓**
☐ They are always visible traits.
☐ They are the genetic makeup of an organism.

Phenotypes are influenced by genotypes and the environment.

Describe how a monohybrid cross differs from a dihybrid cross.

Hint: Consider the number of traits being studied.

A monohybrid cross involves one trait, while a dihybrid cross involves two traits.

Part 3: Applying Knowledge and Analyzing Relationships

If a plant with genotype Aa is crossed with a plant with genotype aa, what is the probability of the offspring being homozygous recessiv?

Hint: Use the Punnett square to determine the probabilities.

○ 0%
○ 25%
○ **50% ✓**
○ 75%

The probability of the offspring being homozygous recessiv is 50%.

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In a dihybrid cross between two heterozygous parents (AaBb x AaBb), which of the following genotypic combinations are possible?

Hint: Consider the combinations of alleles from both parents.

☐ **AABB ✓**

☐ **AaBb ✓**

☐ **aabb ✓**

☐ **Aabb ✓**

▌ Possible genotypic combinations include AABB, AaBb, aabb, and Aabb.

Using a Punnett square, predict the phenotypic ratio of a cross between two heterozygous pea plants (Ttx T t) for tallness, where tall (T) is dominant over short (t).

Hint: Draw a Punnett square to visualize the cross.

▌ **The expected phenotypic ratio is 3 tall to 1 short.**

In a genetic cross, what does a 3:1 phenotypic ratio typically indicate?

Hint: Think about the type of genetic cross involved.

◯ A monohybrid cross with incomplete dominance

◯ **A monohybrid cross with complete dominance ✓**

◯ A dihybrid cross with linked genes

◯ A test cross with a homozygous recessiv

▌ A 3:1 phenotypic ratio typically indicates a monohybrid cross with complete dominance.

Which factors can affect the accuracy of a Punnett square prediction?

Hint: Consider external influences on genetic outcomes.

☐ **Environmental influences ✓**

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- ☑ **Mutations in the genes** ✓
- ☑ **Random fertilization** ✓
- ☑ **Linked genes** ✓

> Factors affecting accuracy include environmental influences, mutations, random fertilization, and linked genes.

Analyze the potential outcomes of a genetic cross between two organisms with genotypes AaBb and AaBb. Discuss the expected genotypic and phenotypic ratios.

Hint: Consider the combinations of alleles from both parents.

> **The expected genotypic ratio is 1 AABB : 2 AaBb : 1 aabb, and the phenotypic ratio is 9:3:3:1.**

Part 4: Synthesis and Reflection

Which of the following scenarios would most likely require a revision of Mendelian genetics predictions?

Hint: Think about new discoveries in genetics.

- ○ **Discovery of new alleles** ✓
- ○ Observation of incomplete dominance
- ○ Introduction of a new species
- ○ Identification of linked genes

> Discovery of new alleles would likely require a revision of Mendelian predictions.

Which scenarios demonstrate the limitations of using Punnett squares for genetic predictions?

Hint: Consider complex inheritance patterns.

- ☑ **Predictin traits in polygenic inheritance** ✓
- ☑ Estimating probabilities in large populations

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☐ **Accounting for epigenetic factors** ✓
☐ **Determining exact phenotypes in complex traits** ✓

❚ Limitations include predicting traits in polygenic inheritance and accounting for epigenetic factors.

Design a genetic experiment using Punnett squares to determine the inheritance pattern of a new trait in a plant species. Describe the steps and expected outcomes.

Hint: Think about the methodology and analysis involved.

❚ **The experiment should outline the cross, expected ratios, and analysis of results.**

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